Adoption and Use of Social Media Among Registered Dietitians Nationwide:

Implications for Health Communication

by

Claudia Thompson-Felty

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Graduate Supervisory Committee:

Carol Johnston, Chair
Chong Lee
Leslie-Jean Thornton
Pamela Swan
Christy Lespron

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ABSTRACT

Currently, there has been limited research on evaluating the social media use and competency level of registered dietitian/nutritionists (RD/N). With health information increasingly sought on social media, it is imperative to understand the social media competency of health professionals. The social media use, reach, and competency level of a nationwide RD/N sample was assessed utilizing an online survey. The sample (n=500) while mostly female (97%) was representative of RD/Ns compared to the nationwide statistics from the Commission on Dietetic Registration. The sample included RD/Ns from forty-six states with California (n=44), New York (n=42), and Texas (n=34) having the largest proportion of respondents. The majority of RD/Ns engage in social media for personal use (92.4%) and 39.2% engage for professional use. One hundred and twenty-five RD/Ns reported 777 $\pm$ 1063 (mean $\pm$ SD) social media followers. As compared to non-millennial RD/Ns, millennial RD/Ns engaged significantly more in social media for personal and professional use (+10% and +13.5% respectively, $p<0.001$) and scored significantly higher for social media competency ($p<0.001$). Additionally, food and nutrition management and consultant/private practice/industry RD/Ns had significantly higher competency scores than clinical RD/Ns ($p=0.015$ and $p=0.046$, respectively). RD/Ns who use social media personally and professionally had a significantly higher competency score than RD/Ns who did not ($p<0.001$). There were significant associations of Facebook, Twitter, total followers and total average followers with the social media competency score ($r=0.265$, 0.404, 0.338, & 0.320, respectively) in RD/Ns. Specifically, the social media competency score, was found to explain 16% of the variation in the number of Twitter followers and 10% of the variation in the average

number of followers by platform. These data suggest an opportunity to increase RD/Ns' social media reach (i.e. following) by improving competency level.

DEDICATION

This dissertation is dedicated to my husband. Your belief in me all these years encouraged me to believe in myself. Thank you for being my best friend, my sounding board, my support system, and my biggest cheerleader. You earned this PhD right along with me. You will always be my teammate in life. Thank you!

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TABLE OF CONTENTS

Page

APPENDIX Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

In 2010, seven of the top ten causes of death were chronic diseases, and the total medical cost associated with just two chronic diseases, heart disease and diabetes, is over 500 billion dollars with costs estimated to triple by 2030.[1,2,3,4] With chronic disease burden so high there is an increased need to find ways to provide chronic disease prevention and health promotion interventions that reach large numbers of Americans in a cost effective manner. Social media is becoming an increasingly vital tool on this front. Research examining Americans' use of social media indicates that a vast majority of Americans, 74% of adults and as high as 90% of adolescents, use at least one form of social media.[5,6] The use of social media spans all racial and ethnic groups and users of all socio-economic backgrounds are engaged, providing a unique platform for health interventions.[12] Americans are looking for health information and guidance on social media sites, with an estimated 10 million users seeking health-based information online daily.[7,8,9,10,11]

While users are seeking accurate health information they are not always able to identify the difference between evidence-based information and inaccurate health claims.[7,5,6] Health information disseminated online continues to be problematic due to the use of medical jargon, lack of accreditation or regulation, and inaccurate or misleading information.[7] The quality of health information found online has led Healthy People 2010 to include a health communication objective due to the significant potential for consumer harm from inaccurate health information.[13] Currently, it is not known how many Americans are getting nutrition information from qualified professionals online. A

Google search using the term "diet" returned 476 million responses. The first two pages of search results did not include any information provided by registered dietitians, indicating that even though registered dietitians go through evidence-based training and a national examination they may not be the first source of nutrition information online for the American public. Even though ensuring the accuracy of health information provided online can be difficult, research is indicating health behavior change interventions utilizing social media networks, specifically those that encourage user engagement, are an effective strategy for positive behavior change.[5,6,14,15,]

While there have been several successful studies utilizing social media based health behavior change interventions, research still needs to be conducted to broaden the literature. Several systematic reviews sought to evaluate the successfulness of social media in health research producing mixed results.[5,6,16] The reviews produced low returns when identifying studies for inclusion with one review having an inclusion of twelve studies.[5,6] Balatsoukas et al. concluded that more research is needed in the area of health promotion and social media, including the investigation of theoretical grounding with effectiveness. Developing an understanding of social media competency in health professionals allows for the utilization of individuals with a higher social media competency level score to lead online interventions. Future investigations may find that social media interventions are more successful when led by researchers with a high social media competency.

Registered dietitians play a pivotal role in the dissemination of health information, specifically nutrition strategies to prevent and reduce chronic disease.[17] Investigating the social media use and competency level of registered dietitians is significant in that it

provides the framework and foundation for understanding how to best utilize health professionals and social media to disseminate evidence-based nutrition information and interventions.

The contribution of this research is significant because it is estimated that 117 million Americans suffer from at least one chronic health condition. Providing a low-cost solution to reach the majority of the American populous, spanning all races and ethnicities and socio-economic backgrounds, to provide health interventions and evidence-based information is a major breakthrough.

Our proposed research is novel in several ways. Currently, the research regarding social media use and competency level of health professionals is lacking. A recently validated measure for certified and master certified health education specialists was utilized to assess the social media competency of registered dietitians. While this instrument was not specifically designed for dietitians the instrument was designed to incorporate the seven areas of responsibility for health education specialists.[13] The seven areas of responsibility share significant overlap with the competency requirement for dietetic registration as registered dietitians also assess needs, assets and capacity, plan, implement, conduct evaluation and research, administer and manage, serve as a resource, and communicate and advocate for health and health education. Our proposed research is novel in that registered dietitians' social media use and competency has never been assessed.

To our knowledge, our proposed research is the first study to investigate the association between social media use and competency score of dietitians. Making the connection between competency level and social media use provides an understanding of

the barriers to use of social media for health promotion and behavior change. Understanding the gaps in competency provides a unique opportunity to facilitate training and education to increase social media competency in health professionals.

While social media has shown great promise to help promote positive health behavior change it is of great importance that those who are delivering health messages via social media are well versed in evidence-based practice and have the skills to assess the ever-changing body of scientific literature. Our proposed research is novel in that we are assessing the social media use and competency level of registered dietitians, a health profession known to utilize evidence-based methods to provide accurate nutrition and health information.

Aims and Hypotheses

1. **To determine the use of social media in registered dietitians nationwide, utilizing a cross-sectional approach.**

   Due to differences in ease of use and adoption we hypothesize a significant difference in frequency use of social media between millennial and non-millennial registered dietitians. Specifically, we anticipate millennial dietitians will have a higher frequency of social media use than non-millennial dietitians. We also hypothesize that there will be a significant difference in frequency use of social media dependent on organizational characteristics. Specifically, registered dietitians with an employment focus of private practice or media promotion will have significantly higher social media use than dietitians in a clinical or research setting.

2. **To determine the social media competency level of registered dietitians nationwide, utilizing a cross-sectional approach.**

Due to differences in ease of use and adoption we hypothesize a significant difference in social media competency level between millennial and non-millennial registered dietitians. Specifically, we anticipate millennial dietitians will have a higher social media competency level than non-millennial dietitians. We also hypothesize that there will be a significant difference in social media competency level dependent on organizational characteristics. Specifically, registered dietitians with an employment focus of private practice or media promotion will have significantly higher social media competency level than dietitians in a clinical or research setting.

3. **To determine the strength of the association between social media competency and social media followers in registered dietitians nationwide.**

   We hypothesize a positive association between social media competency and social media followers, specifically as competency score increases, followers increase.

CHAPTER 2

REVIEW OF LITERATURE

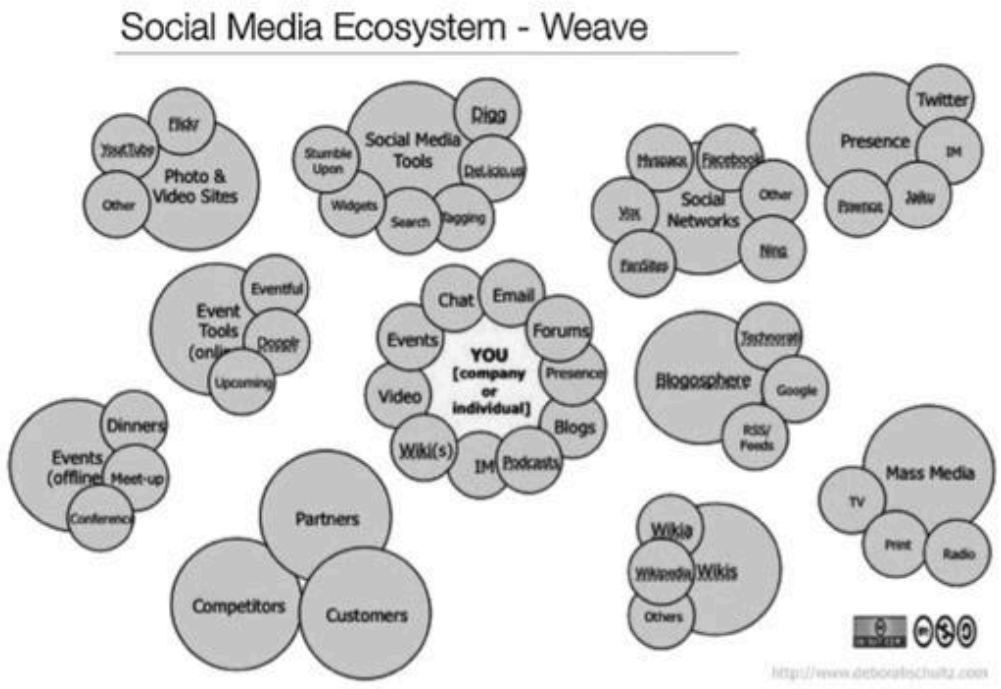
Social Media Introduction

Social media is defined as the websites and applications that enable users to create and share content or to participate in social networking.[24] Social media has changed how individuals interact with each other, society, and organizations. Focusing on marketing concepts (health or otherwise) the landscape has changed dramatically over the last twenty years. People are no longer passive recipients of information. Individuals are taking an increasingly active role in information dissemination that has previously not been available.[25,26] The individual is now one of the main sources of how information is viewed and used.[25,26]

Traditional media includes television, radio, phone, and print (magazines, newspapers, etc.). Traditional marketing techniques utilized a top down approach. Marketers decide the message and how it would be distributed. This approach worked in a Web 1.0 model where the user was primarily searching for information. The current age of Web 2.0 is highly interactive where individuals are deciding the nature and context of messaging.[25, 26] Individuals use social media not to just find out information but to engage with content creators, experts, and other users that may have valuable information to share. In Web 1.0: brand managers owned and orchestrated their brands, phones were for making phone calls, the web was for finding information, companies and organizations controlled their message, and consumers purchased products promoted by marketers.[25,26] Moreover, in Web 1.0 permitting customers to talk was considered risky and dangerous. Web 2.0 represents a paradigm shift in how people consume, share, and interpret

information.[25,26] Interactions with people are now driven by connectivity and interactivity and dissemination of marketing information is in large part defined by user engagement and experience.[25,26] The ability to leverage relationships located within social networks is quickly becoming one of the most significant and transformative uses of the Internet.[27] Although the use of social media for marketing is often restricted to using the various platforms (Facebook, Instagram, YouTube, etc.) as stand-alone units, the emerging thought is that it is much better to utilize the platforms in an interconnected way, similar to an ecosystem (see figure 1).

Figure 1: Social Media Ecosystem[26]



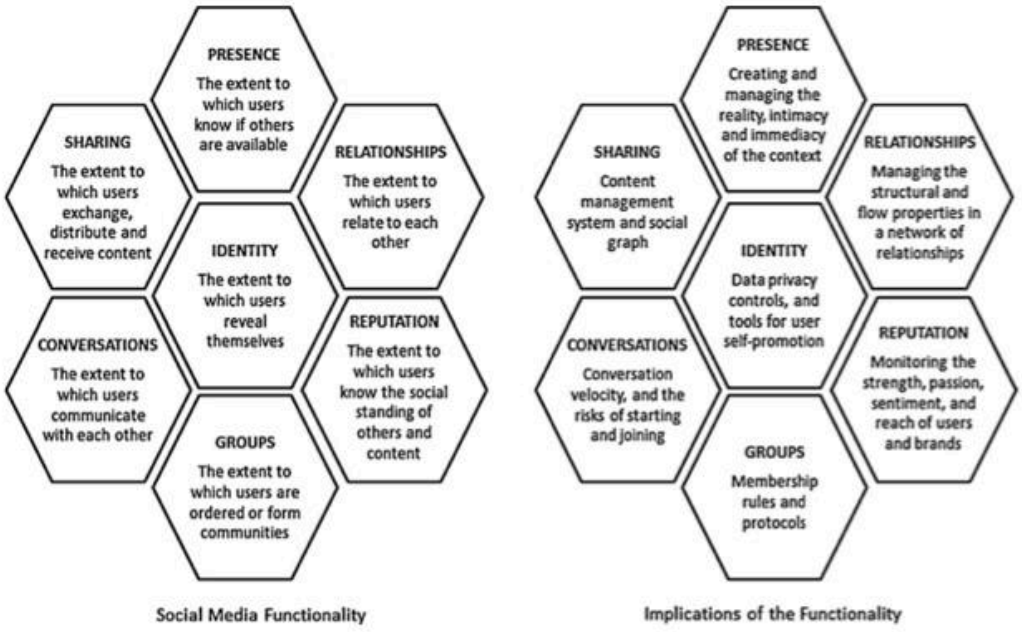
Source: Schultz (2007)

According to Alexa, a web information company, as of 2010 the top websites were Google, Facebook, YouTube, yahoo, windows live, baidu.com, Wikipedia, blogger.com, twitter, and qq.com.[26] These websites accounted for 75% of the total page

views in the United States. This is up from 31% in 2001 and 40% in 2006.[26] While there are hundreds of social media platforms a handful are driving most of the traffic online.[26] These figures from 2010 do not take into account social media apps that have skyrocketed in popularity in recent years, like Pinterest, Instagram, and Snapchat.

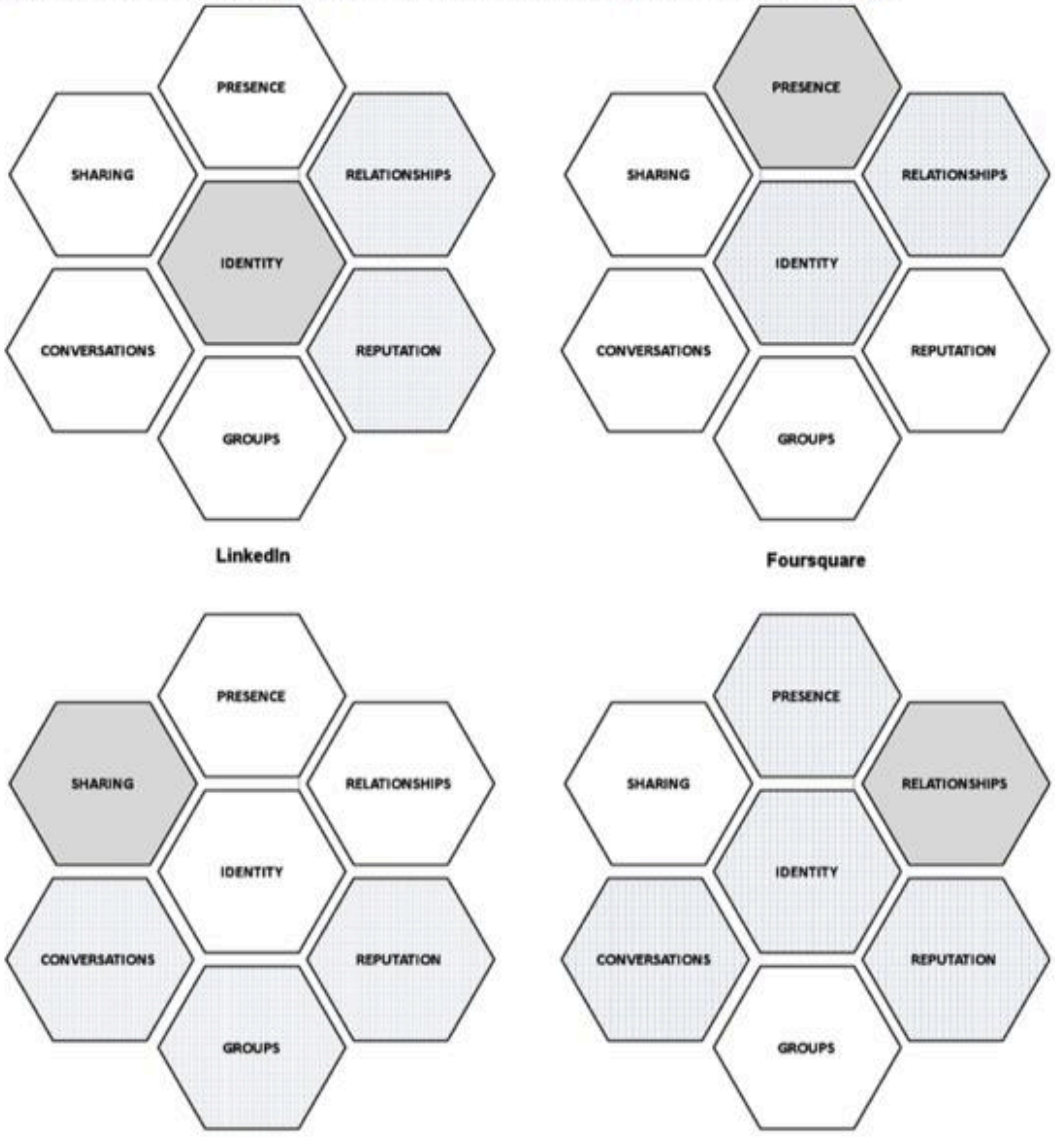
Unlike traditional media, social media incorporates a deeply influential sphere of influence for each individual user. When looking at marketing concepts this sphere of influence empowers bottom-up marketing versus the traditional top-down model. Bottom-up marketing occurs when social media users, numbering in the billions, create additional connections by sharing and engaging with their personal sphere of influence. It is estimated that social media creates trillions of connections on a daily basis.[26,28] Metcalfe's Law, which is related to marketing performance, implies that the value of a social network increases in proportion to the square of its connections.[29] Kietzmann et al., in an article published in 2011, described the seven fundamental building blocks of social media as: identity, conversations, sharing, groups, reputation, relationships, and presence (see Figure 2).

