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# Entry-Level Physical Therapy Students' Knowledge and Attitudes of Nutrition

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# ENTRY-LEVEL PHYSICAL THERAPY STUDENTS' KNOWLEDGE AND ATTITUDES OF NUTRITION

By

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ABSTRACT

Like other allied health fields, physical therapy has incorporated health promotion as a part of their practice. A large and important component of health promotion is nutrition. Little research has been conducted on the knowledge and attitudes of nutrition in physical therapists and has only included small sample sizes. Therefore, the purpose of the present study was to expand upon the knowledge and attitudes of nutrition in physical therapy students. Subjects included doctoral physical therapy students from across the United States, ranging from first year to senior level. The present research was conducted online via a Qualtrics survey. Surveys, included a nutrition knowledge test (NKT) (32 possible points) and an attitudes scale (55 possible points) and were disseminated by doctoral physical therapy program directors to students in various programs. The mean attitude score of this sample (N=605) was 47.13 ± 4.32. The mean NKT score was 22.43 ± 3.43. There was no correlation between nutrition attitudes and nutrition knowledge (.026, p=.526. There were differences in NKT scores between those who had taken previous nutrition courses and those who had not. From these results, we can conclude that increasing the number of nutrition courses taken by physical therapy students may lead to greater knowledge of nutrition.

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## Introduction

The practice of physical therapy has been modified throughout the years of its occupational existence from only a physical rehabilitative aspect to a more holistic health promotional approach. A component of this health promotion approach, and duty of physical therapists (PTs) to reduce chronic disease risk, is to incorporate nutrition within their scope of practice.[1] PTs and other rehabilitative specialists are sometimes the only health professional clients see. This creates a window of opportunity for PTs to be involved in providing nutritional information in the form of screenings, advice, and treatment to those patients.[2] The public relies on not only medical doctors, but allied health professionals, as well, to aid in the development of healthier behaviors by providing nutritional advice within their scope.[2,3,4] PTs can be key components to providing a service for patients that would aid in reaching the overarching goal of Healthy People 2020, that aims for promoting quality of life, healthy development, and healthy behaviors across all life stages.[5,6]

The need to enhance nutrition education in this arena may be further elucidated by the National Health and Nutrition Examination Survey.[7] Americans are not obtaining adequate levels of vitamin D or calcium, as well as several other necessary vitamins and minerals. Both nutrients are crucial for bone health and deficiencies of the aforementioned nutrients may lead to osteoporosis. Primary, secondary and tertiary

prevention of such nutrition-related diseases are of great concern for all groups in the United States.[6,8,9,10] Additionally, patients with chronic and acute conditions are dependent on nutrition for immunity, healing, and repair, as well as energy for resting metabolism and functional performance, which is required for treatment in physical therapy.[11] Using nutrition as a way to enhance the recovery process for persons with chronic or acute disabilities is much the same as an athlete requiring proper nutrition for optimal performance for sport.[11]

The purpose of the present research was to evaluate the knowledge and attitudes of nutrition of entry-level physical therapy students and to elucidate a correlation between the two variables.

**Research Questions**

RQ 1: What are the attitudes of entry-level physical therapy students in the United States regarding nutrition?

RQ 2: What is the nutritional knowledge of entry-level physical therapy students in the United States?

RQ 3: Is there a difference in NKT scores and attitudes scores between participants who have taken a nutrition course and those who did not, those who have taken 0 nutrition courses, 1-2 nutrition courses, or 3 or more nutrition courses, between genders, regions, graduation year, and healthy and non-healthy eaters.

## Review of Literature

### Disabled Individuals

The goals of Healthy People 2020 for disability and health are to "maximize health, prevent chronic disease, improve social and environmental living conditions, and promote full community participation, choice, health equity, and quality of life among individuals with disabilities of all ages."[4] Health consists of a dynamic continuum ranging from high to low throughout the lifespan and should be regarded in the same manner towards persons with disabilities as it is with those without.[12] The high risk of developing secondary conditions decrease the ability of individuals with disabilities to reach health on the high end of this spectrum.[13] Obesity, a frequent lifestyle-related condition, can complicate how the overall diagnosis and treatment for patients by PTs are developed.[11]With chronic lifestyle-related diseases affecting about half of all adults in the United States, it is common that patients receiving physical therapy for one ailment would need additional aid in lifestyle modifications, such as nutrition, to pursue a life free of additional health conditions.[14]

Due to people with disabilities having a high risk for developing secondary health conditions, such as osteoporosis, arthritis, and decreased balance, strength and endurance or any other lifestyle-related disease, it is important that they are provided with secondary condition prevention.[12,15,16] For example, it is widely known that osteoporosis has a strong link with calcium and vitamin D deficiency. As a health promoter and to prevent

secondary conditions, the PT should be able to assess the deficiency within the client's dietary recall and respond with appropriate nutritional advice to correct problems such as these.

