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Learn first, practice second approach to increase health professionals' nutrition-related knowledge, attitudes and self-efficacy.

Madison E. Santella, MS, RDN¹, Rebecca L. Hagedorn, PhD, RDN², Rachel A. Wattick, BS³, Makenzie L. Barr, PhD, RDN⁴, Tanya M. Horacek, PhD, RDN⁵, Melissa D. Olfert, DrPH, RDN⁶

¹Graduate Dietetic Intern, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G29 Agricultural Sciences Building, 333 Evansdale Drive Morgantown WV 26506

²Postdoctoral Fellow, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G27 Agriculture Sciences Building, 333 Evansdale Dr. Morgantown, WV 26506

³Graduate Student, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G29 Agricultural Sciences Building, 333 Evansdale Drive Morgantown WV 26506

⁴Postdoctoral Fellow, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G26 Agricultural Sciences Building, 333 Evansdale Drive Morgantown WV 26506

⁵Director of Undergraduate Programs in Nutrition, Department of Public Health, Food Studies and Nutrition, David B. Falk College of Sport and Human Dynamics, Syracuse University, 558 White Hall Syracuse NY 13244-3240

⁶Associate Professor, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G25 Agriculture Sciences Building, 333 Evansdale Dr. Morgantown, WV 26506

Abstract

Health professionals generally have positive attitudes towards the role of nutrition in medicine, but limited knowledge and low self-efficacy for incorporating it into routine care. To assess the effectiveness of a “learn first, practice second” intervention on the nutrition-related knowledge, attitudes, and self-efficacy of multidisciplinary health professionals, the present approach consisted of 16 weeks of online education and 2 weeks of cultural immersion in Tuscany, Italy. Data was captured via online surveys at Baseline, Post-education, Post-immersion, and Follow Up. Repeated measures ANOVA with irregular spacing was used, followed by Dunnett’s or Cochran-

***Correspondence and Reprint:** Melissa D. Olfert, DrPH, RDN, Division of Animal and Nutritional Sciences, Davis College of Agriculture, Natural Resources, and Design, West Virginia University, G25 Agriculture Sciences Building, 333 Evansdale Dr., Morgantown, WV 26506, (304) 293 - 1918, (304) 293 - 2232 (Fax), Melissa.olfert@mail.wvu.edu.

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Mantel-Haenszel testing. Results indicate significantly improved participant nutrition knowledge (nonzero correlation $p=0.0136$, means score $p=0.0075$) and self-efficacy (T0-T1 $p<0.0001$, T0-T2 $p<0.0001$, T0-T3 $p=0.0002$), with differences in attitude trending towards significance ($p=0.0764$). Findings from this study suggest that a combination of online education and hands on learning experiences can be beneficial for increasing health professionals' nutrition knowledge, confidence, and potentially attitude.

Keywords

Mediterranean Diet; Nutrition Education; Self-efficacy; Attitude; Experiential Learning

Introduction:

There are many factors involved in influencing healthy dietary patterns and increasing nutrition knowledge and self-efficacy of health professionals. One area of study that can positively influence the use of nutrition principles by health professionals is culinary medicine (Polak et al. 2016). Culinary medicine is the use of nutrition in the treatment and prevention of poor health conditions. It has previously been explained as the fusion of cooking as an art form, nutrition in relation to health, and the science of medicine (Polak et al. 2016). One lifestyle approach that can be used in the context of culinary medicine and has shown positive health benefits is the Mediterranean Diet (Trichopoulou et al. 2014). This dietary pattern is predominately plant-based, emphasizing an intake of whole grains, fruits and vegetables, unsaturated fats, moderate dairy, limited red meat, and wine in moderation (CIHEAM 2015). This pattern translates into a diet that is high in fiber, antioxidants, omega-3 and omega-6 fatty acids, and essential micronutrients. Additionally, the Mediterranean diet is low in cholesterol, saturated fats, trans fats, and added sugars. All of these properties, combined with various lifestyle components (e.g. physical activity, conviviality, de-stressing), allow a Mediterranean way of life to be useful in conditions such as obesity, diabetes, cardiovascular disease (CVD), certain cancers, and mental health disorders (Trichopoulou et al. 2014).