Figure 2: Fundamental Building Blocks of Social Media[29]



The authors indicate that while all seven building blocks are essential for a social network, different platforms lean on some components more than others. Figure 3 demonstrates this difference between platforms: the darker the block the more emphasis on that component.[29]

Figure 3: The Contrasting of Different Functionality on Social Media Sites[29]



In addition to utilizing spheres of influence, social media has diverted from traditional media in that marketing is no longer about specific messages directed at the receiver but is now conversation focused on two-way communication between both parties.[29] Conversations versus messages are now the marketing tool that succeeds in the social media ecosystem. Traditional media focused on reaching individuals. A marketer could provide brand/health information in a highly-publicized television commercial but

the ability to influence an individuals' behavior was often limited. Taking this example online, a website may reach millions of people a day but studies conducted on ads provided on websites show that only 16% of people click on an ad with only 8% of the total website viewers accounting for 85% of all ad clicks.[26,29] While the reach is high, the engagement (i.e. clicking on an ad) is very low.[26] Engagement in this environment peaks when a level of intimacy in creating a user experience is reached.

While social media is vitally important to providing information to the general public moving forward, traditional media should not be abandoned. Social media does not replace traditional media, and should be used in conjunction with traditional media.[26,28,29] Traditional media has the ability to reach a large population base while social media has the ability to engage.

It was reported in 2009, that education and healthcare industries reported a 43% increase in social media budgets.[26] As social media budgets are being increased in healthcare industries, the need for guidelines for healthcare providers, pharmaceutical companies etc. are needed to ensure the promotion of accurate health information for the general public.

Social Media Competency Inventory

Seventy-four percent of adult Internet users report using social media sites.[30] Personalizing health messaging via social media provides an opportunity to increase the relevance and attention paid to the information by recipients.[30,22] In 2015, Alber et al. published a validation for an inventory testing the social media competency of certified health education specialists. Currently, this is the only validated tool available for social

media competency. The study incorporated three phases: Conceptualization and Domain Specifications, Item Development, and Inventory Testing and Finalization. In the conceptualization phase social media competency was defined and operationalized.[22] Social media competency is defined, in the context of health education, as "the user's potential to apply social media technologies to disseminate health information and messages, engage and empower individuals to make healthier decisions, and encourage conversation and participation related to the mission of their health organization."[22] Domain specifications were drafted by a list of potential and actual social media tasks completed by health education specialists, identified by searching key public health terminology on Google Scholar, PubMed, and CINAHL. These tasks were compared with the Seven Areas of Responsibility, which define key competencies met by entry-level certified health education specialists.[22] This ensured representation of all seven areas in the final inventory to allow for linkage of key responsibilities of health education specialists.[22] Observable behaviors were then evaluated by a panel of four experts who's expertise included content as well as extensive knowledge on utilizing social media for health education research.[22] Six main constructs emerged: social media self-efficacy, social media experience, effort expectancy, performance expectancy, facilitating conditions, and social influence. These constructs utilized the integrated behavioral model and the unified theory of acceptance and use of technology.[22,31,32] The integrated behavioral model states: a person should have strong intention to participate in a behavior as well as the knowledge and skills to preform it, there should not be any substantial environmental constraints that prevent the behavior, the behavior should be important to the person, and the person should have some prior experience preforming the behavior.[22]

The unified theory of acceptance and use of technology states behavioral intention and facilitating conditions predicts behavioral action.[22] Item development consisted of an expert review of items and item revisions, think-aloud sessions, and pilot testing. Inventory testing consisted of a field test of certified health education specialists (n=353).[22] The field test was a web-based survey, which included a sample comprised of 74.5% female participants with a mean age of 37 years.[22] The majority was white (61%) and had a household income of $50,000 or more (59%).[22] Half the participants indicated having a master's degree, 22% a bachelor's, and 12% achieved a doctoral degree.[22] After checking the inventory for correlating items, 17 items were removed resulting in 82 items distributed over six scales.[22] Items are based on a Likert scale. Authors note several limitations. The data was self-reported and there is no guarantee individuals provided accurate information, field tests were not inclusive of all certified health education specialist due to lack of contact information, and divergent, convergent and predictive validity were not assessed at this juncture.[22] Researchers also note that the competency inventory does not measure social media performance and future research exploring the relationship between competency and performance should be conducted.[22]

Health Communication at State Agencies and Medical Organizations

A study conducted by Thackeray et al. explored the use of social media by state health departments. A non-experimental, cross-sectional study was conducted of state health department website URLs from the National Public Health Information Coalition list.[33] The authors examined the use of social media by state health departments by noting whether their website home pages indicated an institutionally maintained account for at

least one of five social media applications (Facebook, Twitter, YouTube, Flickr).[33] Accounts were excluded if they did not represent the health department as a whole (example: flu response Twitter account (an account that only tweets about flu information)). Results indicated sixty percent of state health departments (n=30) used social media.[33] Of the state health departments that used one social media account, 86.7% had a Twitter account, 56% had a Facebook, 43% used YouTube, and 13% had a Flickr account.[33] One state health department had a blog. While reach varied by application the mean followers per application was: Facebook 789, Twitter 983, and YouTube 40.[33] Posting averaged once per day on the social media platforms. Eighty-six percent of Facebook posts received no comments and 45.1% of Facebook posts received no likes.[33] This study shows that while state health departments are using social media they are not utilizing the applications effectively.[33] The posts are receiving very little engagement, which does not capitalize on social media's interactive potential. State health departments are using social media like traditional media, resulting in a one-way communication structure. While using social media is still in the early adoption phase for state health departments increasing engagement will be pivotal to increasing utilization of health information.[33]

A paper published by George et al. explored the dangers and opportunities for social media in medicine. The authors of the paper acknowledge that due to the widespread use of social media by patients, social media technology will inevitably be part of the modern medicine landscape.[34] While the culture of medicine values confidentiality, in-person interactions that promote sharing and openness is the true value of social media. At first glance, it may seem medicine would not interact well with social

media, but due to ever evolving privacy settings within platforms, medicine is being provided online more often.[34] The authors state that with the passage of the Affordable Care Act there is a great emphasis on communication, providing health information within communities, and fostering across discipline preventative medicine.[34] Social media provides a unique opportunity to reach patients outside of the exam room. Due to privacy concerns the American Medical Association published guidelines for the ethical use of social media.[34,35] The guidelines stress privacy and maintaining personal and professional boundaries. Despite guidelines, mistakes can be made, but the value of social media in building deeper and more enduring connections with patients is of pivotal importance in moving forward public health goals of lowering chronic disease burden and improving patient outcomes.[36] George et al. identified several key areas of opportunity for medicine in social media: improving communication with patients, enhancing professional development, and contributing to public health research and service.

In 2014, Pillow et al. published social media guidelines from the Council of Residency Directors. The recommendations came from the collaboration of fourteen separate emergency medicine residency centers across the United States, including the Mayo Clinic, which is seen as a leader in the development of social media guidelines for health professionals.[37] This social media task force recommended that each residency program develop social media policies and education efforts to engage their students.[37] If a program chooses to sponsor a social media site it should be done so by a content manager who is permanent employee of the institution and not a trainee. The authors indicate that this process helps to ensure content is current and accurate, does not divulge

any protected health information, follows proper informed consent of individual information, necessary copyright approval procedures are followed, and activity is in line with the program's communication plan.[37] The authors recommend that the institution develop a communications plan and/or policy to govern the use of social media and encourage residency programs to provide guidance to residents, faculty, personnel and fellows of proper social media protocols.[37]

Social Media and Health Interventions

Online social networking sites have been explored as an option for health behavior change in the literature. In 2013, Lohse et al. published a study in the Journal of Nutrition Education and Behavior exploring the use of Facebook as an effective recruitment tool for an online nutrition program for low-income women. The study builds on known Internet statistics indicating Internet use is not limited by education, income, or geography.[38] Researchers utilized a Facebook ad to determine the ability of social networks to recruit low-income women into an online nutrition program. To be included in this study, participants needed to be able to speak and read in English, have one or more keywords identified in their profile page (debt, Dollar stores, Family Dollar, Wal-Mart, free food, I need money, jobs, unemployed, welfare, public libraries), be a female Pennsylvania resident, 18-45 years of age, and aware of the ad through Facebook.[38] Participants deemed ineligible were referred to an online nutrition education accessible from the U.S. Department of Agriculture website. According to Facebook the potential reach determined by the criteria set by the researchers was estimated at 33,780 people.[38] The ad ran for 19 days and Facebook indicated the ad appeared 2,541,197 times, resulting

in 465 clicks on the ad.[38] Eighty-one clicks led to completion of the eligibility survey, and 62 people met the inclusion criteria.[38] Out of the 62 eligible, 39 met the target audience criteria of low-income. Facebook advertisement fees totaled $596.71 and the average cost per click was $1.28.[38] The recruitment costs totaled $15.30 for each low-income interested eligible participant (n=39). Authors cited that the recruitment cost via Facebook is substantially less than traditional methods of recruitment indicating that the social media platform could be used as a convenient and cost-effective method for reaching low-income women with nutrition education programs.[38]

There have been several systematic reviews examining the effectiveness of interventions utilizing social media. Park et al. explored published articles focused on using social media for youth health research. The researchers evaluated seventeen articles meeting the following criteria: participants age 13 to 25 years of age, English language, and included both international and national studies.[6] The systematic review determined that that utilizing social networking sites for recruitment, intervention, and measurement was effective.[6] Specifically, ease of use, high levels of access to social media, cost effectiveness, reliable screening tools, and ease of intervention were common among the studies reviewed. The authors sited that while there was a small sample size, only seventeen studies were available due to the minimal research in this area, social networking sites can have a large impact in health research.[6] With precision and appropriate targeting social networking sites are likely to become an increasingly important tool to recruit and deliver health interventions to underserved populations in a cost effective manner.[6]

A meta-analysis conducted by Laranjo et al. found similar results regarding social networking sites. Article retrieval produced 4656 citations, but after considering inclusion criteria only eight randomized controlled trials were included in the analysis. The authors found that Facebook was the social networking site most used by researchers, followed by Twitter and health-specific social media sites.[5] The authors found a positive effect of social networking sites on health behavior change with no indication of publication bias (Hedges' g0.24; 95% CI 0.04 to 0.43).[5] This was the first meta-analysis to include randomized controlled trials that utilized social networking sites as their sole intervention source, since previous published reviews included studies with multiple component interventions making it difficult to tease out the effect of the social networking site.[5]

While several systematic reviews have indicated a positive effect of social networking sites utilized during health interventions, a narrative review conducted by Balatsoukas et al. indicated that more research is needed in this area to determine the components that lead to an effective health intervention on social networking sites.[16] The review included forty-two studies, but only six were randomized controlled trials examining the effectiveness of social networking sites in health interventions. The authors concluded that further research examining the effectiveness, usability, design elements within the sites, and how interface preferences effect user engagement in health behavior interventions are needed.[16]

When evaluating individual studies, the effects of user interface (i.e. social media platform) and intervention monitors' (i.e. individuals providing content to participants) behavior appear to have a relationship with intervention effectiveness. Hales et al. examined how different social media post types impacted engagement within a social

networking site for weight loss. The authors concluded that engagement with Facebook was significantly associated with weight loss during the four-month maintenance period ($p=0.04$) of the trial, and different post types had different levels of engagement. The Facebook support group was only offered during the maintenance period of the trial. The study utilized five different post types rooted in social cognitive theory: weight-related, recipes, nutrition information, poll votes, and requests for suggestions. Participant engagement was quantified as likes, comments, and views. When engagement and post type were assessed the authors found poll votes were the most engaging, followed by suggestions, and weight-related posts.[14] Poll votes allowed participants to select an item from a list (vs. having to type in an answer). Example: "What is the most challenging meal to prepare each day? Breakfast, Lunch, Dinner." Since engagement was significantly associated with weight loss the authors concluded that for a weight loss intervention utilizing social networking site to be successful the intervention should incorporate messaging that is highly engaging to the participants.

Zhang et al. also examined the effect of different messaging types on a social networking site based intervention focusing on increasing physical activity. Researchers utilized two types of messaging: motivational campaigns utilizing professionally produced messages to increase physical activity, and peer networks that provide the behavior of other members of the intervention.[15] Researchers found that the anonymous online peer network was more effective than the professionally produced motivational messages. The social condition resulted in an additional 1.6 days of moderate exercise per week.[15]

An article published by George et al. in 2016, explored using a social marketing campaign rooted in more traditional methods to combat obesity and diabetes. This campaign consisted of a total of 100 advertisements that were displayed on bus shelters, buses, and subway platforms in target neighborhoods for a six-week period.[39] Social media outlets were used to spread awareness of the campaign but there were no specifics on how social media was utilized for promotion. The total cost of the campaign advertisements was $23,125. This is a breakdown of $550.59 per day versus $31.41 per day in the campaign conducted on Facebook.[38, 39] The researchers surveyed 171 respondents after the conclusion of the campaign and of the respondents only 41% of the respondents had even seen the campaign material. Researchers also indicated that the sample overrepresented educated and higher income individuals, while their target population was low-income black and Hispanic men and women.[39] Traditional methods of reaching low-income individuals may be less effective and more expensive than utilizing online social networks.