**Patient Beliefs**

To date, only one study has reviewed patient beliefs regarding physical therapy consultation of healthy behavior modification. Seventy-three percent of physical therapy patients agreed that their PT should advise them on maintaining a healthy weight, 75.6% felt they should discuss the benefits of maintaining healthy weight and 67.4% felt their PT should suggest ways to maintain healthy weight.[17] Contrary to the patients desiring PTs to discuss healthier weight issues, patients did not feel PTs should discuss fruit and vegetable consumption. With just 32.1% of patients agreeing PTs should advise them on recommended intake of fruits and vegetables, 47.4% agreeing that PTs should discuss benefits of fruit and vegetable consumption, and 41.3% agreeing their PTs should suggest ways to increase fruit and vegetable intake, thereby suggesting that patients do not want to discuss nutritional components with their PT.[17] Only 27% of patients felt that health education did not apply to their therapy treatment from their PT.[18] Though fruits and vegetables are a significant component in nutrition, this does not account for all nutritional elements. Therefore, patients that express aversion to fruit and vegetable education could possibly still benefit from PTs discussing other nutritional elements. Additionally, if between 32-47% of patients were interested in PTs providing nutritional information and if 73% of patients were interested in receiving health education from

their PT, a portion of physical therapy patients that desire this service could be positively impacted by increasing nutritional knowledge in PTs.[17,18]

**PT's Knowledge of Nutrition**

Physical therapy has been a profession since the 1920s and the nutritional knowledge of PTs was first researched in 1989.[1,3] A Nutrition Knowledge Test (NKT) found that 97% of PTs surveyed recognized women are more prone to developing osteoporosis over the lifetime and should have a higher intake of dairy products, however, only 79.5% recognized yogurt as a source of calcium.[3] From this information, we see that many PTs can relate diseases with nutritional problems, but for some, relating the specific food sources of these nutrients is less prominent.[3]

Typically, NKTs are scored and then given a percentage out of 100%. Several studies collectively found that physical therapy students had average scores, 72%, 60%, and 71%.[2,3,19] Practicing PTs from another study felt that they needed more nutrition education in order to provide the best nutritional information to their future patients.[6] In a 2004 telephone survey, PTs revealed a desire to give patients nutritional advice, but felt their lack in confidence and knowledge held them back from doing so.[6] As these data suggest, there is a discrepancy between NKT scores and the need for PTs to incorporate nutrition into their field of work. It is paradoxical that there is a lack of training on nutrition of these individuals within entry-level physical therapy education programs.[19]

**PT's Attitudes Toward Nutrition**

In a survey for practicing PTs, 49% of respondents felt that nutritional knowledge for sports physical therapy was very important, 42% felt it was important and 9% thought

it was somewhat important and none felt nutrition was not important.[3] Another study assessing attitudes toward nutrition of entry-level physical therapy students found 92% agreeing or somewhat agreeing that they planned to encourage their clients to maintain healthy weight to reduce their risk of certain chronic diseases and 86% agreeing or somewhat agreeing that they planned to encourage their clients to include fruits and vegetables in their daily diet to promote good health.[2]

**PT Patient Education**

With patient nutrition educational needs increasing within physical therapy, it is important to look at how patient education is being performed by PTs presently. Rae et al.[6] found that just 19% of total visit time was spent regarding nutrition. Generally, PTs provide information on 5 subjects during therapy sessions: teaching and providing information about illness, instructions for home exercises, giving advice and information, general health education, and counseling about stress related problems.[20] Sluijs[21] recorded the number of statements per visit given for each of the subjects (listed above) and found PTs provided information on the highest recorded statements given applied to home exercises and the least recorded statements provided regarded health education, 7.7 statements per session and 1.1 statements per session, respectively. Gahimer and Domholdt[18] found similar results with just .38 statements per session regarding health education. A similar study found just 2.44 statements were recorded per session regarding health promotion.[22] However, as a result of PTs disseminating information during therapy sessions, patients reported feeling that either an attitudinal change or a behavior change occurred.[18] Sluijs[20] also reported that PTs tend to only disseminate education to patients

during the initial visit, instead of throughout the entire therapy program. If nutritional education was implemented even only at the initial visit of a physical therapy program, there is hope that this could lead to a life-long health behavior change for patients, however reinforcement throughout treatment may also enhance patient outcomes.