To influence healthy dietary patterns, a foundational knowledge of nutrition is an important component and is essential for the practice of culinary medicine. Specifically, nutrition knowledge has been shown to influence eating pattern and affect indicators of poor health, such as obesity and diabetes (Sharifirad et al. 2009; Bonaccio et al. 2013; Spronk et al. 2014). This suggests that people are more likely to partake in a certain behavior, when they have sufficient information to do so. Thus, it can be stated that education may be a powerful tool in the prevention of unhealthy dietary patterns, and ultimately the onset of chronic disease. Therefore, it is recommended that professionals across all health disciplines have a foundational understanding of food and nutrition concepts, recommendations, and resources.

Unfortunately, nutrition struggles to attain recognition as a health science, particularly within medical curricula (Adams Kelly M. et al. 2010). Therefore, practitioners who are not registered dietitians might feel they are not responsible for, or lack the confidence for, incorporating nutritional recommendations into patient interactions. The National Academy

of Sciences recommends at least 25 contact hours of nutrition education in a medical school curriculum (Nutrition Research Council 1985), yet findings from research conducted in 2010 revealed that only 25% of a representative sample of medical schools met this criteria (Adams Kelly M. et al. 2010). More alarmingly, this was a 5% decrease from the previous data collection 6 years prior. Even with guidelines, inclusion of nutrition in the curriculum remains inadequate. The effects that nutrition can have on health status are underestimated, and as a result, the skillset of health experts are lacking. Authors of a 2011 study surveyed a group of health professionals and prospective students and found that while only 6% of individuals received the desired score of 80% on the nutrition knowledge questionnaire, very few cited a lack of knowledge as a barrier when counseling patients (Parker et al. 2011). This highlights not only the lack of nutrition knowledge among health practitioners, but also an ignorance regarding knowledge deficit. In fact, another author suggests that there is little difference in knowledge level between the general public and health professionals (Barratt 2001). When looking at Mediterranean knowledge among health professionals, to our knowledge, no studies have been conducted.

Like knowledge, increasing an individual's self-efficacy regarding a topic or task has been shown to impact behavior. According to the Social Cognitive Theory (SCT) (Bandura 2011), an important determinant of behavior is self-efficacy, or one's judgements of their abilities to perform a given action (Guntzviller et al. 2017). That is, by making people feel more comfortable with nutrition-related information, they are more likely to practice healthy eating. Self-efficacy has been positively linked to actual behavior in terms of fruit and vegetable consumption, avoiding fatty foods, and participating in physical activity, and also plays an important role in the treatment of chronic disease (Adam and Folds 2014; Guntzviller et al. 2017).

Additionally, an individual's attitude towards a topic is likely to influence their adherence to a behavior or action (Prochaska 2013). Fortunately, practitioners generally have positive attitudes towards nutrition in medicine. A group of Canadian physicians recognized that nutrition counseling can have effects on behavior and reported making referrals to dietitians (Wynn et al. 2010). Additionally, current medical students have vocalized that they value nutrition education in their schooling for overall wellness and disease prevention yet lacked adequate knowledge to effectively counsel patients on recommendations (Hargrove et al. 2017). With that being said, limited studies focus on the source of these attitudes or the factors that may influence professionals' beliefs.

In order to investigate the best way to address and impact nutrition knowledge, self-efficacy, and attitudes, the intervention style for the present study is based on a "learn first, practice second" approach. This model refers to the principles of learning first, practicing second, and ultimately implementing or teaching (McGaghie et al. 2011). Very little research focuses on this learn first, practice second type of intervention in order to amplify understanding, comfort, and confidence with new material and methods. However, immersion learning has shown success for furthering comprehension (Zink et al. 2008; Tremethick and Smit 2009). The present study combined traditional education with experiential learning to optimize exposure and repeatedly stress concepts in different learning settings.

The present pilot feasibility study, known as Increasing Culinary Health Opportunities for Professionals (iCHOP) Mediterranean, aimed to examine the effectiveness of a “learn first, practice second” intervention on the knowledge, attitudes, and self-efficacy of multidisciplinary health professionals in West Virginia regarding nutrition in medicine, with a focus on the Mediterranean Diet. This study explores a virtual method of interacting with both rural and urban health professionals to supply new information that can be used towards combatting negative health trends.

Materials and methods:

Preparations for this study began in June of 2017. Between June and September, the itinerary was formed, the budget was established, and collaboration with (insert university name here)’s Office of Global Affairs was conducted to set up the program. The web-based course was created via the West Virginia University eCampus portal, with participants receiving visiting student access for the 16-weeks of virtual education. The cultural immersion portion of the intervention took shape as a 2-week study abroad experience in Tuscany, Italy. This study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Institutional Review Board at West Virginia University (1709753932).