Research conducted by Waring et al. aimed to determine the interest in a Twitter-based weight loss program among women of childbearing age. The researchers recruited women of childbearing age directly from Twitter.[40] This was accomplished by three of the study authors tweeting recruitment messages 28 times over a 4-week period. The recruitment tweets were retweeted by 72 unique Twitter accounts, totaling 95 retweets.[40] It was estimated that this resulted in a maximum potential reach of 349,244 Twitter accounts.[40] In total 144 individuals clicked on the survey link and 63 participants were enrolled in the study. The participants' mean age was 34 years and they were from 22 U.S. states, Washington DC, and 7 other countries.[40] Forty-one percent of the participants

reported tweeting about weight loss, nutrition, and/or physical activity. Of the women that were surveyed 81% stated they would be interested in a Twitter-delivered weight loss intervention.[40] Fifty-nine percent of the sample indicated there would be program advantages as well as disadvantages. Advantages indicated were support/accountability, convenience, and lack of feeling judged. Concerns were low support, technology, lack of privacy and not engaging. The women also indicated the components they were least interested in were watching videos of healthy cooking demos and scheduled chats with other women and a coach.[40] The women were most interested in reading about other women's progress (83%).[40]

An article published by Turner-McGrievy et al. explored the relationship between Twitter engagement and weight loss. Most studies looking at social support and weight loss interventions focus their efforts on the utilization of discussion boards while the authors in this study explored the use of Twitter as a social support system.[41] The study recruited overweight and obese men and women (n=96) from television advertisements and listservs for a 6-month randomized weight loss trial.[41] The participants were randomly assigned to either a podcast-only intervention or an intervention with the podcast plus enhanced mobile media.[41] The podcasts were designed utilizing social cognitive theory and were delivered in a 15-minute format twice per week for the first 3 months and dropped to two 5-minute mini podcasts per week for months 3-6.[41] At the conclusion of the study there was no significant difference in weight loss between the two groups ($p>0.05$), but the authors analyzed the podcast plus enhanced mobile media group (n=47) to determine the relationship between engagement on Twitter and weight loss.[41] Over the course of the 6 months there were 2,630 posts to Twitter. The authors found

there was a large variability between the participants in total number of posts (0-385 total posts per participant), and that posts were significantly lower during the second half of the study (3-6 months) versus the first (0-3 months).[41] The participants' Twitter engagement over the course of the study was not predicted by race, gender, or baseline Twitter use.[41] Age was predictive ($p=0.03$), indicating that those that posted frequently were younger with a median age of 35 years. When adjusted for age, gender, and ethnicity, posts to Twitter significantly predicted weight loss at 6 months ($p<0.001$), which corresponded to every ten posts on Twitter equating to approximately -0.5% of weight loss.[41] Results from Turner-McGrievy et al. provide insight into adherence of social media posting for weight loss. Similar publications utilizing an online or phone application intervention for weight loss also cited adherence as a key-contributing factor to the degree with which a participant lost weight.[42,43]

An editorial published by Holmberg in the European Journal of Clinical Nutrition discussed strategies for combating childhood obesity with social media. Since more than 70% of adolescents, ages 13-17, use social media daily it is an area primed with food marketing targeted to children.[44] Current regulations are aimed at restricting the amount of advertising towards children during television shows and have not tackled marketing towards children on social media networks.[44] The author recommends three key strategies for action. The first is that clinicians need to assess what social media environment is currently influencing their adolescent patients. This can be accomplished by discussing pages and sites followed regarding food on social media.[44] Second, is educating adolescents on the effects of marketing low nutrient content food themselves (where adolescents take pictures of unhealthy foods and post to Instagram with brand names to

share meals with friends).[44] Lastly the author recommends taking a proactive approach and using social media within the medical community to promote evidence-based healthy living.[44]

An article published by Ballantine et al. explored the level of satisfaction with informational and emotional support in a Weight Watchers support Facebook page. The researchers utilized a quantitative approach by distributing a Qualtrics based survey via the Weight Watchers Facebook page.[45] Researchers posted the survey ad on the page two times per day for a two-week period after which the ads were removed from the Facebook wall of the Weight Watchers Facebook page.[45] The survey was divided into three sections (general page use, participants communication style with types of support sought, and demographics including internet availability and usage) and took approximately 5 minutes to complete.[45] All items utilized a five-point Likert scale from strongly agree to strongly disagree. The results provided 168 submitted surveys with 145 included in data analysis.[45] Analysis yielded three distinctive types of support seekers: passive recipients, active supporters, and casual browsers.[45] Passive recipients had high ratings of informational and emotional support. They also preferred a passive communication style. Active supporters perceived high informational and emotional support.[45] This group reported the lowest satisfaction with communication, which would be anticipated with their need for active communication.[45] The third group, casual browsers had the lowest perceived informational and emotional support scores. Casual browsers did indicate the highest satisfaction with communication style supporting their preference for a passive communication style.[45] There was no difference between the groups when looking at demographic data including Internet accessibility and usage.[45]

The authors did indicate that active supporters were found to have been members of the Facebook group the longest ($p=0.047$).[45] This study indicates that even when participants have different communication and page use styles, online social media platforms may provide a valuable form of social support for weight loss groups.[45]

While systematic reviews have indicated a positive effect of social networking sites on health behavior change, it is clear that further investigation is warranted into the types of messaging utilized during an intervention. Research has indicated that engagement level is linked with the effectiveness of the intervention. One way to increase engagement is proper utilization of messaging. Little is known about the effect of social media competency of the interventionist on engagement level and proper utilization of messaging. This study is the first to evaluate the social media competency of a large cohort of nutrition and health professionals. Once competency is evaluated, future investigations exploring competency level and engagement can be explored.

Theories and Models used in Social Media Interventions

Several models of behavior change have been used in social marketing health interventions. An article published by the Journal of Health Communication by Luca et al. examined theory and model use in social marketing health interventions. The researchers conducted a search of peer-reviewed articles in spring of 2009 using available search engines.[46] Included articles were health interventions published between 1990 and 2009 that focused on behaviors related to physical activity, nutrition, heart disease, HIV, STDs, cancer management, smoking cessation, and reproductive health.[46] Included articles also met the 2002 social marketing criteria defined as: consumer research,

behavior change, segmentation and targeting, competition, marketing mix, and exchange.[46] Initially, 271 articles were retrieved and 24 qualifying studies were analyzed which included 17 interventions.[46] The most frequently used theories were the transtheoretical model (n=4) and the theory of planned behavior (n=3).[46] This systematic review indicates that only a small number of social marketing health interventions used health behavior change models and theories.[46]

Transtheoretical Model

The transtheoretical model, also known as the stages of change, behavior model is the most frequently used health behavior model when looking at social marketing for health behavior change.[46] The transtheoretical model (TTM) is comprised of several constructs including: stages of change, processes of change, self-efficacy, decisional balance, and temptations.[47,48]

The first construct, stages of change, is broken down into six specific stages. The first stage is precontemplation. In this stage, an individual is either unaware of the need for a behavior change or they do not intend to change in the near future (defined as within six months).[47,48] In the precontemplation stage it is important for the individual to learn about the need for change and the healthy behaviors necessary for the change. In the precontemplation stage it is important to encourage mindful decision-making and highlight the positive benefits of behavior change.[47,48] Those in the precontemplation stage have a tendency towards overestimating the cons of change and underestimate the positive effects of change.[47,49,50]

The second stage is contemplation. In this stage, and individual has the intention to start the behavior change (defined as starting within six months). While this group has the intention to start healthier behaviors their con list is now about equal with the positives of changing.[47,49,50] In this stage other people can influence effectively by providing encouragement, modeling healthy behavior, and shrinking the con list to the behavior change.[47,49,50] Stage three is preparation. Individuals in this stage are ready to take action within thirty days. In this stage, individuals start to tell their peers and family that they are planning on making a change.[47,49,50] The small step of alerting those close to them makes the change more realistic. The biggest concern during this stage is failure. A support structure is crucial during this stage.[47,49,50] Stage four is action. This stage is defined as a behavior change has occurred within the last six months and there is ongoing work by the individual to solidify the behavior change desired.[47,49,50] In this stage behavior rewards, avoiding unhealthy environments, and additional behavior technique swaps are warranted to suppress the unhealthy behavior while uplifting the desired healthy behavior.[47,48,49,50]

The fifth stage is maintenance. Individuals in this stage have made a change more than six months ago. Individuals in this stage need to be aware of unhealthy environments and triggers that may allow them to backslide on their behavior change. [47-50] Stress management is beneficial as stress can be a main trigger to unhealthy behaviors. The support network formed in early stages still needs to be utilized for a healthy, supportive environment. [47-50] The final stage described by the transtheoretical model is the termination phase. In this phase, there is no temptation to return to the unhealthy behavior targeted during the previous stages. In addition to the six stages of change,

there is also a phase called relapse or recycling. [47-50] This is not a stage within itself but is an action returning to a previous stage from maintenance or action.

The second construct in TTM is processes of change. [47-50] This construct can be broken down into ten different change processes: consciousness-raising, dramatic relief, self-reevaluation, environmental reevaluation, social liberation, self-liberation, helping relationships, counter-conditioning, reinforcement management, and stimulus control. These change processes are considered overt and covert activities that individuals use to progress through the stages of change. [47-50]

The third construct is self-efficacy. Self-efficacy is defined as an individuals' perceived ability to complete a task. In the TTM self-efficacy pertains specifically to the situation-specific confidence an individual has at performing a healthy behavior or avoiding an unhealthy one. [47-50] The fourth construct is decisional balance. Decisional balance is the reflection of how an individual weighs the pros and cons of changing behavior. Specifically, in the precontemplation stage cons of behavior change outweigh the pros and the pros outweigh the cons in the action stage. [47-50] The fifth construct is temptation. Temptation encompasses the environmental and biological triggers to discontinue a healthy behavior change. [47-50]

In 2014, a Cochrane review published by Mastellos et al. sought to determine the efficacy of the Transtheoretical model for dietary and physical activity modification for overweight and obese adults. The reviews selection criteria included randomized controlled trials using the Transtheoretical model, that included overweight or obese adults only with a intervention delivered by professionals or trained lay people at a hospital and community level.[51] The TTM was used to develop lifestyle modification

strategies versus a standard of care control group. The outcome measure needed to be weight loss. This inclusion criterion resulted in 3106 screened articles with three studies included in qualitative analysis with a total of 2971 participants. Out of the 2971 participants, 1467 were randomized to an intervention group, while 1504 were randomized to a control group. [51] The studies included intervention time periods of 9, 12, and 24 months. The results of these studies produced inconclusive evidence that TTM interventions result in sustained weight loss. [51] The authors of the review concluded that the evidence is limited by bias and imprecision, which resulted in little conclusion drawn about the efficacy of TTM. [51]

The systematic review conducted by Luca et al. identified publications that utilized TTM in their intervention development. Gallivan et al. examined the National Diabetes Education Program's "Control your Diabetes. For Life." campaign. This program was co-sponsored by NIH and the CDC, and was launched in 1998.[52] The authors indicated the program was designed to move people from the pre-contemplation and contemplation stage to taking action to control their diabetes. [52] The campaign encouraged individuals to write down three reasons for controlling their diabetes, three things they would do in the next three months to improve diabetes control, and three people who could help them with their plan. [52] The campaign utilized public service announcements which aired on television over 127,000 times over the five-year campaign, radio announcements broadcast nearly 80,000 times, and print ads that reached a circulation of almost forty million people at a cost of 21 million dollars over the course of the campaign. [52] Authors reported the campaigns website averaged 76,000 visits per month in 2003. Outcome measures of the campaign indicated the percentage of people

with diabetes who reported daily blood glucose testing increased from 39% in 1997 to 55% in 2002.[52] Hemoglobin A1C awareness also increased from 31% in 1998 to 59% in 2003.[52] While the campaign appears to have been effective at raising the awareness of the need to monitor blood glucose and A1C levels, the authors did not have specific outcomes to measure the effectiveness of the TTM messaging in the campaign.[52] The authors indicated using a traditional marketing mix as well as the Health Behavior Model in the campaign.[52] The effectiveness of the TTM messaging in the campaign is unclear.

Richert et al. utilized TTM to determine the population segment for their physical activity intervention but did not indicate any further involvement of TTM.[53] De Gruchy et al. utilized TTM in a smoking cessation campaign in Nottingham in the United Kingdom. The campaign utilized a traditional marketing mix using billboards, bus advertisements, radio, television, and print ads.[54] The authors state significant limitations evaluating the campaign and there is no clear outcome measure of effectiveness reported.[54]

Theory of Reasoned Action

The theory of reasoned action has also been found a successful tool for social marketing campaigns. The theory of reasoned action is one of three main psychological models. The purpose of the theory of reasoned action (TRA) is to explain the relationship between behaviors of human action and attitudes towards those behaviors.[55,56] TRA can be used as a predictive tool for individuals' behavior based on their pre-existing attitudes of a behavior. [55,56] TRA postulates that individual behavior decisions are rooted in a person's perceptions of the outcome they are expecting as a result of a particular behavior. [55,56] Within the theory TRA states that intention to perform a behavior always

precedes performing the behavior. Researchers designated this intention as behavioral intention, and state that behavioral intention is determined by two factors, subjective norms and attitudes towards the behavior.[55-58] In TRA, an attitude is defined as an individual's opinion about a behavior, whether the behavior is positive or negative. A subjective norm is defined as a perceived social pressure arising from one's own perception. A subjective norm defines the pressure an individual feels towards performing or not performing a behavior. Along with the factors that determine behavioral intention, there are three conditions that can affect the relationship behavioral intention and behavior.[55-58] The three conditions are: the measure of the intention must correspond with respect to their levels of specificity, stability of intentions between time of measurement and performance behavior, and the degree to which carrying out the intention is under the volitional control of the individual.[55-60]

Theory of Planned Behavior

The theory of planned behavior (TPB) builds on the concepts from TRA. Like TRA, TPB incorporates attitudes and subjective norms to define behavioral intention. TPB builds on this framework with the addition of perceived behavioral control. Perceived behavioral control is a person's perceived level of difficulty or ease of performing a particular behavior.[55-58] The concept of perceived behavioral control is very similar to the construct of self-efficacy described in Bandurra's social cognitive theory. In conclusion, TPB states that human behavior is guided by behavioral beliefs/attitudes, subjective norms, and control beliefs.[55-58,61,62]

The theory of reasoned action and theory of planned behavior were reported together in the systematic review conducted by Luca et al. The heart disease awareness campaign "The Heart Truth" was the first federally sponsored national campaign aimed at increasing heart disease awareness among women.[63] Long et al. indicated the campaign utilized not only the TPB but also used the Health Belief Model, and TTM along with a traditional marketing mix and development of campaign partners. [63] One of the most well-known aspects of this campaign is the Red Dress image adorning campaign materials. The American Heart Association tracked the outcome measures of this campaign. The AMA found that in 1997, awareness of heart disease as the leading cause of death among women was 30%, while their survey in 2006 indicated awareness had increased to 57%.[63] Sixty percent of the women survey indicated that the Red Dress made them want to learn more about heart disease and 45% said it would prompt them to speak with their doctor or get a checkup. [63] While this campaign indicated the use of TPB in planning the most successful component of the campaign, the Red Dress, is a promotional element coming from the traditional marketing mix. [63] While the overall campaign was successful it is unclear what contribution TPB played in the results. [63]

Peterson et al. utilized TPB and TRA in the development of marketing messages for a physical activity campaign. Their campaign marketed messages aimed at increasing physical activity in adults 18 to 34 years old.[64] The researchers determined via Nielsen ratings that they reached approximately 126,280 households over the course of their campaign. [64] A survey following the campaign (n=363) indicated that 39.1% had seen the television ads in the last month and 24.9% of those that had seen the ads, discussed them with someone else. [64] Of those that saw the ads, 27.7% intended to be more active after

seeing the ads. [64] The authors noted that assessing the impact the campaign had on increasing physical activity was difficult. [64]

Social Cognitive Theory

Social cognitive theory (SCT) is commonly cited in weight-loss and physical activity interventions.[65,66] SCT is rooted in an individuals' awareness of their own behavior. SCT asserts an individuals' ability to change an unhealthy behavior is directly linked to their daily awareness of the behavior, i.e. the less a person is aware of their behavior the less likely they are to change that behavior. [65,66] SCT states that while an individuals' knowledge of their behavior creates a precondition for change, there are necessary self-influences to overcoming the barriers to adopting new behaviors. [65,66]

The most relevant self-influence in SCT is perceived self-efficacy. [65,66] SCT defines self-efficacy as one's belief that they are capable of completing a task. [65,66] Self-efficacy is known to have an impact on the ability to complete a task, influence which goals are set, and determines the commitment and expectation an individual has to a goal. [65,66] Bandura et al. determined there are four main paths to developing self-efficacy. The first, and strongest influence is mastery. Mastery gives an individual the ability to practice a behavior and overcome obstacles along the way. A persons' ability to be resilient in the face of challenges increases self-efficacy. [65,66] The second is modeling where an individual sees a similar person and models their success and strategy to achieving a behavior. The third is social persuasion, where an individual is persuaded to believe they are capable of mastering a new behavior, and the final path is an individuals' ability to foster positive mood states and reduce physical and mental stressors. [65,66]

Palmeira et al. explored predicting short-term weight loss and the four leading health behavior change theories. Subjects were overweight/obese women (n=142), greater than 24 years of age, premenopausal and not currently pregnant, free from major disease, and had a BMI greater than 24.9 kg/m^2.[67] The women were randomized into one of four groups: Social Cognitive Theory (SCT), Theory of Planned Behavior (TPB), Transtheoretical Model (TTM), and Self-Determination Theory (SDT). [67] The study indicated SCT and TTM groups represented the strongest models for weight management with the changes in self-efficacy explaining much of the variance in weight change ($p<0.001$). [67] Changes in self-efficacy accounted for 20.5% of the weight change variance in the SCT group and 19.4% in the TTM group. [67]