**Laws/statements by Governing Bodies**

Each state has their own set of laws concerning nutritional licensing and insurance reimbursement. For example, Texas' current state law states: "there is no licensure requirement for providing nutrition".[23] The American Physical Therapy Association (APTA)[5] states that they "fully support the positive roles that PTs and physical therapist assistants (PTA) play in the promotion of healthy lifestyles, wellness and injury prevention". APTA[24] also states, "It is the role of the PT to screen for and provide information on diet and nutritional issues to patients, clients and the community within scope of physical therapy practice".

**Call for Research**

Results from research of university curriculum within the state of Texas revealed, that there are currently no schools with specific courses for nutrition within entry-level doctoral physical therapy education programs or at the prerequisite level, however, there are possible nutrition competencies taught within other courses that are offered. Subsequently, entry-level physical therapy students may not be taking nutritional courses prior to entering or during the doctoral physical therapy education program. For the increased health and well-being of PTs' patients, especially for those with disabilities, nutrition is a necessary component that could dramatically increase the quality of life of

those individuals.[13] With the strong need for PTs to be competent in providing nutritional advice within scope and a governing organization promoting this idea, there is a need to assess nutrition knowledge and attitudes toward nutrition in PTs. These components have been researched in the past, however, only on relatively small sample sizes (single university), or to already practicing PTs.[2,3,6,19] Therefore, the purpose of the present study was to broaden this field of research by assessing entry-level physical therapy students' knowledge and attitudes toward nutrition across the nation.

## Subjects

The participants of the present research involved a convenience sample of entry-level physical therapy students among universities in the United States currently enrolled in an entry-level physical therapy education program. This study included students from first year to senior level doctorate of physical therapy students. Universities were grouped into Western (Washington, Oregon, Idaho, Montana, Wyoming, Nevada, California, Utah, Colorado, Arizona, New Mexico, Alaska, or Hawaii), Mid-Western (North Dakota, South Dakota, Minnesota, Iowa, Nebraska, Kansas, Missouri, Wisconsin, Illinois, Indiana, Michigan or Ohio), Southern (Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, West Virginia, Virginia, Delaware, Maryland, North Carolina, South Carolina, Georgia, and Florida, and Eastern (Pennsylvania, New York, New Jersey, Connecticut, Rhode Island, Massachusetts, Maine, Vermont, and New Hampshire) regions depending upon where their institution resided geographically.

## Methods

### Study Procedure

The survey was disseminated via emailing directors of entry-level physical therapy education programs across the nation. The email consisted of an introduction to the present research and a request that they forward a separate email to their entry-level physical therapy students which included a link to the survey. Prior to beginning the online survey, participants were informed that the survey was voluntary, responses were kept confidential and used only for academic use, there was no compensation for participation and then each participant was required to execute an electronic informed consent prior to participating in the research.

### Demographics

Data were collected online via an online Qualtrics survey. The initial section of the survey gathered demographic information of participants. This included age, sex, race or ethnicity, level of education, prior nutrition course attendance, intended graduation date, geographical location of the school currently attended, and what undergraduate degree was received. The next 3 questions regarded current satisfaction of their own nutrition knowledge.

### Nutrition Knowledge Test

The following portion of the survey was the NKT. The NKT included an adaptation of the 32-item NKT created by Thomas, McArthur and Corbett in 2006, with

each question followed by four answer choices[2]. Alterations were performed on this NKT by a scholastic cohort of registered dieticians to better represent current dietary guidelines, thereby increasing content validity. Items of this test were arranged into 8 categories of 4 questions.

**Attitudes Scale**

The next section of the survey contained 11 items evaluating attitudes toward nutrition in entry-level physical therapy students.[2] Each item was in the form of a statement and the options for answers are scaled from 5-agree, 4-somewhat agree, 3-undecided, 2-somewhat disagree, to 1-disagree.

**Statistical Analysis**

All statistical analyses were performed with IBM SPSS Statistics Software. Frequency distributions and percentages were calculated for composite data. For the attitudes regarding nutrition component, the total score was summed and a percentage out of 55 was recorded as the score. For the NKT, correct answers were scored as 1 and incorrect answers were scored as 0. Each NKT was totaled individually and a percentage out of 100 was recorded for future comparisons. Means and standard deviations were calculated for the NKT scored and for each category of questions. Bivariate correlation was utilized to determine the relationship between physical therapy students' attitudes regarding nutrition and their nutrition knowledge. One-way Analysis of Variance (ANOVA) was utilized to determine the difference of means in NKT scores between

participants who had taken a previous nutrition class and those who had not, the difference of mean NKT scores between groups of participants with 0 nutrition courses, 1-2 nutrition courses and 3 or more nutrition courses, the difference of mean NKT scores between genders, the difference of mean NKT scores between regions, the difference of mean NKT scores between intended graduation year, the difference of mean NKT scores between levels of education and the difference of mean NKT scores in healthy eaters and non-healthy eaters.