Recruitment

In order to obtain participants, researchers connected with various West Virginia chapters of health professional associations. A recruitment email was sent to the designated contact found on association websites, with the recruitment flyer attached. Researchers also contacted hospitals around the state, and distributed flyers throughout the local area surrounding the university. The same recruitment email was sent to individuals within West Virginia University’s health sciences college. Three information sessions were held in October, to allow interested individuals an opportunity to ask questions. Since these sessions took place fairly early in the recruitment process, a video covering the discussed information was designed and posted online for those who could not attend. All applications were handled by the Office of Global Affairs and were completed online.

Subjects

The present research consisted of a convenience sample of 15 health professionals currently practicing in the state of West Virginia. To participate in the study, an individual needed to be a currently practicing health care professional in the state of West Virginia. They also were required to independently fund and participate in both portions of the intervention (online learning and travel to Italy). Anyone unable to meet these criteria, or who failed to complete the informed consent, were excluded from the study.

Those agreeing to participate enrolled at West Virginia University as a visiting student and signed up for the corresponding 400/500 level course, an upper-classmen course format that can accommodate both undergraduate and graduate requirements. Anyone interested in taking part in the research study provided written informed consent at the start of the online

course, marking the start of the intervention timeline. No incentives were provided for participation.

Measures

The 51-item survey for iCHOP Mediterranean was created uniquely for this study but had influence from evidence based sources. A version of this tool was originally pilot tested on a sample of West Virginia University medical students (n=56) (Hagedorn et al. 2017). Based on the feedback and results from that small sample, two researchers independently refined the survey and agreed upon a final version to best accompany the intervention period. A third researcher was utilized as a tiebreaker when necessary to dispute any disagreements. No changes were made to the survey tool across the study timeline. That is, details described below are true for data collection at all four time points.

Demographic data was self-reported to identify age, sex, height in inches, and weight in kilograms. Body Mass Index (BMI) was calculated using the standard formula of weight in kilograms divided by squared height in meters.

The Mediterranean Diet Score assessment was compiled from multiple validated tools (Serra-Majem et al. 2004; Sotos-Prieto et al. 2015) in order to adequately assess both dietary and lifestyle changes. Mediterranean Diet Score accounted for 21 of the total 51 survey questions. Participants provided a yes or no response to these items, signifying whether or not they regularly performed Mediterranean-like behaviors. For example, consuming fish 2-3 times per week, using olive oil as the main fat in cooking, and getting 6-7 hours of sleep per night.

The 8 nutrition knowledge questions focused on the basics of a Mediterranean dietary pattern, as described by cultural experts (Willett et al. 1995), on the basis of principles previously explained. For example, participants were asked “If adhering to a Mediterranean diet pattern, which item should be consumed least?” and “Which type of fat is prominent in the Mediterranean Diet, associating it with good heart health?”, among others. Responses were coded (correct=1, incorrect=0) and summed for an overall knowledge score. Possible score ranged from 0, no correct answers, to 8, all correct answers.

Questions regarding participant attitudes toward nutrition in medicine, as well as readiness to change, were adapted from the Nutrition in Patient Care Survey (NIPS) (McGaghie et al. 2001), in order to develop a set of 10 questions that appropriately reflected the Mediterranean foci of the online learning modules and hands on experiences. Each participant rated their feelings toward ten total statements relating to nutrition in medicine on a scale of 0-10, with lower values signifying disagreement and higher values signifying agreement. Examples of statements gauging participant attitudes toward nutrition in medicine include, “Nutritional assessment should be included in any routine appointment”, “I have an obligation to improve the health of my patients including discussing nutrition with them”, and “It is not worth my time to counsel patients with poor dietary patterns about nutrition”.

Questions relating to self-efficacy and practice behavior were constructed with reference to Mihalynuk et al (Mihalynuk et al. 2003). The final survey used in the present study included 14 concepts or actions (i.e. MyPlate guide, benefits of a Mediterranean Diet, providing nutrition education for a patient with diabetes, etc) for which participants rated their perceived level of proficiency on a scale of not applicable, not proficient, somewhat proficient, very proficient. For analysis, these responses were coded as 1, 2, 3, and 4 accordingly. Individual overall self-efficacy ranged from 0 to 56.

Procedure

Starting on January 8, 2018, after informed consent forms were signed and received, participants completed the baseline survey (T_0). Individuals then engaged in 16 weeks of web-based education. The content was divided into 4 self-paced modules which focused on the Mediterranean Diet and lifestyle, healthy properties of Mediterranean staples, possible implications from following the Mediterranean lifestyle, and a contrast between the Mediterranean region and American health-related habits. Module content consisted of instructor generated videos, PowerPoints, required readings, and additional resources for further optional exploration. The semester ended in May, at which time participants completed the post-education survey (T_1).