Collins et al. conducted a web-based randomized controlled trial, which evaluated a commercial weight loss and weight maintenance program in overweight and obese adults.[68] SCT was heavily incorporated in the web-based program.[68] The program targeted the following components of SCT: self-efficacy (goal-setting, self-monitoring, body measurements, exercise, and diet), outcome expectations (knowledge of web-based components), modeling (interactive website demonstrations and features), and social support (forums, blogs, email contact, and feedback).[68] Participants were randomized into a control, basic, and enhanced program groups.[68] The control group consisted of a 12-week wait list with randomization into one of the intervention groups at the end of the waiting period.[68] Basic group participants received access to the study website with features including: daily calorie targets, food and exercise diaries, weekly menu plans and a grocery list, educational tips and challenges, online forums for support, nutrition and energy balance summaries, weekly newsletters, self-monitoring reminders, goal-setting

options with a graphical display.[68] Enhanced group participants received basic features with the additional of: personalized enrollment report, weekly feedback, and a reminder schedule for self-monitoring.[68] Results indicated the basic and enhanced groups had a significant reduction in weight and significantly reduced waist circumference when compared with the control group.[68] The group adhering to the enhanced version of the website lost the greatest amount of weight (control: 0%, basic: 18%, enhanced 28%; $p<0.001$) and had the least amount of participants that gained weight at 17% ($p<0.001$).[68]

Cowan et al. explored the presence of health behavior theory constructs in iPhone apps targeting physical activity. Authors conducted a content analysis of health behavior theory utilizing the Apple App Store's Health & Fitness category.[69] The final analyses contained 127 total applications. Researchers downloaded the apps, explored functions, and used a theory-based instrument to conduct content analysis looking for the top four behavior theories (Health Belief Model, TTM, TPB, and SCT).[69] SCT accounted for 20.38% ± 3.40 (mean ± SD) of the behavior constructs in the top 10% of applications (top 10% is based on the total theory score of the application).[69] The authors indicated iPhone apps contained few behavior change constructs and there is an opportunity for health professionals to partner with app developers to incorporate behavior change constructs into the iPhone applications.[69] Available research suggests a weight loss intervention containing SCT increases participants' success, and incorporating SCT into iPhone applications for weight loss presents an opportunity for greater success.[67,68]

Personality Modeling on Social Media – Implications for Public Health

The widespread use of social media over the last decade has caused a paradigm shift in the social sciences research field. Facebook alone has an estimated 1.4 billion daily active users as of 2015.[70,71] Daily active users leave behind a log of all activities conducted on the platform, which provides an opportunity to research human behavior on a scale never seen before.[70]

Bachrach et al. examined the relationship between personality, measured by the Five Factor Model, and Facebook activity. The authors note that the Five Factor Model for personality is the most widespread and accepted model of personality.[72] The model has been widely researched and is indicative of an ability to predict an individuals' behavior based on the personality type.[72,73,74,] There are five main personality traits in this model: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism.[72] Openness to experience measures a person's curiosity, imagination, ideas, aesthetics, and the seeking of new experiences and interests in culture.[72] Conscientiousness measures the preference for an organized versus a spontaneous approach to life.[72] These individuals are more likely to be organized, reliable, consistent, and seek long-term goals.[72] Extraversion measures a person's tendency to seek stimulation in the external world, expression of positive emotions, and the company of others.[72] Agreeableness measures the amount a person is focused on maintaining positive social relationships.[72] Individuals with high agreeableness tend to be compassionate and friendly.[72] Neuroticism measures the tendency of an individual to experience mood swings, negative emotions (guilt, anger, anxiety, and depression), and is often referred to as emotional instability.[72] Bachrach et al. utilized a dataset of 180,000 Facebook users obtained via the myPersonality application deployed on Facebook. The myPersonality

application was deployed by researchers in 2007 and utilizes validated measures for assessing the Five Factor Model of personality.[72] The sample was representative of the overall Facebook population, with an average age of 24 years and 58% of the sample being female.[72] Facebook features (number of friends, group association, status updates, etc.) were correlated to personality traits to determine if personality traits could be predicted based on commonly assessed Facebook features. Results utilized Pearson Correlations set a significance level of $p < 0.01$ (only significant correlations reported).[72] Openness was positively correlated with the users' number of likes, status updates, and group associations ($r= 0.102$, 0.062, and 0.077, respectively).[72] Conscientiousness was found to be negatively associated with number of likes, and group memberships but positively associated with the number of uploaded photos ($r= -0.088$, -0.0697, and 0.0330, respectively).[72] Extraversion was positively associated with statuses, likes, groups, and friends ($r= 0.117$, 0.034, 0.069, and 0.177 respectively).[72] Agreeableness was found to be negatively associated with number of likes ($r= -0.036$) and less correlated with high-level Facebook features than the other four personality traits. Neuroticism was found to be positively associated with number of likes ($r= 0.075$) and negatively associated with friends ($r= -0.059$).[72] The authors then conducted multiple linear regression utilizing multiple Facebook features to predict personality. Facebook features used include: friends, groups, likes, photos, statuses, and tags. Results found Extraversion the most predictable (R^2 and RSME, 0.33 & 0.27) while agreeableness was more difficult to predict (R^2 and RSME, 0.01 & 0.29).[72] The model for Openness, Conscientiousness, and Neuroticism were not as strong as Extraversion (R^2 and RSME; 0.11 & 0.29, 0.17 & 0.28, 0.26 & 0.28, respectively).[72] While the authors cite several limitations like self-

selection bias, and the ability to only access user data that was allowed via privacy settings, the authors indicate it would be possible to "profile" individuals on social media allowing for targeted marketing campaigns based on personality profile.[72]

Bachrach et al. sought to determine personality predictability on Facebook; Youyou et al. found computer-based personality judgments were more accurate than human judgments. The researchers utilized the same myPersonality database used by Bachrach et al.[75] The sample utilized 86,220 volunteer responses collected via the myPersonality application on Facebook.[75] These responses were collected from users Facebook friends whom were asked to assess a given participant's personality via the myPersonality application.[75] Computer-based personality judgments, based on Facebook likes, were obtained for 70,520 participants. Results indicated computer-based personality judgments based on a Facebook likes are significantly more accurate ($r=0.56$) than those made by the user's Facebook friends using a personality questionnaire ($r=0.49$).[75] The computer models showed higher inter-judge agreement and showed a higher external validity when looking at life outcomes like: political attitudes, substance abuse, and physical health.[75] The authors note that while these models can provide a cheap method for tailoring marketing messages, encouraging appropriate career choice or even romantic partners knowledge of personality data can open individuals up to manipulation and undue influence in life choices.[75,76]

Quercia et al. investigated the ability to predict personality on Twitter. While researchers used similar data to predict personality on Facebook, Twitter, as a social media platform, is very different.[72] Twitter users were divided into five main types: listeners (those who follow many), popular (those followed by many), highly-read (those

often listed in others reading lists), influencers (determined by Klout), and influencers (determined by TIME).[77] Influential users were identified using the scoring model Klout (klout.com) and TIME.[77] The data set utilized was obtained from the myPersonality application on Facebook. Subjects completing the myPersonality questionnaire and indicating their Twitter account on their Facebook profile were analyzed (n=335).[77] The sample was comprised of 52% women and 48% men, which is representative of the distribution on Twitter. The average user age was 22.7 years. Results revealed Extraversion and Neuroticism were most strongly correlated with listeners and popular users (Extraversion r= 0.13 and 0.15; Neuroticism, r= -0.17 and -0.19, respectively).[77] Highly read individuals were correlated with Openness (r= 0.17) Influencers were found to have a significant correlation with Extraversion (r= 0.15 and 0.25) and Neuroticism (r= -0.03 and -0.20).[77] Upon verification of significant correlations authors conducted regression analysis using a 10-fold cross validation indicating the following predictability of personality on Twitter reported as RMSE (the root mean squared differences between predicted values and observed values) using three available data points (following, followers, and listed counts): RMSE= Openness 0.69, Conscientiousness 0.76, Extraversion 0.88, Agreeableness 0.79 and Neuroticism 0.85. The authors indicate that a Twitter user's personality can be predicted with a RMSE of 0.88.[77] In contrast, in 2009, Netflix awarded a one-million-dollar prize to a team that developed an algorithm predicting user film ratings with a RMSE of 0.8567.[77]

In 2013, Rentfrow et al. examined how personality traits correlated to political, economic, social, and health determinates (PESH) geographically in the United States. The study utilized twelve different matrices to determine geographic differences in PESH

categories.[78] Population statistics were measured using U.S. Census Bureau data (2000). Political conservatism was measured by standardizing the percentage of votes for George W. Bush in 2004 and for John McCain in 2008 utilizing an online database of U.S. election results.[78] Religiosity was determined using the Association of Religion Data Archives by examining the rates of adherence to mainline Protestant religions per 1,000 residents in the year 2000.[78] Wealth was computed as an index computing the average of four standardized variables: gross regional product per capita, median household income, median housing value of owner-occupied units, and proportion of population living below poverty for a twelve month period.[78] Human capital measures the knowledge and skills in a region via measures of educational attainment. Innovation reflects the degree to which states invest in new ideas and technology. Social capital measures residents' value on social relations via rates of volunteerism, civic participation and social trust. Social tolerance is the degree to which residents are open to people who are unconventional in their area measured by the proportion of gay residents and foreign born residents, those speaking languages other than English, and ranking via the bohemian index.[78] Violent crime was measured via the Crime Reporting Program at the Federal Bureau of Investigation. Residential mobility was measured by assessing the number of residents living in an area over time. Well-being was assessed using physical and mental health data obtained from the CDC, Gallup Organization, and the Substance Abuse and Mental Health Services Administration.[78] Health behavior reflect residents of a state engage in physical activity, eat healthfully, and level of cigarette smoking. Data were obtained from CDC and Healthy People surveys. Personality data were obtained via the myPersonality application located on Facebook.[78] A total of 1,596,704 individuals participated in the

sample. The sample was representative of the 48 contiguous states and was not representative of Alaska and Hawaii.[78] Utilizing clustering techniques, three unique personality clusters were found within the 48 contiguous states: Friendly & Conventional, Relaxed & Creative, and Temperamental & Uninhibited. The Friendly & Conventional region represents what is traditionally known as "middle America" or the "red states".[78] The region is exhibits moderately high level of Extraversion, Agreeableness and Conscientiousness. The region also has low Neuroticism and very low Openness.[78] The region is made up of predominately White residents with low levels of education, wealth, economic innovation, and social tolerance. Residents also are likely to be religious, politically conservative and civically engaged.[78]

The Relaxed & Creative region is predominately states along the West Coast, Sunbelt, and Rocky Mountains. This region exhibits low Extraversion and Agreeableness, very low Neuroticism and very high Openness.[78] This region is high in non-whites, people who are wealthy, educated and economically innovative. Social capital is low while tolerance for diversity is high.[78] The region generally values open-mindedness, individualism, tolerance, happiness and health.[78] The Temperamental & Uninhibited region represents states in the mid-Atlantic and Northeast. The region has low Extraversion, very low Agreeableness and Conscientiousness, moderately high Openness and very high Neuroticism.[78]

The authors indicate that the results from this study have implications for research on regional health disparities. For example, the area known as the "Stroke Belt" is made up of eleven states and 9 out of the 11 states are in the Friendly & Conventional region.[78] Future campaigns to target stroke reduction in this area may find targeting information to

this area's personality profile may increase adherence to stroke reduction behaviors. Areas that exhibit high Openness and low Neuroticism may be less susceptible to stress due to these individuals being less likely to overreact to events and use effect coping methods.[78] Utilizing personality information to target health behavior interventions may provide an opportunity for personalized interventions that are more effective than current methods.[78]

CHAPTER 3

METHODS

Research Design. A cross-sectional investigation was conducted to assess the adoption and use of social media among registered dietitians nationwide. The study was approved by the Arizona State University Institutional Review Board prior to data collection, and all participants provided informed consent. Data collection was conducted online via the survey research platform Qualtrics LLC.

Survey Instrument. Demographic questions (e.g., age, sex, race and ethnicity, highest degree obtained, and household income) were adapted from the Behavioral Risk Factor Surveillance System (BRFSS) survey.[18] Organizational questions incorporating employment status, practice setting, and availability of access to social media sites at work was adapted from previous research utilizing the RD population.[19,20]

Survey questions capturing the use of social media platforms for personal and professional use were utilized to capture the volume, type, and reach of social media accounts of registered dietitians. While there has not been an inventory validated to measure social media use there have been several studies measuring this construct in health professionals.[21] This inventory was specifically designed for registered dietitians' use of social media.

To assess social media competency a validated Social Media Competency Inventory was utilized.[22] Social media competency is defined as the user's potential to apply social media technologies to disseminate health information and messages, engage and empower individuals to make healthier decisions, and encourage conversation and participation related to the mission of their health organization.[22] The inventory consists

of 82 items that assess six main areas of social media use: social media self-efficacy, social media experience, effort expectancy, performance expectancy, facilitating conditions, and social influence. Social media self-efficacy is defined as an individual's confidence in their ability to use social media technologies, as a function of their employment, to meet their employer's needs as well as to reach and engage the public.[22] Social media experience is defined as actions or tasks completed by the individual related to social media, social media websites, and tools that exist and are utilized for professional purposes.[22] Effort expectancy is defined as an individual's perceptions of the ease of using social media while at work.[22] Performance expectancy is one's beliefs about the impact of social media on their job performance.[22] Facilitating conditions is an individual's beliefs regarding the existence of technical and organizational infrastructure to support the use of social media in the workplace.[22] Social influence is defined as an individual's beliefs about how those important to them at their workplace believe they should use social media.[22]

The complete survey instrument was pilot tested by thirteen registered dietitians prior to full recruitment for feedback on face validity, appropriateness of demographic and organizational question wording, and time commitment of survey completion. Twenty-four registered dietitians in Arizona were sent a link to the online survey, 15 opened the survey and 13 completed the questionnaire. Completed responses were analyzed and the survey instrument was revised. The participants indicated a need for more clarification in the ethnicity categories, utilizing drop down menus or multiple-choice versus fill-in-boxes, and skip logic throughout the survey was corrected. The participants felt the survey took an appropriate amount of time to complete. The

completed survey instrument was sent via an email through Qualtrics to the randomized sample of registered dietitians provided by the Commission on Dietetic Registration (n=5000).

Participants and Setting. Registered dietitians were recruited via the nationwide random sample provided by the Commission on Dietetic Registration (n=5000). To determine ideal sample size, several peer-reviewed studies were reviewed to assess ideal participation.[22,23] The validated survey instrument assessing social media competency utilized a sample size of 353 individuals, providing a 35.3% response rate.[24] Five hundred survey responses for analysis was indicated.[22,23] To encourage participation participants completing the survey were entered into a drawing to win one of one hundred and thirty $15 Amazon gift cards. Participants received an email thanking them for their participation in research and notifying them of their entrance into the drawing. Winners of the gift cards were notified via email after data collection was completed.

Exclusion criteria limited the participants to registered dietitians currently registered with the Commission on Dietetic Registration. Nutrition students and non-RD nutritionists were excluded. Organizational questions captured the length of registration and time since graduation, which allowed for the inclusion of all dietitians, regardless of the length of registration.

Target Outcomes. The primary outcomes of this study, social media use and competency level was assessed utilizing validated survey instruments and newly designed questions pilot tested by a portion of the target population.

Statistical Analysis Plan. Statistical analyses were carried out using SPSS Version 23.0 software (SPSS, Inc., Chicago, IL, USA). Normality was assessed, and non-

parametric tests were used for data not normally distributed. Descriptive statistics and frequencies were calculated for each categorical and continuous variable. Representation of the sample was investigated by utilizing frequencies of demographic and organizational characteristics of the sample compared to the 2013 membership data from the Commission on Dietetic Registration. The chi-square tests were used to determine frequency differences of social media use and competency level across demographic, generational and organizational characteristics. General linear models were used to test mean differences for social media competency score between age groups and job classifications, respectively, after adjustment for covariates (age, education, household income). A Bonferroni post-hoc correction was utilized to identify differences between groups. Values are reported as means$\pm$SD. Results were considered significant if $P<0.05$, unless a post-hoc correction was utilized. Spearman correlations were used to determine the association between platform followers and total social media competency score.