## Results

The objective of the present research was to ascertain knowledge and attitudes regarding nutrition and to discern if there was a difference between the NKT scores and attitudes scores regarding participants who had a previous nutrition course, 0, 1-2 or 3 or more nutrition courses, genders, regions, graduation year and healthy and non-healthy eaters. There were 702 physical therapy students who participated in this voluntary online survey. Due to incomplete data, 97 participants were excluded. The demographic data of the sample (N=605) are reported in Table 1.

Remembering that the total possible points for the NKT (Table 2) was 32 and that scoring a 55/55 on the attitudes scale (Table 3) would provide total agreeableness regarding nutrition both for themselves and for patient advice, the mean and standard deviations of NKT scores and attitudes per each demographic variable are reported in Table 4.

Statistically significant findings of difference in mean NKT scores for demographic data were only found between healthy eaters and non-healthy eaters, 22.76 $\pm$ 3.28 and 21.09 $\pm$ 3.70, respectively ($p<.000$). Statistically significant findings of difference in mean attitudes scores were found between healthy eaters and non-healthy eaters, 47.33 $\pm$ 4.18 and 46.29 $\pm$ 4.77, respectively, ($p=.017$) and females and males, 47.40 $\pm$ 4.35 and 46.33 $\pm$ 4.15, respectively ($p<.01$). There was no significant correlation

found between nutrition knowledge and nutritional attitudes across all regions (.026, p=.526).

Table 5 shows the comparison of NKT scores and history with previous nutrition courses. There was a statistically significant difference in means between those who had taken a nutrition course and those who had not with their mean NKT scores being 22.8 and 21.66, respectively ($p<.001$). There was a statistically significant difference between the groups who had taken 0 nutrition courses and 1-2 nutrition courses, with 21.66 and 22.64 being their respective NKT scores ($p=.003$). There was a statistically significant difference of NKT mean scores between the groups who had taken 0 nutrition courses and 3 or more nutrition courses with 21.66 and 24.02 being their respective NKT scores ($p<.001$). There was also a statistically significant difference between the groups who had taken 1-2 nutrition course and 3 or more nutrition courses ($p=.019$).

## Discussion and Conclusion

### Comparison of the Average Accepted Physical Therapy Student in US

The gender distribution of this research is comparable to the percentage of females and males accepted into physical therapy programs per cycle. In 2016-2017, 39.2% of total applicants were male and 60.7% were female[25], as compared to 74.4% female and 25.6% male in the present study. Additionally, in 2016-2017, 0.21% of PT applicants were American Indian/Alaskan Native, 8.21% were Hispanic/Latino, 8.67% were Asian, 3.32% were African-American/Black, 70.27% were white/Caucasian, .60% were other, and 4.78% declined to state their race[25] compared to 1.0% American Indian or Alaskan Native, 2.3% Asian, 3.5 Black or African American, 4.0% Hispanic/Latino, .2% Non-Hispanic, 86.9% White/Caucasian, 1.5% other, and .7% declined to state their race. With the similarities seen in comparison to gender ratio, as well as racial and ethnicity statistics in all United States physical therapy programs, the current sample seems to represent the overall population of physical therapy students within the United States.

### Physical Therapy Student Nutrition Knowledge

NKT scores were found similar to findings of previous research with 70% being the average compared to 72%, 60%, and 69%.[2,3,19] When comparing sectional NKT scores to findings of Thomas et al[2] in Table 6, there were no significant differences (p=.07). The highest scoring sections for this study were obesity and carbohydrates and

the highest for Thomas, et al[2] were minerals and carbohydrates. It is notable that though the sample size of their study was small, our findings on a larger scale support the results of Thomas et al.[2]

Not only was there a statistically significant difference between NKT scores by simply having or not having taken a nutrition class before, there was also a statistically significant difference in NKT scores among those who have taken 0 nutrition courses, those who have taken 1-2 and those who have taken 3 or more. Long[3] also found significant NKT score differences in PTs who engaged in continuing education (73.61%) and those who did not (70%) ($p=.016$). Thomas et al[2] also found significant correlation between NKT scores and previous exposure to nutrition education ($p<.05$).