Two weeks after the end of the virtual education period, the group embarked on a 2-week cultural immersion experience through Tuscany, Italy for active hands on learning. In late May, individuals participated in tours of production facilities for common Mediterranean staples (i.e. wine, olive oil, cheese, ancient grains). The group heard from cultural experts, experienced traditional Italian meal time, and engaged in multiple culinary lessons at countryside homes and esteemed culinary schools. Upon return to the United States, two days after the trip's end, participants were sent the post-immersion survey (T_2). All responses were obtained within two weeks.

Participants then returned to normal every day practice for a 7-month period. In January 2019, 1 year after the start of the intervention, individuals completed the follow up survey (T_3).

Statistical Analysis

Data were analyzed using JMP and SAS software (JMP®, Version Pro 12.2, SAS Institute Inc., Cary, NC, USA, Copyright ©2015; SAS®, Version 9.3, SAS Institute Inc., Cary, NC, USA, Copyright ©2002-2010). Survey responses were reported as ratings on ordinal item scales. Results are reported as means alongside standard deviations. Response variables collected at each time point were analyzed via irregularly-spaced repeated measures analysis of variance (ANOVA). Data screening revealed a lack of normality and left-skewness, especially for the variables of knowledge and self-efficacy. The latter was corrected using a cube transformation, while $\frac{3}{4}$ of the knowledge time points remain left skewed. Mediterranean Diet Score, attitude, and cube transformed self-efficacy were compared to the baseline measure through Dunnett's multiple comparison testing. Knowledge data were analyzed via Cochran-Mantel-Haenszel testing, while controlling for subject, to assess

correlation for this ordinal scaled item. In all statistical analyses, significance criterion alpha for all tests was 0.05 and a statistical trend was declared when $p < 0.1$.

Results:

A total of 18 individuals enrolled in the study, of which 3 were excluded for not meeting inclusion criteria (i.e. practicing in a health professional field, willingness to participate in both the online education and travel abroad components, West Virginia resident, completion of informed consent). The final sample ($N=15$) was 73% female ranging from ages 22 to 65 (mean age: 43 ± 16.92). Table 1 shows the sample breakdown by discipline. At baseline, the group had an average Body Mass Index (BMI) of $29.15 \pm 7.96 \text{ kg/m}^2$, followed by $26.85 \pm 5.21 \text{ kg/m}^2$ at T_1 , $28.19 \pm 6.24 \text{ kg/m}^2$ at T_2 , and $28 \pm 5.88 \text{ kg/m}^2$ at T_3 .

Mediterranean Diet Score improved steadily from 12.6 ± 3.09 at T_0 to 14.27 ± 2.74 at T_1 and again to 15 ± 2.33 at T_2 . Mediterranean Diet Score then fell slightly during the 7 month return to practice, with participants reporting an average score of 14.5 ± 2.93 at T_3 . While differences in mean Mediterranean Diet Score between baseline and post-education, as well as baseline and follow up were not significantly different ($p=0.1191$, $p=0.1849$ accordingly), mean Mediterranean Diet Score from baseline to post-immersion significantly improved ($p=0.0259$).

On the 0 to 8-point scale, average group knowledge fluctuated from 6.20 ± 1.26 at T_0 , 7.27 ± 1.10 at T_1 , 7.13 ± 0.83 at T_2 , and 7.29 ± 1.07 at T_3 . More specifically, there was a 1.17-point rise in knowledge score from baseline to post-education, a slight decrease in knowledge score (0.14-point deficit) after the immersion experience, and a 0.16-point increase upon follow up. The integers (1-8) were used to score the knowledge level for Cochran-Mantel-Haenszel statistics to assess mean scores and for the correlation statistic. When controlling for subject, the nonzero correlation statistic ($p=0.0136$) shows a highly significant monotone association between progression of days and knowledge level scores. The results from the means score statistic also show statistical significance for difference in means across the intervention ($p=0.0075$). Analysis revealed that there was significant ($p=0.0325$) shift in row mean scores, signifying that knowledge score is directly associated with time.