To assess generational differences in social media use among registered dietitians the following age categories defined in previous social media research were utilized: 18 to 24, 25 to 34, 35 to 44, 45 to 54, and $\geq$ 55 years.[21] Generational differences were also assessed by splitting the data set into millennial and non-millennial age groups. According to Pew Research Center, a millennial is defined as those born 1981 and later, and for the purpose of this study anyone thirty-four years of age and younger were placed into the millennial category. Organizational characteristics evaluate the practice type and level of employment of the registered dietitians. Category examples include: clinical dietetics, food and nutrition management, public health nutrition, education and research,

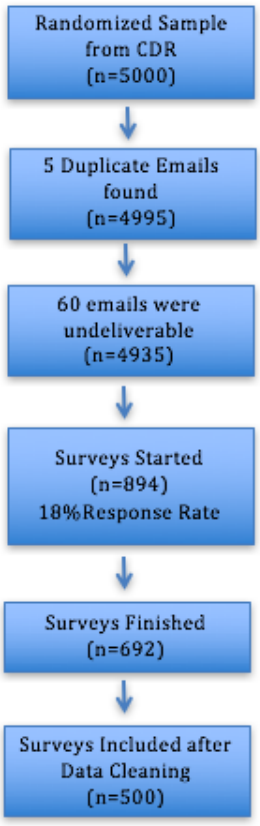
consultant/private practice, business and industry, media, international food organizations, and public policy/government.

CHAPTER 4

RESULTS

From the national pool of registered dietitian/nutritionists (n=89,300), a randomized sample of five thousand RD/Ns was provided by the Commission on Dietetic Registration in September of 2016. The sample was found to have five duplicate emails and sixty emails were found to be undeliverable, providing an initial sample of 4,935 RD/Ns. In total, 894 surveys were started by RD/Ns indicating a response rate of 18% to the web-based survey. Out of the 894 surveys started, 692 were completed. Upon closure of the survey, data cleaning removed 192 surveys for incomplete/missing data. Surveys were determined to be incomplete/missing data if primary job classification, age, and total social media competency score could not be determined. This resulted in 500 surveys being included in the final data analysis, or 10% of the initial sample. The average time to complete the survey was 13 ± 11 minutes (mean$\pm$SD). The final sample included RD/Ns from forty-six states (Hawaii, Vermont, and Alaska were not represented) with California (n=44), New York (n=42), and Texas (n=34) having the largest proportion of respondents.

Figure 4: Social Media Competency Sampling Breakdown



Demographic characteristics of the sample (n=500) are represented in Table 1. The sample of RD/Ns was overwhelming female, 97% female. Nationwide statistics of RD/Ns are reported to be 3.5% male, which aligns with the sampling in this study (Table 2). The majority of RD/Ns are within the 25-34 years age bracket (34.2%), have a Master's level education (50.7%), are predominately white (87.4%) and not Hispanic (93.8%), and have zero children under 18 years of age living in the household (63%). Table 2 illustrates the nationwide statistics for RD/Ns as of 2013, reported by the Commission on Dietetic Registration.

Table 1: Registered Dietitian Demographic Characteristics

	% (n)
Gender	(500)
Male	3 (15)
Female	97 (485)
Age Group (years)	(500)
18 - 24	5.4 (27)
25 - 34	34.2 (171)
35 - 44	23.6 (118)
45 - 54	16.8 (84)
55 >	20 (100)
Education Level	(499)*
Bachelor's	41.7 (208)
Master's	50.7 (253)
Doctoral	5.6 (28)
Professional (MD, PA, etc.)	2 (10)
Race	(500)
White	87.4 (437)
Black or African American	2.8 (14)
American Indian or Alaska Native	1 (5)
Asian American and/or Pacific Islander	4 (20)
Multi-racial	3.2 (16)
Prefer not to say	1.6 (8)
Ethnicity	(500)
Hispanic	5.6 (28)
Not Hispanic	93.8 (469)
Prefer not to say	0.6 (3)
Household Children	(500)
0	63 (315)
1	16.4 (82)
2	14.8 (74)
3	4.4 (22)
4 or more	1.4 (7)

*n < 500 due to missing data

Table 2: Demographics reported by CDR* (December 1, 2013)

Number of Registered Dietitians (total)	89,300
	% (n)
Male	3.5 (3,160)
Female	94.5 (84,177)
Not Reported	2 (1,963)
Native Hawaiian, Pacific Islander	1.5 (1,353)
American Indian or Alaskan Native	< 1 (288)
Asian	4 (3,359)
Black or African American	2.7 (2,396)
Hispanic or Latino	2.9 (2,577)
Other	1.2 (1,049)
Prefer not to disclose	2.4 (2,136)
Not Reported	3 (2,739)
Two or more indicated	<1 (354)
White	81.8 (73,049)

*Source: https://www.cdrnet.org/certifications/registered-dietitians-demographic

When comparing the demographic characteristics of dietitians whose responses were analyzed versus those who were not, a significant difference in age was found (Pearson Chi-Square, $p < 0.001$). While there was a similar proportion of 35-44 year olds (21%) there were less 18-24 and 25-34 year olds and more 45-54 and 55 and above individuals (2%, 24%, 22% & 30%, respectively). A significant difference was also found for personal and professional use of social media among these individuals (Continuity Correction, $p=0.001$ & $p=0.003$, respectively). Overall, individuals who did not complete the survey were older and used social media less than those who completed the survey.

Table 3 illustrates the employment characteristics of the sample. The majority of RD/Ns are employed full-time (70.2%). The sample indicated that there was a similar distribution of RD/Ns practicing for twenty-one years or more (29.6%) and those in practice from one to five years (26%). The majority of RD/Ns practice in a clinical setting (45.6%).

Table 3: Registered Dietitian Employment Characteristics

	% (n)
Employment Status	(500)
Full-time	70.2 (351)
Part-time	18.6 (93)
Self employed	5.8 (29)
Out of work, looking for work	2 (10)
Homemaker	1 (5)
Full-time student	1.2 (6)
Part-time student	0.8 (4)
Retired	0.4 (2)
RDN Certification (years)	(500)
< 1	5.8 (29)
1 -5	26 (130)
6 – 10	16.2 (81)
11 - 20	22.4 (112)
21 or >	29.6 (148)
RDN Job Classification	(500)
Clinical Dietetics	45.6 (228)
Food & Nutrition Management	10.4 (52)
Public Health Nutrition	13.2 (66)
Academia & Research	7.2 (36)
Consultant/Private Practice	11.4 (57)
Media	0.6 (3)
Business & Industry	6.8 (34)
Public Policy/Government	2.4 (12)
Related Health Profession (MD, PA, etc.)	2.4 (12)

Job classification categories were classified as clinical dietetics, food and nutrition management, public health nutrition, academia and research, consultant/private practice, media, business and industry, public policy/government, and related health profession (MD, PA, etc.) for data collection purposes (Table 3). Upon evaluation of the data sample, several related categories were combined. The clinical dietetics and related health professions were combined. Public health nutrition and public policy/government were combined. Academia and research and food and nutrition management remained stand-alone categories and media, business and industry, and consultant/private practice were combined. This resulted in the following job classification categories for data analyses: clinical, food and nutrition management, public health nutrition, academia and research, consultant/private practice/industry. Table 4 represents the combined job classification categories of the sample. Clinical remained the largest category represented (48%).

Table 4: Registered Dietitian Combined Job Classification Characteristics

	% (n)
Job Classification	(500)
Clinical	48 (240)
Food & Nutrition Management	10.4 (52)
Public Health Nutrition	15.6 (78)
Academia & Research	7.2 (36)
Consultant/Private Practice/Industry	18.8 (94)

Table 5 represents the social media characteristics of the sample of RD/Ns. The majority of RD/Ns indicated usage of social media for personal use (92.4%), while only 39.2% indicated using social media for professional use. The majority of RD/Ns had been using social media for more than five years (64.6%). RD/Ns do believe social media is important (90.2%) and more than half of dietitians sampled (59.2%) would be willing to receive training on social media. Of the dietitians that strongly agreed that social media is important 100% (n=152) reported using social media for personal use. One hundred and twenty-seven dietitians reported their number of followers on social media, and two dietitians were considered outliers with followers exceeding 5,102 (mean $\pm$ SD: of 777 $\pm$ 1063 followers total or 429 $\pm$ 578 followers per platform).

Table 5: Registered Dietitian Social Media Characteristics

RDN Social Media Use	% (n)
Personal	(497)*
Yes	92.4 (462)
No	7 (35)
Professional	(498)
Yes	39.2 (196)
No	60.4 (302)
Length of Social Media Use	(483)*
Less than one month	2.2 (11)
1 – 6 months	1.2 (6)
7 months to a year	1 (5)
1 – 5 years	27.6 (138)
More than 5 years	64.6 (323)
Do you think SM is Important?	(500)
Strongly agree	30.4 (152)
Agree	41 (205)
Somewhat agree	18.8 (94)
Neither agree nor disagree	7.6 (38)
Somewhat disagree	0.8 (4)
Disagree	1.4 (7)
Willing to receive training?	(500)
Yes	59.2 (296)
No	11.2 (56)
Maybe	29.6 (148)
Reported Professional Social Media Followers	Mean $\pm$ SD (n), Median**
Total Followers	777 $\pm$ 1063 (125), 387
Average over platforms	429 $\pm$ 578 (125), 201

*n < 500 due to missing data, **outliers defined as followers > 5102 were removed from analyses (n=2 cases)

Table 6 provides the social media usage by age group. Millennial describes dietitians that reported an age of thirty-four years or less and non-millennial describes those reporting an age of thirty-five years and above. Millennial RD/Ns engage in social media for personal and professional use significantly more than non-millennial RD/Ns

(+10% and +13.5% respectively; Figures 5 and 6). Table 7 shows the number of dietitians who indicated overlapping personal and professional use of social media. Figure 7 displays the social media platforms used professionally by dietitians. Table 8 illustrates the number of followers for dietitians on the three main social media platforms.

Table 6: Registered Dietitian Social Media Usage by Age Classification

Age Classification	Social Media Professional Use		Social Media Personal Use	
	(498)		(497)	
	Yes % (n)	No % (n)	Yes % (n)	No % (n)
	(196)	(302)	(462)	(35)
Millennial	47.5 (94)	52.5 (104)	99 (196)	1 (2)
Non-Millennial	34 (102)	66 (198)	89 (266)	11 (33)
Continuity Correction	$p = 0.004$		$p < 0.001$	

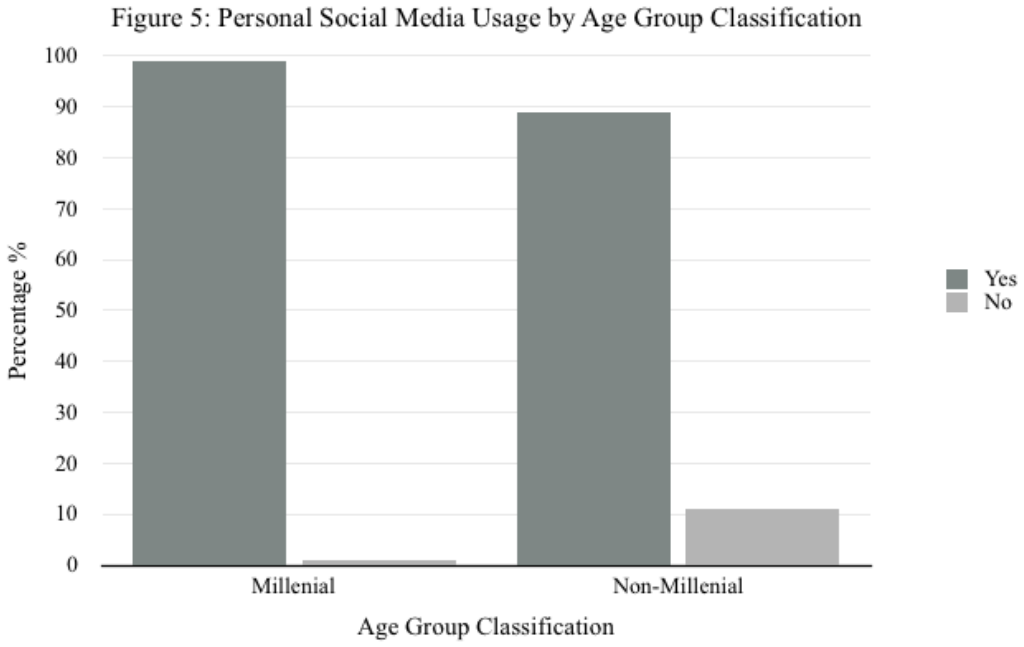


Figure 6: Professional Social Media Usage by Age Group Classification

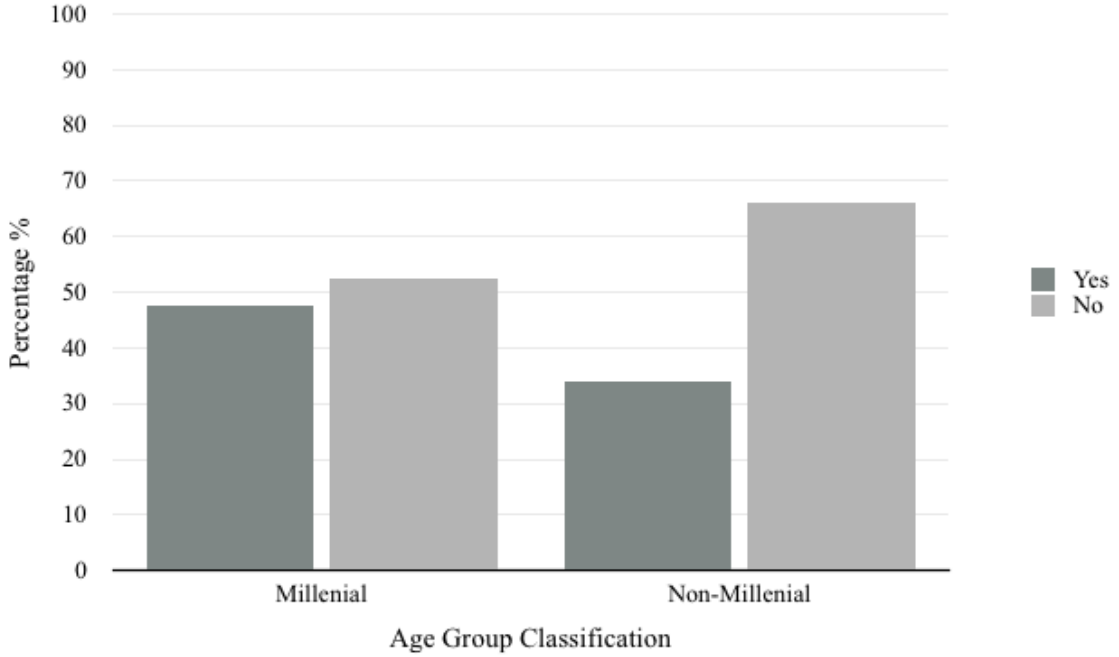


Table 7: Registered Dietitians overlap of Personal & Professional Use

n=495	Professional Use	
	Yes	No
Personal Use		
Yes	189	271
No	6	29

Table 8: Dietitian's followers by Social Media Platform

	Mean ± SD (n)*
Facebook	512 ± 725 (94)
Twitter	457 ± 722 (61)
Instagram	463 ± 602 (40)

*outliers defined as followers > 5102 were removed from analyses (n=2 cases)

Table 9 represents the differences in social media usage by primary job classification. Clinical dietitians use social media the least for professional use (31%), while dietitians reporting a job classification of academia and research use it the most (65.7%). The majority of the sample reported using social media for personal use while public health nutrition dietitians used it the least at 85.7%.

Table 9: Registered Dietitian Social Media Usage by Job Classification

Job Classification	Social Media Professional Use		Social Media Personal Use	
	(498)		(497)	
	Yes % (n)	No % (n)	Yes % (n)	No % (n)
	(196)	(302)	(462)	(35)
Clinical	31 (74)	69 (165)	92.4 (220)	7.6 (18)
Food & Nutrition Management	50 (26)	50 (26)	94.2 (49)	5.8 (3)*
Public Health Nutrition	32.1 (25)	67.9 (53)	85.7 (66)	14.3 (11)
Academia & Research	65.7 (23)	34.3 (12)	94.4 (34)	5.6 (2) *
Consultant/Private Practice/Industry	51.1 (48)	48.9 (46)	98.9 (93)	1.1 (1)*
Pearson Chi-Square	$p < 0.001$		$p = 0.02$	

*cells have count less than 5.