In an interventional study, nutrition education was administered to a NCAA volleyball team by a registered dietician. After individualized nutrition advice was given to each player once per week for four weeks, a significant improvement within sports nutrition knowledge (Reilly and Maughan sports nutrition questionnaire) was found.[26] This study also found behavioral improvements of the athletes following intervention: increase to the recommended energy intake per player ($p=.002$) and an increase to the recommended carbohydrate intake per player ($p=0.01$).[26] Therefore, these data seem to support that if even 1 nutrition course is taken, this could potentially equate to better scores regarding nutrition knowledge, which could lead to greater ability of practicing PTs to provide nutrition information to patients not only for a higher quality rehabilitative plan, but as advice for health promotion, as well. From the aforementioned study

regarding a continuance of behavior after intervention cessation, this could also benefit the health of PTs', as well.[26]

Long[3] found that only 30% of practicing PTs had received nutrition education in their physical therapy program. Our findings resemble these data with 74.4% of students reporting that their school did not offer a nutrition course.

When asked how participants of the present study would like to receive future nutrition education, 17.9% of physical therapy students would chose an elective course, 5.6% wanted to mandate a course in nutrition as a physical therapy school prerequisite, 8.8% desired a module on nutrition, 30.9% wanted to receive nutrition information integrated within other courses, 11.1% desired a required course in nutrition, 4.8% wanted all the above and 15.7% declined to answer. Bahl[19] found 13% of physical therapy students desired a required nutrition course, 30% desired an elective nutrition course, 40% desired nutrition information integrated in with other courses, 6% desired a module on nutrition, 5% checked more than one of these options. From this, we may conclude that integrating nutrition information with courses required for physical therapy education programs may be the most beneficial and desired way for PTs to learn about nutrition.

**Physical Therapy Student Nutrition Attitudes**

The attitudes expressed by physical therapy students in the present study regarding nutrition were positive. Comparing the present study to previous findings by Thomas et al[2], consistent results were found between physical therapy students agreeing or somewhat agreeing (A/SA) to include fruits and vegetables in their daily diet, to plan

to maintain a healthy weight, to encourage clients to maintain a healthy weight, and that PTs would want to feel confident when giving nutrition advice to patients. Comparing to Thomas et al[2] still, the findings for this study found a decrease in participants that A/SA to decrease their fat intake to decrease cardiovascular disease (CVD) risk, increase in including 30 minutes of exercise per day, decrease in decreasing fat intake to decrease CVD risk for clients, and an increase in desiring to have a good understanding of nutrition. These results could be attributed to physical therapy students not understanding the link between excess fat consumption and CVD, the larger push for exercise in society, and the recommendations of APTA[24] for PTs to be able to screen for a provide information on diet and nutrition, respectively. For both studies, there was low agreeableness for use of MyPlate, having an introductory nutrition course required and registered dietician consultation. These findings could be attributed to not feeling confident in using MyPlate as a tool, desiring a form of nutrition education other than required course, and not necessarily knowing where their scope of practice is with nutrition, respectively.

**Physical Therapy Student Knowledge and Attitudes of Nutrition**

Even with the larger sample size of this study, we discovered consistent results with previous research regarding correlations between nutrition knowledge and nutrition education. Neither this study, Long[3] or Thomas et al[2] found a correlation between nutrition knowledge and nutrition attitudes. There was, however, strong evidence of positive attitudes regarding nutrition in physical therapy students (agreeing an average of 47 out of 55). With attitudes regarding nutrition being high, it appears that physical

therapy students desire to implement nutritional competencies for not only themselves, but also to utilize this asset while prescribing the best treatment plan for their patients including a nutritional component to enhance rehabilitative time, as well as prevent secondary conditions for those with disabilities. The lack of nutrition education in physical therapy education programs could be the cause of the inability for these variables to correlate. Therefore, there is a possibility of correlation with increased nutrition education.

**Physical Therapy Student Nutrition Knowledge Satisfaction**

Twelve percent of total participants were from the Eastern region, 43.8% were from the Midwestern region, 37.7% were from the Southern region and 6.4% were from the Western region. Physical therapy student nutrition knowledge understanding satisfaction is reported in Table 7. It is interesting to note, that the Midwestern region had the highest frequency of "Yes" when asked if their physical therapy program offered a nutrition course, had the highest scores on the NKT, had the highest attitudes towards nutrition, as well as the highest reported frequency of "Satisfied" when asked their level of satisfaction with nutritional understanding and scored the highest on the NKT. Bahl et al[19] found significant differences in NKT scores in students who were satisfied with nutrition knowledge and those who were not ($p=.05$). This data could signify that providing a nutrition course within physical therapy programs could lead to increased satisfaction with their own understanding of nutrition, as well as, increased nutrition knowledge.