Participant attitudes increased across the study timeline. On the scale of 0-100, average group attitudes were reported as 83.67 ± 11.97 at T_0 , 86.8 ± 7.97 at T_1 , 87.93 ± 10.26 at T_2 , and 91.57 ± 5.96 at T_3 . Attitude data were analyzed using repeated measures ANOVA with irregular spacing. Results from times T_0 , T_1 , and T_3 were normally distributed, while attitude scores at T_2 were left skewed. The repeated measures ANOVA was followed by Dunnett's multiple comparisons. Results (Table 2) revealed no significant differences in group attitude from baseline to post-education, post-immersion, or follow up (all p -value's > 0.05). However, there appears to be a statistical trend ($p=0.0764$) between baseline and follow up, during which time attitude increased 7.9-points on a scale of 0 to 100.

Individual overall self-efficacy ranged from 0 to 56. Participants reported increasing levels of confidence: 34.6 ± 13.80 at T_0 , 44.80 ± 11.33 at T_1 , 47.13 ± 9.55 at T_2 , and 48.5 ± 8.05 at T_3 . Average self-efficacy at baseline was found to be significantly different from levels at all

other time points. Self-efficacy data were analyzed using repeated measures ANOVA with irregular spacing. Data at baseline was normally distributed, while data for times T₁, T₂, and T₃ were left-skewed. A cube transformation was performed to correct these abnormal distributions. The repeated measures ANOVA was followed by Dunnett's multiple comparisons. Results (Table 3) show that average self-efficacy scores at post-education, post-immersion, and follow up were significantly different from average group self-efficacy at baseline with self-efficacy increasing a total of 13.9 points on a 56-point scale from first to last data collection.

Discussion:

Overall, the current study found that a “learn first, practice second” approach was effective in increasing the nutrition related knowledge and self-efficacy of currently practicing health professionals in West Virginia, with positively trending results for attitudes.

Average sample knowledge score increased from baseline to follow up, although fluctuation occurred throughout the intervention. It can be speculated that the lack of nutrition information provided concretely to participants after the completion of the online course contributed to these changes. Participants had the curriculum at their disposal across time, however, reviewing the information was voluntary. Additionally, during the travel period, any education that occurred was delivered verbally, so retention may have been low. Overall, nutrition knowledge from baseline to post-immersion experienced a statistically significant increase, implying that the iCHOP Mediterranean intervention was successful in providing nutrition education. Other research supports the present findings that providing education and/or hands on learning can improve nutrition knowledge. Researchers from the University of Minnesota – Twin Cities found that a short-term education program and the inclusion of experiential skill building positively affected their population's food knowledge level (Rustad and Smith 2013). Another study suggests that e-learning interventions can be helpful in improving nutrition knowledge among non-nutrition professionals (Sharma and Rani 2016). Therefore, it may be advantageous for interventions aimed at improving nutrition knowledge to incorporate classroom and experiential learning opportunities.

Self-efficacy increased throughout the intervention, with some attribution to the concurrent increase in nutrition knowledge. As previously mentioned, exposing individuals to some form of education can result in a higher level of comfort with topics to facilitate behavior change (McGaghie et al. 2011). The less dramatic rises in self-efficacy at the latter two time points may be due to the fact that confidence increased so greatly upon the education period, that the hands-on practice reinforced rather than improved and this new level of confidence was strengthened when implementing new concepts and behaviors in participants' everyday lives. Overall, this style intervention appears beneficial in increasing self-efficacy of West Virginia health professionals. That is, after undergoing nutrition education in addition to partaking in first hand experiences, confidence to incorporate Mediterranean principles into regular practice is higher. Results of the present study are consistent with other research that has shown how an online nutrition education intervention can be successful for improving self-efficacy for diet-related behavior change (Poddar et al. 2010). Additionally, Franko et al found that self-efficacy is an important variable in health behavior change, and that a

nutrition education website appeared beneficial for increasing the self-efficacy of participants (Franko et al. 2008). Thus, using nutrition education to improve health practitioners' self-efficacy to engage patients in nutrition dialog may be beneficial.

Participants attitudes toward nutrition in medicine were increasingly positive as the study progressed although not significant. Perhaps this is due to the fact that the study subjects entered the intervention with already positive attitudes, which were not highly altered by the content but rather reinforced or solidified. This is consistent with other research that has shown how multidisciplinary health professionals recognize the importance of nutrition in health, with physicians vocalizing that nutrition counseling can have effects on behavior and referring patients to dietitians (Mihalynuk et al. 2003). Additionally, current medical students have stated that they value nutrition education in their schooling for overall wellness and disease prevention yet lacked adequate knowledge to effectively counsel patients on recommendations (Adams Kelly M et al. 2010). Even more obscure health positions that may not seem directly related to nutrition in health, such as paramedics, seem positive about the role of proper nutrition. MacDonald et al found that a sample of paramedics had positive attitudes both before and after the intervention, implicating that there is some level of appreciation and acknowledgement regarding the importance of dietary habits for wellness (MacDonald et al. 2013).