Figure 7: Number of Dietitians Reporting Professional Use of a Social Media Platform

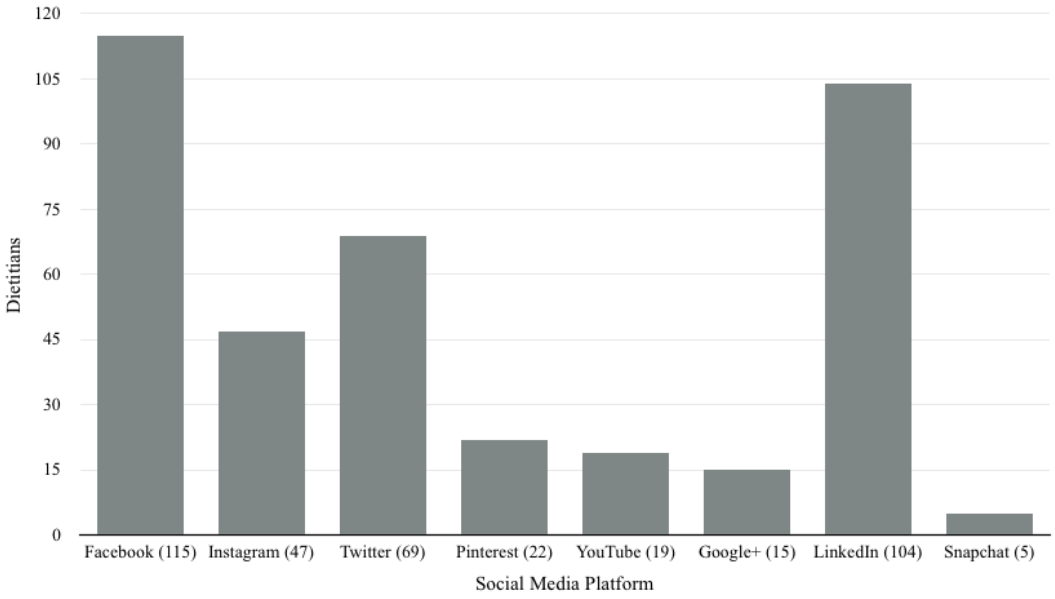


Table 10 examines the differences in total social media competency score by age and primary job classification. The highest social media competency score that can be obtained is 467. Correlations were conducted and age, education level, and household income were found to be significantly correlated with the total social media competency score and were considered confounding factors for analysis. Millennial RD/Ns have a

Table 10: Social Media Total Competency Score Classifications

Social Media Competency	Total Score	p-value
Age Classification	Mean ± SD (n)	
Millennial	280±70 (198)	p<0.001
Non-Millennial	234±69 (301)	
Job Classification		p=0.003*
Clinical	241±62 (240)[a]	p=0.015[ab**]
Food & Nutrition Management	273±65 (52)[b]	
Public Health Nutrition	259±62 (78)	
Academia & Research	257±66 (36)	
Consultant/Private Practice/Industry	263±68 (94)[c]	p=0.046[ac**]

*p-value determined using general linear models after adjusting for covariates (age, education, household income) **Bonferroni post hoc utilized

significantly higher social media competency score than non-millennial RD/Ns (p<0.001). Additionally, food and nutrition management and consultant/private practice/industry RD/Ns were found to have significantly higher scores than clinical RD/Ns (p=0.015 & p=0.046, respectively).

Figure 8: Total Social Media Competency Score by Age Classification (n)

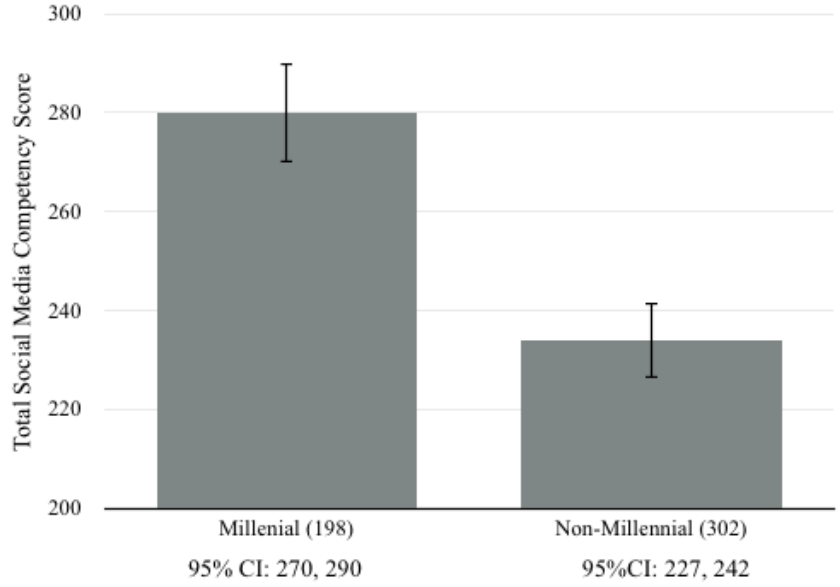


Figure 9: Total Social Media Competency Score by Age Group

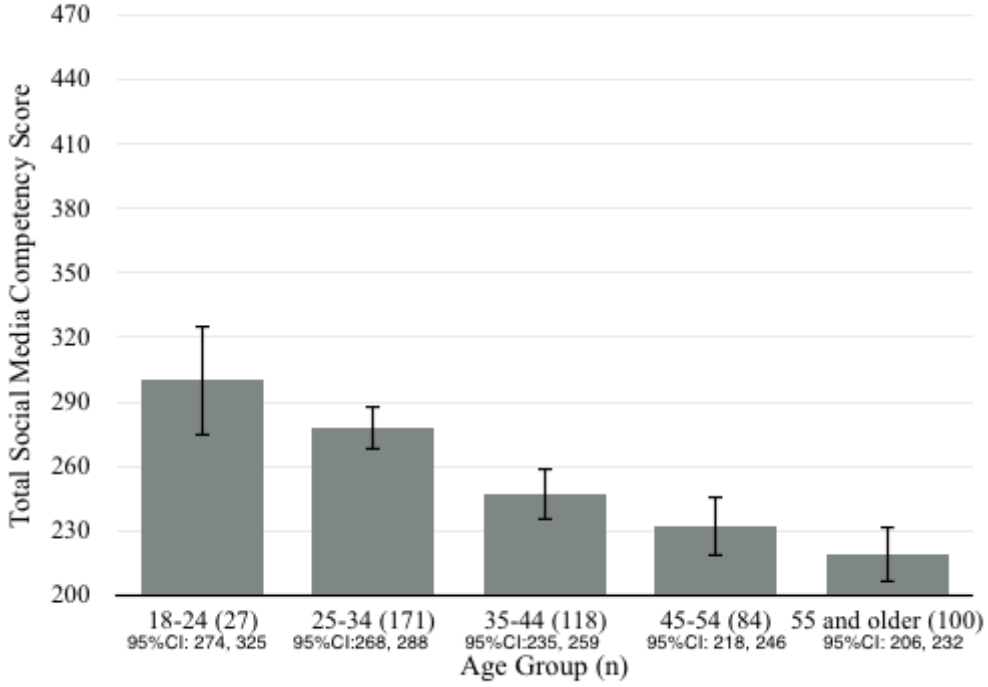


Figure 10: Total Social Media Competency Score by Primary Job Classification (n)

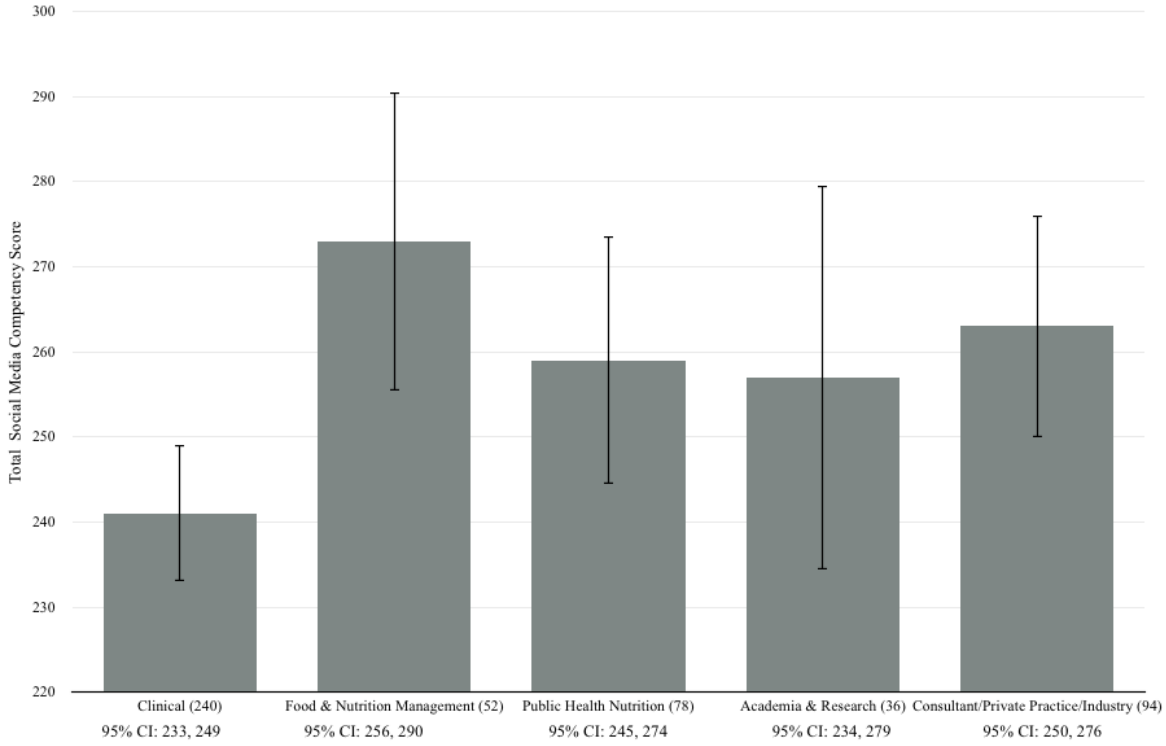


Table 11 illustrates the differences in total social media competency score across personal and professional usage. RD/Ns who use social media personally and professionally have a significantly higher competency score than the RD/Ns who do not ($p<0.001$).

Table 11: Differences in Total Social Media Competency Score based on Usage

Social Media Usage	Total Competency Score		p-value
	Mean ± SD (n)		
	Yes	No	
Personal (496)	256±64 (461)	213±65 (35)	p < 0.001*
Professional (497)	276±70 (196)	238±69 (301)	p < 0.001*

* p-value determined using general linear models after adjustment for covariates (age, education, household income)

Table 12 provides the Spearman correlations between social media followers and total social media competency score. Facebook, Twitter, total followers and total average followers were found to have a significant correlation with total social media competency score. Specifically, the total social media competency score was found to explain 16% of the variation in the number of Twitter followers and 10% of the variation in the average number of followers by platform.

Table 12: Correlation of Registered Dietitians' Total Social Media Competency Score and Social Media Platform Followers

Total Social Media Competency Score (n)*	Spearman Correlation Coefficient	r^2	p-value
Facebook Followers (94)	0.265	0.07	0.01
Twitter Followers (61)	0.404	0.16	0.001
Instagram Followers (40)	-0.067		0.683
Total Followers (125)	0.338	0.11	< 0.001
Average Total Followers (125)	0.320	0.10	<0.001

*outliers defined as followers > 5102 were removed from analyses (n=2 cases)

Figures 11-13 illustrate the correlation between Facebook, Twitter, and Instagram followers and total social media competency score.

Figure 11: Total Competency Score by Facebook Followers

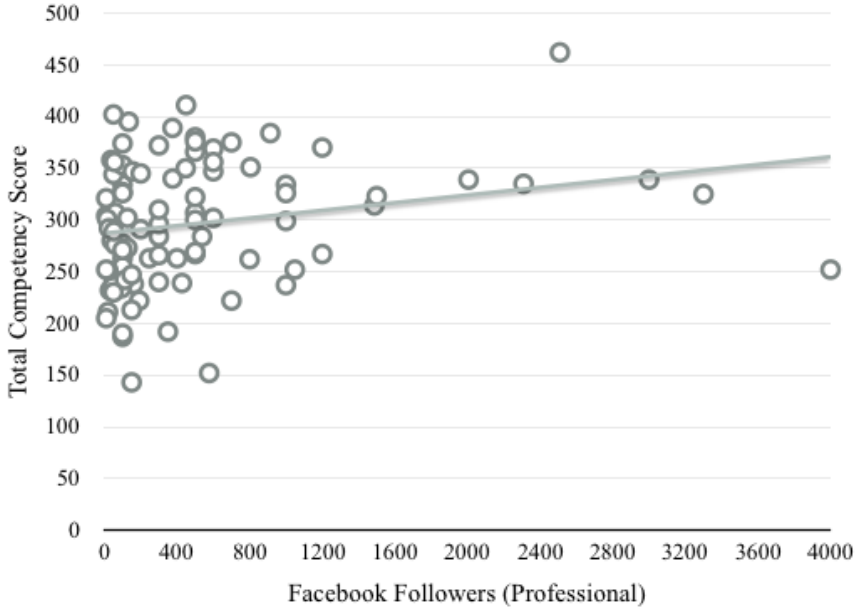


Figure 12: Total Competency Score by Twitter Followers

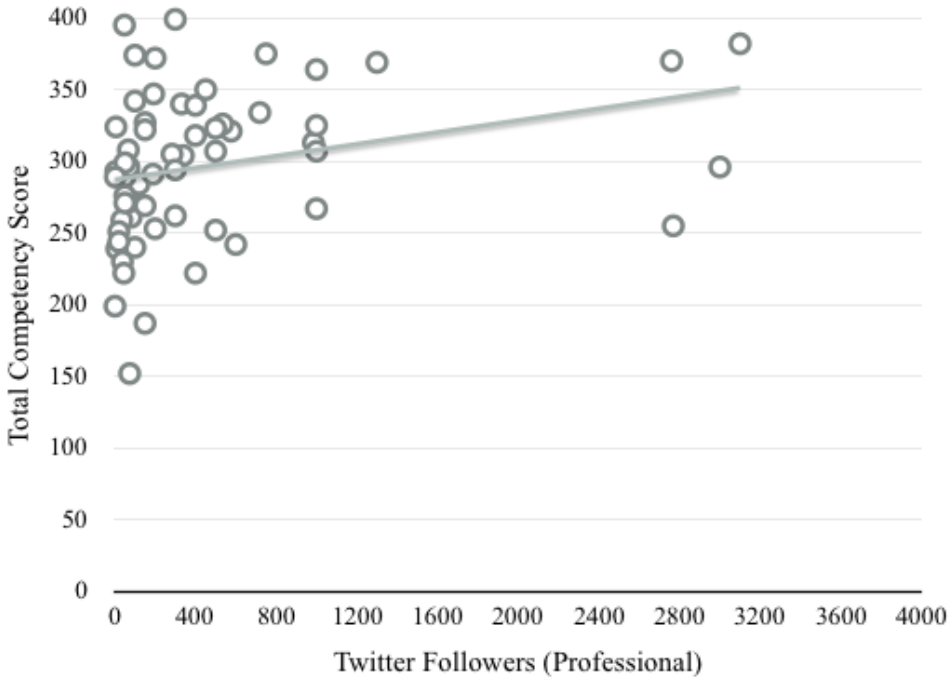
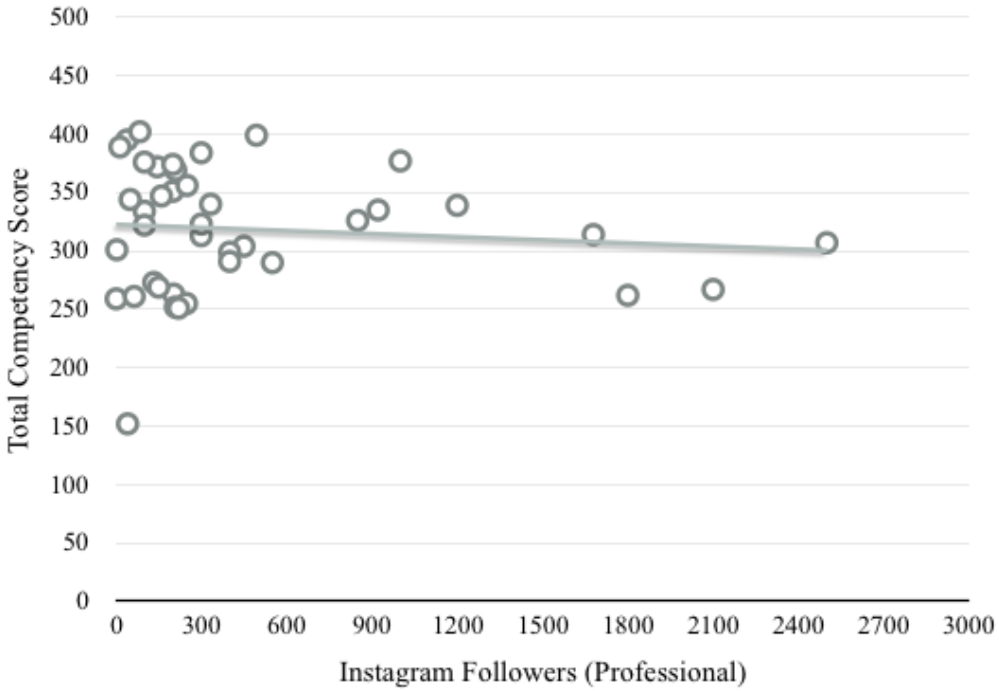


Figure 13: Total Competency Score by Instagram Followers



CHAPTER 5

DISCUSSION

Social media is rapidly becoming a necessary communication and research tool for the nutrition and health professions. It has been estimated that 90% of U.S. adults use the Internet and approximately 72% of them engage in social media.[79] Pew Research Center, in a recent survey, reported a majority of Americans now indicate they use social media as their main source of news.[80] The same survey also found that users 65 years and older are the fastest growing segment of users on Facebook (48% in 2015; 62% in 2016.[80] With an aging population quickly moving onto social media networks, the opportunity to reach populations needing nutrition and health information and interventions is growing. The vast majority of Facebook users (76%) reported using the platform daily with an average of 40 minutes or more per day.[80] While conducting research on social media is proving to be a cost-effective and accurate means to collect what is normally self-reported data there are increased ethical concerns around this type of research.[70] In 2014, researchers manipulated selected users Facebook feeds to study emotional contagion leading to public outrage.[70] Guidelines related to the use of data on social media platforms is limited, and research has shown that publicly available social media data can allow for prediction of personality traits that drive human behavior.[70,75,77,78] Moving forward, securing individuals privacy is paramount to conducting ethical research.