## Conclusion

The purpose of the present study was to gain a greater insight on the nutritional knowledge and attitudes regarding nutrition of doctoral physical therapy students and to try to elucidate correlation between the two. Though attitudes regarding nutrition were high and nutrition knowledge averaged 70.1% on the administered NKT, there was no correlation between the two, possibly due to a lack of current nutrition education in physical therapy education programs. There were significant differences in mean NKT scores between groups of different numbers of nutrition education courses, between those who simply had and had not taken previous nutrition course and individuals who were healthy and non-healthy eaters. There were also significant differences of attitudes scores in healthy and non-healthy eaters and males and females. With the inherent difficulties of adding additional curriculum or eliminating other needed courses, these data seem to indicate that the largest improvement in nutrition knowledge could be acquired by introducing 3 or more nutrition courses with the difference between 0 and 3+ courses being 2.36 points (7%) on the NKT.

However, while these data will serve to improve our understanding of the relationships between attitudes and knowledge, the high level of statistical significance in these findings should not be overstated. While 3 additional courses led to the largest increase in NKT scores, these data seem to represent that less than one additional correct answer on the NKT is seen with each additional nutrition course taken. Small effect sizes in the current study should be considered in regards to the restructuring and addition of curriculum within physical therapy education programs. Our additional findings suggest

that integrating nutrition education the desired way of physical therapy students (within current physical therapy education program courses) might increase NKT scores beyond our results.

**Limitations**

Data was self-reported and given via an online survey with no supervision. Thus, there is the possibility that academic dishonesty occurred during the NKT portion of the survey. Directors who had a greater concern for nutrition and felt that it is an important and researchable component for physical therapy students, could have been the only ones to disseminate the survey. There were only 32 questions presented to assess nutrition knowledge, which cannot effectively cover every aspect of nutrition.

**Future Research**

It would be beneficial to experiment with integrating nutrition education components within physical therapy education programs try to elucidate an increase of NKT scores and increase nutrition knowledge, thereby possibly enhancing PTs rehabilitative time, as well as satisfaction of patients. It would also be of value to further expand upon how patients desire to obtain nutrition information from their PT (i.e. brochure, group talks, one-on-one advice, etc).

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**Table 1.** Demographic Data of Doctoral Physical Therapy Students in the United States

| Characteristics | Female (n = 450) | Male (n = 155) |
|---|---|---|
| Age, Frequency (%) | | |
| 18-24 | 288 (64) | 66 (42.6) |
| 25-39 | 161 (35.8) | 87 (56.1) |
| 40-59 | 1 (2) | 2 (1.3) |
| Height, mean ± SD | 65.3 ± 2.82 | 71 ± 2.97 |
| Weight, mean ± SD | 143 ± 24 | 184.4 ± 30.1 |
| BMI, mean ± SD | 23.6 ± 3.62 | 25.7 ± 3.63 |
| Race, Frequency (%) | | |
| American Indian or Alaskan Native | 5 (1.1) | 1 (.6) |
| Asian | 11 (2.4) | 3 (1.9) |
| Black or African American | 13 (2.9) | 8 (5.2) |
| Hispanic/Latino | 16 (3.6) | 8 (5.2) |
| Non-Hispanic | 1 (.2) | 0 |
| White/Caucasian | 394 (87.6) | 132 (85.2) |
| Other | 8 (1.8) | 1 (.6) |
| Rather Not Say | 2 (.4) | 2 (1.3) |
| Highest Level of Education, Frequency (%) | | |
| Advanced Graduate Work or Ph.D. | 82 (18.2) | 32 (20.6) |
| Baccalaureate Degree | 354 (78.7) | 119 (76.8) |
| Master's Degree | 9 (2.0) | 4 (2.6) |
| Not Sure | 5 (1.1) | 0 (2.6) |

[a] Means and standard deviations (SD) are reported for biometric data. Frequency and percentages (%) are reported for all other demographic data.