Although showing promise for the use of a learn first, practice second intervention, this study is not without limitations. First, the sample size of 15 participants may be thought to hinder precision or devalue the results. This number was chosen due to space restrictions for activities and accommodations abroad. While there are some drawbacks to a study with such a small sample, it allowed iCHOP Mediterranean to be completed in a timely manner and also acted as a feasibility study to test the potential outcomes of a certain intervention style. Based on the results, a similar study can be conducted on a larger sample or varying populations in order to capture more extensive data. Second, the present study has only been conducted in a small West Virginia population, and cannot be generalized to health practitioners in other states. Further research should test this intervention style in different locations. Third, the survey used to collect data at each time is not yet validated. The survey was constructed from a mix of other validated and not validated tools but was built based on previous literature with the aims of the present study in mind. Researchers may work toward validation. Fourth, all data was self-reported. While researchers feel that the relationship with participants fostered honesty, it must be considered that there is room for false or misreported information.

Conclusions:

Results from iCHOP Mediterranean show that a learn first, practice second style intervention can positively impact nutrition-related knowledge and self-efficacy, and could potentially improve attitudes toward nutrition in medicine. Findings from the present study are consistent with the literature, as evidenced by the contents of the introduction. On the basis of principles explained by the Social Cognitive Theory, it is thought that by implementing an intervention, like that of iCHOP Mediterranean, in order to improve knowledge, attitude, and self-efficacy, researchers have the potential to facilitate behavior change (Bandura 2011).

Further, by educating health professionals on incorporating healthy principles into their regular practice behavior and allowing them physical exposure to exemplar cultures, the health of the general population may be improved.

Future research should investigate further interventions such as a larger scale, including a wider array of health disciplines, or more specific cohorts within specific fields. Since the results regarding attitude toward nutrition in medicine were only trending toward statistical significance in the present study, further examination into what may influence an individual's attitude is needed. Additionally, it may prove beneficial to explore more exact components of nutrition education and experiential learning that influence knowledge, attitudes, and self-efficacy.

Overall, study findings suggest that iCHOP Mediterranean, a learn first, practice second style approach, may be beneficial in improving health practitioners' knowledge and self-efficacy regarding Mediterranean lifestyle principles. This feasibility study warrants further exploration in order to diversify multidisciplinary care and positively impact patient or client health.

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Table 1.

Breakdown of Sample Disciplines

Discipline	Frequency (N)	Percent (%)
Nutrition	5	33%
Dental (total)	3	20%
Dentist	2	13%
Dental Hygienist	1	7%
Respiratory Therapy	1	7%
Psychology	1	7%
Nursing	1	7%
Health Department IT	1	7%
Life Coach	1	7%
Physician (total)	2	13%
Family	1	7%
OBGYN	1	7%

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Table 2.

Results of Dunnett's Multiple Comparisons Testing on Group Attitude

Comparison	Estimate	Standard Error	Degrees of Freedom	Adjusted P
T ₀ – T ₁	3.1333	2.9340	41	0.5471
T ₀ – T ₂	4.2667	3.1186	41	0.3631
T ₀ – T ₃	7.8418	3.5425	41	0.0764**

Concise differences of least square means data results. Dunnett's Multiple Comparisons Test was run to compare the means from each experimental time point (T1, T2) to the control time point (T0) to determine any significant changes in participant attitudes across the intervention period.

**
p<0.1, trending

*
p<0.05, statistical significance

Table 3.

Results of Dunnett's Multiple Comparisons Testing on Group Self-Efficacy

Comparison	Estimate (cubed value)	Standard Error (cubed value)	Degrees of Freedom	Adjusted P
T ₀ – T ₁	45353	8440.24	41	<0.0001 *
T ₀ – T ₂	56646	9458.34	41	<0.0001 *
T ₀ – T ₃	60974	13740	41	0.0002 *

Concise differences of least square means data results. Dunnett's Multiple Comparisons Test was run to compare the means from each experimental time point (T1, T2) to the control time point (T0) to determine any significant changes in participant self-efficacy across the intervention period.

**
p<0.1, trending

*
p<0.05, statistical significance