This research evaluated registered dietitians' social media use, reach, and competency score via a newly published social media competency inventory for certified health education specialists. We hypothesized that the use of social media in registered dietitians would vary by demographic and primary job characteristics. Specifically,

millennial dietitians and those in a private practice/consulting or media focus would use social media significantly more than non-millennial and clinical setting dietitians. We also hypothesized that the social media competency score of registered dietitians would vary by demographic and primary job characteristics. Specifically, millennial dietitians and those in a private practice/consulting or media focus would have a significantly higher social media competency score than non-millennial and clinical setting dietitians. Finally, we hypothesized that there would be a significant positive association between social media competency score and social media followers. Specifically, as competency score increases, social media followers increase.

When looking at characteristics of social media usage 92.4% of dietitians reported using social media for personal use. This statistic is similar to the national usage of social media in the United States (5, 6). While the majority of dietitians sampled reported using social media for personal use only, 39.2% of dietitians used social media in a professional capacity. A smaller proportion of dietitians engaged in social media for both personal and professional use (n=189) than those who indicated engaging for personal and not professional use (n=271). Only six dietitians indicated they engage in social media for professional use and not for personal use, and 29 dietitians were not using social media at all. The majority of the sample was willing to receive training on social media (59.2%). Considering 10 million Americans are looking for health information and guidance on social media daily this research indicates an opportunity to improve social media for professional use among dietitians.[7-11]

The platform dietitians indicated using for professional use the most was Facebook (n=115), followed by LinkedIn (n=104), Twitter (n=69), and Instagram (n=47).

Dietitians' indication of Facebook as the most used platform is not surprising. A survey conducted by Pew Research Center in 2016 found that 79% of online adults use Facebook. Interestingly, online adults ages 65 years and older reported a 14-point increase in Facebook usage from 2015 to 2016 (48% in 2015 and 62% in 2016).[80] Within those who reported using Facebook, 76% are using the platform daily and an additional 15% are logging on weekly.[80] Facebook, in particular, provides a unique opportunity to reach the public. It is estimated that 800 million users are engaging on Facebook daily for more than 40 minutes on average.[71,72]

Registered dietitians reported a mean 777 $\pm$ 1063 total followers and an average of 429 $\pm$ 578 per platform after removing two outliers (followers > 5102). Dietitians reported a mean of 512 $\pm$ 725 Facebook followers (n=94), 457 $\pm$ 722 Twitter followers (n=61), and 463 $\pm$ 602 Instagram followers (n=40). While research has indicated an individual can maintain 10-20 close relationships, and 150 social relationships social media does not always reflect offline relationships.[81-83] Specifically Quercia et al. demonstrated that users with followers ranging from 500-1000 should be identified as social hubs. Social hubs are highly connected users.[81] Social hubs allow for the dissemination of information to spread throughout their interconnected networks.[81] While registered dietitians, when compared with celebrities, have a relatively low following their mean followers on Facebook would be considered in the low range of a social hub. Interestingly, mean followers on Facebook for State Health Departments was reported at 789 followers.[33] Registered dietitians, individually, have a similar reach as State Health Departments.

For the purpose of generational classification dietitians indicating an age of thirty-four years or less are considered millennial. Registered dietitians aged 35 years and above were classified as non-millennial. Millennial dietitians engage in social media for personal and professional use significantly more than non-millennial dietitians (+10% and +13.5% respectively). These results are supported by known social media usage statistics.[5,6,80] Millennial registered dietitians also had a significantly higher social media competency score than non-millennial registered dietitians (280±70 and 234±69, $p < 0.001$).

Social media use and competency were found to be significantly different over primary employment classifications as well. Clinical dietitians reported engaging social media for professional purposes the least (31%), while registered dietitians in academia and research engaged in professional social media the most (65.7%) Clinical dietitians had the lowest social media competency score (241±62) while those in Food & Nutrition Management had the highest score (273±65). Dietitians reporting Consultant/Private Practice/Industry had the next highest score (263±62). Both the Food & Nutrition Management and Consultant/Private Practice/Industry dietitians' social media competency score was significantly higher than clinical dietitians ($p=0.015$ and $p=0.046$, respectively). The significantly higher score in Food & Nutrition Management and Consultant/Private Practice/Industry dietitians is most likely due to the differences in daily job requirements of the different professions. Clinical dietitians see patients in-person in a hospital or clinic setting. These dietitians make specific dietary recommendations to patients based on personal information that is protected by privacy laws. It is unlikely Clinical dietitians would access social media as a means to counsel

patients on dietary advice. In contrast Food & Nutrition Management and Consultant/Private Practice/Industry dietitians would be expected to have more visibility on social media. Food & Nutrition Management dietitians may work for large food manufactures or brands that want to promote the healthfulness of their products. One of the ways to accomplish this is by having dietitians who work for the brand promote the product online. These dietitians may also work in the school food arena. These dietitians may promote healthy school lunch online via a school's designated Facebook page. Consultant/Private Practice/Industry would also require more of a social media presence than Clinical dietitians. Consultant/Private Practice/Industry dietitians may utilize social media to self-promote their private practice or industry endeavor.

Additionally, a significant difference in social media competency was found for dietitians who used social media personally and professionally versus those who did not ($p<0.001$ and $p<0.001$, respectively). Dietitians that indicated engaging in social media for professional use had the highest score (276 ± 70) while those who did not engage in personal use had the lowest score (213 ± 65). The social media competency was based on a Likert Scale, and the questions ranged from strongly agree to strongly disagree and extensive experience to no experience. Due to this scale, the minimum score required to have a positive competency is 220, with a maximum score of 467. Those who did not engage in personal use did not meet the minimum threshold for a positive competency score. Simply, using social media personally or professionally will increase social media competency.[22] This result is indicative of the principals and theories the social media competency inventory was built upon.[22] The inventory utilized the theory of integrated behavior and the unified theory of acceptance and use of technology. Both of these

theories rely heavily on behavioral intention and facilitating conditions including self-efficacy. Self-efficacy is cited throughout the literature as a main contributing factor of an individuals' ability to carry out a behavior.[22,42,43,65] An opportunity for increasing professional use of social media in dietitians resides in the ability to facilitate effective usage of the various platforms. Programs designed at familiarizing dietitians with key platform features, effective messaging techniques, and activities aimed at increasing daily engagement may prove effective at increasing dietitians' social media competency.

Lastly, we sought to determine the association between social media competency score and followers on various platforms. While social media followers are just one of many social media metrics analyzed to determine effective use of social media it is the only metric captured by this investigation. Significant positive correlations were found for Facebook, Twitter, total followers and total average followers per platform (p-value 0.01, 0.001, <0.001 and <0.001, respectively). Twitter provided the strongest correlation (0.404) with the social media competency score, which explained 16% of the variation in Twitter followers. Social media competency score explained 10% of the variation in the average number of followers per platform. Programs designed at increasing the social media competency of dietitians may at the same time increase the overall reach of dietitians on social media. Increasing social media reach is instrumental in ensuring the 10 million Americans who search for health information on social media are accessing evidenced-based nutrition information.[7=11]

There were several limitations present in this study. While the Commission on Dietetic Registration provided a randomized sample of dietitians nationwide (n=5000), the response rate was low when compared with paper-based surveys (18%). The response

rate is low compared to paper-based surveys, but the research indicates the average response rate for web-based surveys to be between 10%-25%.[84] Studies indicated personalizing recruitment and reminder emails, providing larger lottery incentives, and providing survey feedback may increase the response rate.[84] Furthermore, the sample does not contain representatives from all fifty states (specifically from Hawaii, Vermont, and Alaska). There were also significant differences in age and social media usage between the dietitians who completed the survey and those that did not. Dietitians who completed the study were younger and used social media more. This may have affected the mean of the social media competency score as it was shown that simply using social media more is linked with an increased social media competency score. The results cannot be generalized to those who were unwilling to take an online survey and who did not have Internet access. Finally, social media competency measures an individuals' potential to apply social media technologies to disseminate health information and messages, engage and empower individuals to make healthier decisions, and encourage conversation and participation related to the mission of their health organization. Social media competency does not measure effectiveness. While significant correlations were present for social media competency and social media followers, followers are not the only metric available to gage effectiveness on a social media platform. Engagement metrics would have to measured and correlated to gain an understanding of the inventory's ability to predict effectiveness through the competency score. Finally, the tool used to measure social media competency was not validated in registered dietitians and may not accurately depict social media competency in the present sample.

CHAPTER 6

CONCLUSIONS

Our study examined the social media use, reach and competency score of registered dietitians. The sample was representative of registered dietitians when compared to the nationwide statistics available from the Commission on Dietetic Registration in 2013. The purpose of the study was to identify social media use, reach and social media competency level of registered dietitians. Our long-term goal is to develop effective social media strategies to facilitate the dissemination of evidence-based nutrition science information and health interventions to reduce the prevalence of chronic disease burden in the U.S. Dietitians who use social media for personal or professional use had higher social media competency scores. Indicating the ability to familiarize dietitians to social media platform features and providing activities to practice social media use may lead to higher competency scores. Overall, millennial dietitians engaged in social media for personal and professional use significantly more than their non-millennial peers and scored significantly higher in social media competency. Food & Nutrition Management and Consultant/Private Practice/Industry dietitians scored significantly higher than their Clinical peers in social media competency. Lastly, social media competency score was significantly correlated with social media followers, indicating an opportunity to increase the reach of dietitians by increasing their social media competency. Future studies linking social media effectiveness metrics and social media competency are needed to assess the ability of competency to predict the effectiveness of a user.

CHAPTER 7

FUTURE DIRECTIONS

This research lays the foundation for additional research evaluating social media competency and effectiveness of social media interventions led by registered dietitians. This research also provides an understanding of the online communication skills of a large subset of health promotion professionals. This study provides a baseline for social media competency and results allow for the development of additional training and/or additional competency requirements of registered dietitians to ensure proper utilization of social media as a tool for the promotion of evidence-based nutrition information.

An additional research direction that will be pursued, utilizing this study as the foundation, is exploring the association between social media competency level and the effectiveness of registered dietitians on social media. Linking the social media competency inventory with measures of effectiveness is a clear next step for validating the use of this tool. Additionally, investigating the relationship of personality type and dietitians who are deemed effective on social media could provide additional insight into which dietitians will have the highest likelihood of success on social media. Currently, the literature is split on the effectiveness of social media interventions for health behavior change, and social media competency may be a contributing factor. In the future, investigations examining the volume, type, and reach of social media accounts between registered dietitians and non-registered dietitian accounts will also be conducted. Additional future investigations will work to design social media based health inventions utilizing strategies found effective in these future investigations.

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APPENDIX A

IRB APPROVAL

EXEMPTION GRANTED

Carol Johnston
SNHP: Nutrition
602/827-2265
CAROL.JOHNSTON@asu.edu

Dear Carol Johnston:

On 7/28/2016 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Adoption and use of Social Media Among Registered Dietitians in Arizona: Implications for Health Communication
Investigator:	Carol Johnston
IRB ID:	STUDY00004695
Funding:	Name: Graduate College
Grant Title:	
Grant ID:	
Documents Reviewed:	• HRP-503a-TEMPLATE_PROTOCOL_SocialBehavioralV02-10-15.docx, Category: IRB Protocol; • Email, Category: Recruitment Materials; • Survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • consent for online survey, Category: Consent Form;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 7/28/2016.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

APPENDIX B

SOCIAL MEDIA SURVEY

Thank you for your interest in this research study conducted by Claudia T. Felty, an ASU doctoral student under the direction of Dr. Carol Johnston, ASU nutrition professor. This survey is specifically for nutrition professionals who hold the credential: Registered Dietitian (Nutritionist). You must be 18 years of age to participate in this survey. This survey will ask demographic questions such has age and education level and a series of questions regarding the use of social media in your professional work. You will NOT be asked to provide your name or other identifying information. You may quit the survey at any time if you do not want to continue answering questions. Survey participation will indicate consent. Participation is completely voluntary. The survey should take 10-15 minutes to complete. Please complete the survey in one sitting. You will not be able to save and return later. If you choose not to participate or to withdraw from the study at any time, there will be no penalty. You will be entered into a raffle for one of 130, $15 Amazon gift cards. There are no foreseeable risks or discomforts to your participation. The results of this study may be used in reports, presentations, or publications but your name will not be known. If you have any questions, please contact Dr. Johnston, ASU Nutrition Professor, at carol.johnston@asu.edu or 602-827-2265. Information collected from this survey may be used in research reports but your input is anonymous. If you have questions about your rights as a subject/participant in this research, you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Research Compliance Office, at 480-965 6788. Thank you for your interest in research conducted in the School of Nutrition and Health Promotion.

What is your primary language?
- ❍ English (1)
- ❍ Spanish (2)
- ❍ Other (3)

What is your gender?
- ❍ Female (1)
- ❍ Male (2)

What is your age (years) ?
- ❍ 18 - 24 years (1)
- ❍ 25 - 34 years (2)
- ❍ 35 - 44 years (3)
- ❍ 45 - 54 years (4)
- ❍ 55 years or older (5)

What is the highest level of education you have completed?
- ❍ Bachelor's Degree (1)
- ❍ Master's Degree (2)
- ❍ Doctoral Degree (3)
- ❍ Professional Degree (MD, JD, etc.) (4)

How would you classify yourself?
- ❍ White (1)
- ❍ Black or African American (2)
- ❍ American Indian or Alaska Native (3)
- ❍ Asian-American and/or Pacific Islander (4)
- ❍ Multi-racial (5)
- ❍ Prefer not to say (6)

Are you Hispanic, Latino/a, or of Spanish origin?
- ❍ Yes (1)
- ❍ No (2)
- ❍ Prefer not to say (3)

Are you _____?
- ❍ Married (1)
- ❍ Divorced (2)
- ❍ Widowed (3)
- ❍ Separated (4)
- ❍ Never married (5)
- ❍ Prefer not to say (6)

How many children less than 18 years of age live in your household?
- ❍ 0 (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 or more (5)

Are you currently _____?
- ❍ Employed full-time (1)
- ❍ Employed part-time (2)
- ❍ Self-employed (3)
- ❍ Out of work (i.e looking for work) (4)
- ❍ Homemaker (5)
- ❍ Full-time student (6)
- ❍ Part-time student while working (7)
- ❍ Retired (8)

What is your household income from all sources in U.S. dollars?
- ❍ Under $10,000 (1)
- ❍ $10,000 - $19,999 (2)
- ❍ $20,000 - $29,999 (3)
- ❍ $30,000 - $39,999 (4)
- ❍ $40,000 - $49,999 (5)
- ❍ $50,000 - $74,999 (6)
- ❍ $75,000 - $99,999 (7)
- ❍ $100,000 - $150,000 (8)
- ❍ Over $150,000 (9)
- ❍ Prefer not to say (10)

How long have you been a Registered Dietitian (Nutritionist), registered with the CDR?