**Table 2.** NKT Categories and Questions.

| Category | Questions |
|---|---|
| Dietary Recommendations | Based on the Acceptable Macronutrient Distribution Ranges (AMDR), what is the MAXIMUM percentage of daily calories that should come from fat?<br>Which of the following would be the best choice for someone trying to reduce added sugar intake?<br>What is the recommended MINIMUM combined number of daily servings of fruits and vegetables?<br>What is the MAXIMUM amount of alcohol an adult should consume per day based on current dietary guidelines? |
| Exercise and Caloric Expenditure | What are the three components of total energy expenditure?<br>Which type of exercise is most effective for increasing muscular strength and building lean body mass?<br>Based on ACSM recommendations, how often should one undertake moderate physical activity to stay in good health?<br>What type of weight loss will an individual experience by restricting calories but not increasing his or her level of physical activity? |
| Vitamins | Which food contains the GREATEST amount of folate per serving?<br>Which vitamin would need to be taken as a supplement by vegans? (Vegans do not consume animal products, including eggs or dairy)<br>What is the function of vitamin C?<br>What is insufficient vitamin D during adulthood is associated with? |
| Minerals | Which food group provides iron that is MOST available to the body?<br>Which is a function of calcium?<br>What is the iron-carrying protein that assists in the transport of oxygen into muscle cells?<br>Diets rich in which of the following nutrients are associated with maintaining healthy blood pressure levels? |
| Carbohydrates | Which food contains the GREATEST amount of carbohydrate per serving?<br>Which is a function of carbohydrate?<br>How many calories are in one gram of carbohydrate?<br>What is the recommended amount of fiber an adult should consume every day for good health? |
| Fat & Cholesterol | Which of the following ingredients on the label of a box of cookies would alert you to the presence of trans fatty acids?<br>How many calories ae there in one gram of fat?<br>Body fat stores are…<br>Which is a function of dietary fat? |
| Protein | Which food contains the GREATEST amount of protein per serving?<br>How many calories are there in one gram of protein?<br>Which is a function of protein?<br>How much is one serving of cooked meat based on MyPlate recommendations? |
| Obesity | What type of information is provided by body mass index (BMI)?<br>Which of the following is NOT one of the primary components of a sound weight change plan?<br>Justin is an offensive lineman on his college football team. He is 6'3" and weighs 335 pounds, with a BMI of 42. Which of the following statements about Justin is MOST LIKELY true?<br>Which condition is most strongly associated with obesity? |

[b] This table displays the 8 nutritional categories and their corresponding questions for the Nutritional Knowledge Test (NKT).

**Table 3.** Attitudes Questionnaire

| Question |
| --- |
| I plan to decrease the amount of fat in my diet to reduce my risk of CVD. |
| I plan to include at least 30 minutes of moderate intensity exercise in my daily activities. |
| I plan to include fruits and vegetables in my daily diet to promote good health. |
| I plan to maintain a healthy weight to reduce my risk of chronic diseases. |
| I plan to encourage my clients to decrease the amount of fat in their diet to reduce their risk of CVD. |
| I plan to use MyPlate to teach my clients how to choose a healthful diet. |
| I plan to encourage my clients to maintain a healthy weight to reduce their risk of certain chronic diseases. |
| An introductory nutrition course should be a requirement in my curriculum. |
| Professionals in physical therapy should have a good understanding of basic nutrition concepts. |
| As a future physical therapist, I would want to feel confident when giving nutrition advice to clients. |
| Professionals in physical therapy should consult with a registered dietician before giving nutrition advice to clients. |

[d] The statements were provided in sections separated by statements pertaining to physical therapy students' personal feelings about nutrition, patient impact, and future nutrition education for PTs.

**Table 4.** NKT and Attitude Scores for Demographic Data

| Characteristic | NKT Score-Mean ± SD | Attitude Score-Mean ± SD |
|---|---|---|
| Sample (N=605) | 22.43 ± 3.43 | 47.13 ± 4.32 |
| Gender | | |
| Female (N=450) | 22.8 ± 3.53 | 47.4 ± 4.35* |
| Male (N=155) | 22.88 ± 3.08 | 46.33 ± 4.15* |
| Int Grad Yr | | |
| 2018 (N= 216) | 22.40 ± 3.4 | 46.76 ± 4.23 |
| 2019 (N=204) | 22.83 ± 3.42 | 47.58 ± 4.47 |
| 2020 (N=179) | 22 ± 3.46 | 47.08 ± 4.19 |
| 2021 (N=6) | 23.67 ± 2.86 | 46.50 ± 4.93 |
| Healthy Eater | | |
| Yes (N=480) | 22.76 ± 3.28* | 47.33 ± 4.18* |
| No (N=123) | 21.09 ± 3.70* | 46.29 ± 4.77* |
| Region | | |
| Eastern (N=73) | 21.88 ± 2.91 | 46.62 ± 4.22 |
| Western (N=39) | 22.36 ± 2.59 | 47.15 ± 3.66 |
| Southern (N=228) | 22.35 ± 3.94 | 46.93 ± 4.80 |
| Midwestern (N=265) | 22.67 ± 3.19 | 47.44 ± 4.22 |
| Highest Level of Education | | |
| Baccalaureate (N=473) | 22.52 ± 3.29 | 47.11 ± 4.21 |
| Master's (N=13) | 23.69 ± 4.35 | 47.15 ± 4.14 |
| PhD (N=114) | 22.04 ± 3.81 | 47.17 ± 4.78 |
| Not Sure (N=5) | 19.4 ± 2.61 | 47.6 ± 5.13 |