- ❍ less than 1 year (1)
- ❍ 1 - 5 years (2)
- ❍ 6 - 10 years (3)
- ❍ 11 - 20 years (4)
- ❍ 21 years or greater (5)

What state do you currently live and practice in?

- ❍ Alabama (1)
- ❍ Alaska (2)
- ❍ Arizona (3)
- ❍ Arkansas (4)
- ❍ California (5)
- ❍ Colorado (6)
- ❍ Connecticut (7)
- ❍ Delaware (8)
- ❍ Florida (9)
- ❍ Georgia (10)
- ❍ Hawaii (11)
- ❍ Idaho (12)
- ❍ Illinois (13)
- ❍ Indiana (14)
- ❍ Iowa (15)
- ❍ Kansas (16)
- ❍ Kentucky (17)
- ❍ Louisiana (18)
- ❍ Maine (19)
- ❍ Maryland (20)
- ❍ Massachusetts (21)
- ❍ Michigan (22)
- ❍ Minnesota (23)
- ❍ Mississippi (24)
- ❍ Missouri (25)
- ❍ Montana (26)
- ❍ Nebraska (27)
- ❍ Nevada (28)
- ❍ New Hampshire (29)
- ❍ New Jersey (30)
- ❍ New Mexico (31)
- ❍ New York (32)
- ❍ North Carolina (33)
- ❍ North Dakota (34)
- ❍ Ohio (35)
- ❍ Oklahoma (36)
- ❍ Oregon (37)
- ❍ Pennsylvania (38)

- ❍ Rhode Island (39)
- ❍ South Carolina (40)
- ❍ South Dakota (41)
- ❍ Tennessee (42)
- ❍ Texas (43)
- ❍ Utah (44)
- ❍ Vermont (45)
- ❍ Virginia (46)
- ❍ Washington (47)
- ❍ West Virginia (48)
- ❍ Wisconsin (49)
- ❍ Wyoming (50)

How would you classify your current position in dietetics? Please select the response that describes your main position if working multiple jobs.

- ❍ Clinical Dietetics (1)
- ❍ Food and Nutrition Management (2)
- ❍ Public Health Nutrition (3)
- ❍ Academia and Research (4)
- ❍ Consultant/Private Practice (5)
- ❍ Media (6)
- ❍ Business and Industry (7)
- ❍ Public Policy/Government (8)
- ❍ International Food Organization (Peace Corps, US AID etc.) (9)
- ❍ Related Health Profession (MD, PA etc.) (10)

If working multiple positions, please select all that apply to secondary positions.

- ❑ Clinical Dietetics (1)
- ❑ Food and Nutrition Management (2)
- ❑ Public Health Nutrition (3)
- ❑ Academia and Research (4)
- ❑ Consultant/Private Practice (5)
- ❑ Media (6)
- ❑ Business and Industry (7)
- ❑ Public Policy/Government (8)
- ❑ International Food Organization (Peace Corps, US AID etc.) (9)
- ❑ Related Health Profession (MD, PA, etc.) (10)
- ❑ Does not apply, working one position only (11)

Are you a member of social networking sites (i.e. Facebook, Instagram, Twitter, LinkedIn etc.) for PERSONAL use? *LinkedIn is considered personal use unless managing and promoting a brand/organization.

- ❍ Yes (1)
- ❍ No (2)

Are you a member of social networking sites (i.e. Facebook, Instagram, Twitter, etc.) for PROFESSIONAL use? Either self brand promotion or promotion of employer messaging.

- ❍ Yes (1)
- ❍ No (2)

Display This Question:

If Are you a member of social networking sites (i.e. Facebook, Instagram, Twitter, LinkedIn etc.) for PERSONAL use? *LinkedIn is considered personal use unless managing and promoting a brand/organizat... Yes Is Selected

Which social networking sites do you use for PERSONAL use? Select all that apply.

- ❑ Facebook (1)
- ❑ Instagram (2)
- ❑ Twitter (3)
- ❑ Snapchat (4)
- ❑ Periscope (5)
- ❑ Vimeo (6)
- ❑ YouTube (7)
- ❑ Google+ (8)
- ❑ Tumblr (9)
- ❑ LinkedIn (10)
- ❑ Pinterest (11)
- ❑ Other, please indicate platform/s (12) _____

Display This Question:

If Are you a member of social networking sites (i.e. Facebook, Instagram, Twitter, etc.) for PROFESSIONAL use? Either self brand promotion or promotion of employer messaging. Yes Is Selected

Which social networking sites do you use for PROFESSIONAL use? Select all that apply.

- ❑ Facebook (1)
- ❑ Instagram (2)
- ❑ Twitter (3)
- ❑ Snapchat (4)
- ❑ Periscope (5)
- ❑ Vimeo (6)
- ❑ YouTube (7)
- ❑ Google+ (8)
- ❑ Tumblr (9)
- ❑ LinkedIn (10)
- ❑ Pinterest (11)
- ❑ Other, please indicate platform/s (12) _____

How long have you been using social networking sites?

- ❍ Less than a month (1)
- ❍ 1 - 6 months (2)
- ❍ 7 months to a year (3)
- ❍ 1 - 5 years (4)
- ❍ More than 5 years (5)

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Facebook Is Selected

You indicated you use Facebook for Professional use. How many followers do you have on your Professional Facebook page? Please enter only numbers. Example: 5000

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Instagram Is Selected

You indicated you use Instagram for Professional use. How many followers do you have on your Professional Instagram account? Please enter only numbers. Example: 5000

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. YouTube Is Selected

You indicated you use YouTube for Professional use. How many subscribers do you have on your Professional YouTube channel? Please enter only numbers. Example: 5000

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Twitter Is Selected

You indicated you use Twitter for Professional use. How many followers do you have on your Professional Twitter account? Please enter only numbers. Example: 5000

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Snapchat Is Selected

You indicated you use Snapchat for Professional use. What is your Snapchat score? Please enter only numbers. Example: 5000

Display This Question:

If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Pinterest Is Selected

You indicated you use Pinterest for Professional use. How many followers do you have on your Professional Pinterest page? Example: 5000

Display This Question:
If Which social networking sites do you use for PROFESSIONAL use? Select all that apply. Periscope Is Selected

You indicated you use Periscope for Professional use. How many followers do you have on your Professional Facebook Periscope account? Example: 5000

Do you think social media networks are important?

- ❍ Strongly agree (1)
- ❍ Agree (2)
- ❍ Somewhat agree (3)
- ❍ Neither agree nor disagree (4)
- ❍ Somewhat disagree (5)
- ❍ Disagree (6)
- ❍ Strongly disagree (7)

Social media are the technological tools that allow users to communicate and share content. Examples of social media technologies include Twitter, YouTube, Instagram, Facebook, and Snapchat. Social media competency can be described as an individual's capacity to use social media for nutrition education programs and initiatives.For this inventory, you will be answering questions specific to social media use in a professional setting within the field of dietetics. Please read the instructions for each section carefully.

In this section, you will be asked to review different tasks that a Registered Dietitian (Nutritionist) may complete when developing, implementing, or evaluating a social media program. More specifically, you will be asked to indicate how confident you would feel completing each of the tasks presented.

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Collect primary health-related data through survey methods using social media (1)	❍	❍	❍	❍	❍	❍
Identify instruments that can be used for collecting health-related data using social media (2)	❍	❍	❍	❍	❍	❍
Analyze the capacity within your organization for developing a social media program (3)	❍	❍	❍	❍	❍	❍
Use existing theories to assess social media campaigns (4)	❍	❍	❍	❍	❍	❍
Create an assessment plan for a social media campaign (5)	❍	❍	❍	❍	❍	❍
Assess the	❍	❍	❍	❍	❍	❍

use of social media platforms for health-related purposes in populations of interest (6)						

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Identify populations of interest to reach during a social media campaign (1)	❍	❍	❍	❍	❍	❍
Apply principles of health literacy when creating social media activities (2)	❍	❍	❍	❍	❍	❍
Develop objectives for social media campaigns (3)	❍	❍	❍	❍	❍	❍
Develop social media activities and strategies that are evidence-based to meet nutrition education objectives (4)	❍	❍	❍	❍	❍	❍
Develop social media activities and strategies that are theory-based to meet nutrition education objectives (5)	❍	❍	❍	❍	❍	❍
Identify resources required for implementation of a social media campaign (6)	❍	❍	❍	❍	❍	❍
Identify the	❍	❍	❍	❍	❍	❍

factors that may hinder or foster implementation of social media activities (7)						
Apply principles of cultural competency when creating social media pages (8)	❍	❍	❍	❍	❍	❍

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Monitor the progress of social media activities (1)	❍	❍	❍	❍	❍	❍
Determine the readiness of the population of interest to implement the social media program (2)	❍	❍	❍	❍	❍	❍
Apply evidence-based strategies to social media planning (3)	❍	❍	❍	❍	❍	❍
Determine the readiness of your organization to implement the social media programs (4)	❍	❍	❍	❍	❍	❍
Use appropriate social media tools to implement the	❍	❍	❍	❍	❍	❍

campaign (5)						
Develop a plan of action for social media programs (6)	❍	❍	❍	❍	❍	❍
Implement plan of action for social media programs (7)	❍	❍	❍	❍	❍	❍

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Asses the validity of data collected for social media research or evaluation (1)	❍	❍	❍	❍	❍	❍
Monitor data collection progress for social media activities (2)	❍	❍	❍	❍	❍	❍
Interpret findings for data collected during social media interventions (3)	❍	❍	❍	❍	❍	❍
Apply ethical standards when developing evaluation plans for social media interventions (4)	❍	❍	❍	❍	❍	❍
Identify survey instruments for data collection in social media research or evaluation (5)	❍	❍	❍	❍	❍	❍
Communicate findings from social media interventions with key stakeholders	❍	❍	❍	❍	❍	❍

(6) Apply ethical standards when conducting social media research (7)	❍	❍	❍	❍	❍	❍

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Provide expert assistance for implementing social media initiatives (1)	❍	❍	❍	❍	❍	❍
Provide expert assistance for evaluating social media initiatives (2)	❍	❍	❍	❍	❍	❍
Identify potential partnership that will assist with the social media intervention (3)	❍	❍	❍	❍	❍	❍
Explain how the goals of a social media program align with the mission and goals of your organization (4)	❍	❍	❍	❍	❍	❍

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Convey the advantages of using social media (1)	❍	❍	❍	❍	❍	❍
Convey the disadvantages of using social media (2)	❍	❍	❍	❍	❍	❍
Develop training programs in social media for registered dietitians (3)	❍	❍	❍	❍	❍	❍
Develop guidelines for evaluating social media initiatives (4)	❍	❍	❍	❍	❍	❍
Evaluate the qualification of individuals who will be assisting with social media initiatives if needed (5)	❍	❍	❍	❍	❍	❍
Identify social media resources with accurate nutrition information (6)	❍	❍	❍	❍	❍	❍
Justify the need for social media guidelines for registered dietitians (7)	❍	❍	❍	❍	❍	❍

Identify social media resources with relevant nutrition information (8)	❍	❍	❍	❍	❍	❍
Convey nutrition-related information to key stakeholders using social media (9)	❍	❍	❍	❍	❍	❍
Convey nutrition-related information to populations of interest through social media (10)	❍	❍	❍	❍	❍	❍

For EACH task, please indicate how confident you feel TODAY in your ability to complete the task in the field of dietetics.

	Extremely Unconfident (1)	Unconfident (2)	Somewhat Unconfident (3)	Somewhat Confident (4)	Confident (5)	Extremely Confident (6)
Use social media technologies to communicate nutrition information with populations of interest (1)	❍	❍	❍	❍	❍	❍
Lead nutrition-related advocacy initiatives using social media (2)	❍	❍	❍	❍	❍	❍
Engage with stakeholders in nutrition-related advocacy using social media (3)	❍	❍	❍	❍	❍	❍
Tailor nutrition-related social media messages to individuals (4)	❍	❍	❍	❍	❍	❍
Use social media to create opportunities for professional development (5)	❍	❍	❍	❍	❍	❍
Select appropriate	❍	❍	❍	❍	❍	❍

nutrition-related images to be posted on social media platforms (6)						
Evaluate the use of social media in nutrition-related advocacy efforts (7)	❍	❍	❍	❍	❍	❍
Identify issues that may influence the use of social media for nutrition education (8)	❍	❍	❍	❍	❍	❍

In this section, you will be asked to review a set of tasks that a Registered Dietitian (Nutritionist) may need to complete while developing, implementing, or evaluating a social media program or for advocacy or professional development purposes.

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Collecting health data from a social media site (e.g. Twitter, Facebook) (1)	❍	❍	❍	❍	❍
Determining the quality of existing social media campaigns (2)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Developing social media activities that are theory-based to meet objectives (1)	❍	❍	❍	❍	❍
Identifying populations of interest for social media programs nutrition education (2)	❍	❍	❍	❍	❍
Identifying key stakeholders involved with implementing a social media program (3)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Creating an action plan for social media (1)	❍	❍	❍	❍	❍
Determining the readiness of a population of interest before implementing a social media program (2)	❍	❍	❍	❍	❍
Applying evidence-based strategies within a social media plan (3)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Analyzing data collected from a social media intervention (1)	❍	❍	❍	❍	❍
Communicating findings from social media interventions to key stakeholders (2)	❍	❍	❍	❍	❍
Explaining how the use of social media aligns with your organization's mission and goals (3)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Recruiting individuals to help assist with the implementation of a social media intervention (1)	❍	❍	❍	❍	❍
Identifying potential partnerships to help with social media interventions (2)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Providing expert assistance during the implementation of a social media program (1)	❍	❍	❍	❍	❍
Identifying social media resources that share accurate health information (2)	❍	❍	❍	❍	❍
Critiquing social media campaigns for accuracy (3)	❍	❍	❍	❍	❍

For EACH task, you will be asked to indicate your level of previous experience completing that task within a dietetics setting.

	None (1)	Very Limited (2)	Some Experience (3)	Quite A Lot (4)	Extensive (5)
Critiquing social media campaigns for accuracy (1)	❍	❍	❍	❍	❍
Utilizing social media technologies to communicate with the public (2)	❍	❍	❍	❍	❍
Using social media to empower individuals to make healthier decisions (3)	❍	❍	❍	❍	❍
Posting evidence-based nutrition messages on social media sites (4)	❍	❍	❍	❍	❍
Selecting appropriate images to be posted on nutrition-related social media platforms (5)	❍	❍	❍	❍	❍

In this section, you will be asked to read statements related to social media use in dietetics. You will then be asked to indicate your level of agreement with each statement. Please read EACH statement and indicate your level of agreement to EACH statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Somewhat Agree (3)	Strongly Agree (4)
I don't like using social media in dietetics because it is difficult to select appropriate social media platforms (1)	❍	❍	❍	❍
Identifying the appropriate social media sites for my population of interest would be difficult for me (2)	❍	❍	❍	❍
I think it would be difficult to determine the readiness of a population of interest for a social media intervention (3)	❍	❍	❍	❍

In this section, you will be asked to read statements related to social media use in dietetics. You will then be asked to indicate your level of agreement with each statement. Please read EACH statement and indicate your level of agreement to EACH statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree or Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
Social media could improve my ability to convey nutrition information to my populations of interest (1)	❍	❍	❍	❍	❍
Social media would make it easier for me to engage with my populations of interest (2)	❍	❍	❍	❍	❍
Social media is a valuable tool for nutrition education (3)	❍	❍	❍	❍	❍

In this section, you will be asked to read statements related to social media use in dietetics. You will then be asked to indicate your level of agreement with each statement. Please read EACH statement and indicate your level of agreement to EACH statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree or Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
I think my organization would pay for me to attend a social media training if I asked (1)	❍	❍	❍	❍	❍
I think my organization would provide a social media training if I requested one (2)	❍	❍	❍	❍	❍
At my place of work, I think I have access to the technologies needed to use social media (e.g., computer, Internet) (3)	❍	❍	❍	❍	❍

In this section, you will be asked to read statements related to social media use in dietetics. You will then be asked to indicate your level of agreement with each statement. Please read EACH statement and indicate your level of agreement to EACH statement.

	Strongly Disagree (1)	Somewhat Disagree (2)	Neither Agree or Disagree (3)	Somewhat Agree (4)	Strongly Agree (5)
I think my organization supports the use of social media (1)	❍	❍	❍	❍	❍
I think my supervisor does not support the use of social media (2)	❍	❍	❍	❍	❍
My coworkers do not like to use social media for nutrition education (3)	❍	❍	❍	❍	❍

Would you be willing to receive training to improve your use of social media in the dietetics setting?

❍ Yes (1)

❍ No (2)

❍ Maybe (3)