e Means and standard deviations (SD) of Nutrition Knowledge Test (NKT) and attitudes scores are reported here to compare groups of gender, intended graduation year (Int Grad Yr), whether physical therapy students considered themselves a healthy eater or not, region and highest level of education. A (*) indicates statistical significance between means of groups at the p=.05 level.

**Table 5.** NKT Scores & History of Previous College Nutrition Courses

| Characteristic | NKT Score-Mean ± SD | Group Comparison | Statistical Significance |
|---|---|---|---|
| Previous Nutrition Course | | | |
| Yes | 22.81 ± 3.56 | Yes to No | p<.000 |
| No | 21.66 ± 3.46 | No to Yes | p<.000 |
| Num. Prev. Nutrition Course | | | |
| 0 | 21.66 ± 3.46 | 0 to 1-2 | p=.003 |
| 1 to 2 | 22.64 ± 3.3 | 1-2 to 3+ | p=.019 |
| 3+ | 24.02 ± 3.51 | 0 to 3+ | p<.000 |

[f] Means and standard deviations (SD) of NKT scores were compared between groups of who have and have not taken a nutrition course and the number (Num.) of previous (Prev.) nutrition courses.

**Table 6.** Comparison of NKT Categorical Scores to Previous Findings.

| Category | Thomas, McArthur and Corbett- Mean ± SD (N=48) | Day et al.-Mean ± SD (N=605) |
|---|---|---|
| Dietary Recommendations | 2.2 ± 1.0 | 2.8 ± 0.8 |
| Exercise & Caloric Expenditure | 2.4 ± 1.0 | 2.8 ± 0.9 |
| Vitamins | 2.2 ± 1.0 | 2.5 ± 1.0 |
| Minerals | 3.0 ± 0.9 | 2.4 ± 0.9 |
| Carbohydrate | 2.6 ± 0.9 | 2.9 ± 0.8 |
| Fat & Cholesterol | 2.3 ± 1.0 | 2.7 ± 1.0 |
| Protein | 2.3 ± 0.8 | 2.7 ± 0.9 |
| Obesity | 2.3 ± 0.8 | 3.6 ± 0.6 |

[g]This table shows the differences between mean scores of the Nutrition Knowledge Test (NKT) categories out of a total of 4 points each. The results are reported as means and standard deviations (SD). When compared as a whole, there was no significant difference between means (p=.07).

**Table 7.** Satisfaction of Nutrition Knowledge of Physical Therapy Students per Region.

| Region | Dissatisfied-Freq (%) | Somewhat Dissatisfied-Freq (%) | Somewhat Satisfied-Freq (%) | Satisfied-Freq (%) | Undecided-Freq (%) |
|---|---|---|---|---|---|
| Eastern | 4 (5.5) | 22 (30.1) | 34 (46.6) | 6 (8.2) | 7 (9.6) |
| Midwestern | 12 (4.5) | 43 (16.2) | 137 (51.7) | 48 (18.1) | 25 (9.4) |
| Southern | 9 (3.9) | 48 (21.1) | 112 (49.1) | 29 (12.7) | 30 (13.2) |
| Western | 2 (5.1) | 5 (12.8) | 21 (53.8) | 7 (17.9) | 4 (10.3) |

[h] This table displays the frequency distributions (Freq) and percentages (%) of satisfaction per region.

# VITA

After completing her work at Central High School, Pollok, Texas in 2012, Delaney Day entered Stephen F. Austin State University at Nacogdoches, Texas. She received the degree of Bachelor of Science from Stephen F. Austin State University in August 2016. Following graduation, she entered the Graduate School of Stephen F. Austin State University, and accepted a Graduate Assistantship for the department of Kinesiology and Health Science, and received the degree of Master of Science in May 2018.

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