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Assessing the Effect of a College-Level Nutrition Course on Kinesiology Student Knowledge

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ABSTRACT

The purpose of this study was to assess nutrition knowledge among Kinesiology students in order quantify student understanding of fundamental nutrition principles and determine if differences were significant between students who had completed a college-level nutrition course versus those who had not. It was hypothesized that students who completed a college nutrition course would score significantly higher in each categorical domain as well as total knowledge. Kinesiology students were surveyed utilizing a validated instrument to assess fundamental nutrition knowledge. Specific emphasis was placed on recruiting students who had completed a college-level nutrition course. Question items were categorized into four distinct categorical domains including: sources of nutrients, dietary recommendations, identification of optimal dietary choices, and awareness of diet-disease relationships. Students who had previously completed a college-level nutrition course (n = 62) scored significantly higher than those who had not (n = 46) for dietary recommendations (7.36 ± 1.92 and 6.61 ± 1.93, p = .047), sources of nutrients (40.16 ± 9.65 and 35.72 ± 9.63, p = .02), and total score (57.48 ± 13.11 and 51.07 ± 13.48, p = .014). There was no significant difference between groups associated with dietary choices (p = .174) and diet-disease relationship (p = .126). Overall, students who completed a college-level nutrition course attained higher knowledge scores than those who did not. While there was a difference in knowledge, total percent correct answers for both groups were well below the established cutoff by content raters indicating a need to further assess pedagogical content within nutrition courses and its articulation to knowledge questionnaires.

Keywords: nutrition, kinesiology students, knowledge.

Introduction

Within the current health care system, dietitians are uniquely trained to provide nutritional services and education to the community. However, access to dieticians within a community may not be easily accessible or practical and therefore the role of nutrition educator may necessitate health and wellness professional to perform this task in an auxiliary capacity (Ettienne-Gittens et al., 2012). In order for professionals to adequately serve in this capacity, it is necessary to have fundamental knowledge and application skills to effectively communicate and disseminate nutrition information.

With a strong push by organizations such as the Centers for Disease Control and Prevention (CDC) for schools to adopt a coordinated approach to school health such as the Whole School, Whole Community, Whole Child (WSCC) model, various professionals must collaborate in order to address key priority areas including nutrition. School professionals and those who work closely with youth populations are uniquely positioned to promote nutrition and establish healthy eating habits that can be sustained for a lifetime. Allied health professionals are "health care practitioners with formal education and clinical training who are credentialed through certification, registration and/or licensure" (Health Professions Network, 2013, para 1.) and are ideally suited to deliver nutrition education due to prolonged contact with the professional during visits. Public health educators are concerned with improving the health of individuals and communities through the education and adoption of healthy behaviors including proper nutrition. Oftentimes professionals in health education and public health work with underserved, low income populations whom may not have access to medical care via physicians and dieticians, with the only sources of information and education coming from those health education and public health specialists. Due to the potential for these professionals to serve as auxiliary nutrition educators, it is essential they possess competence in fundamental nutrition knowledge to better assist the populations they serve.

The California Education Code does not mandate the instruction of nutrition education from grades kindergarten through 12 but instead uses indistinct language that "encourages" nutrition education, instructional activity from knowledgeable instructors, and a supportive administration (CAL Educ Code § 8990, § 8993, § 8995). Due to this lack of policy mandating nutrition education at the state level, the decision to include nutrition education is relegated to individual school districts. In order to assist in this process, the California State Board of Education adopted the California Health Education Content Standards (HECS) in 2008 and published the California Nutrition Education Competencies (CNEC) in 2011. These standards define necessary content students should know in order to promote health and nutrition literacy, but their content is not mandated or required to be taught to California youth. If future professionals are already acquiring this knowledge as a supplement during their elementary, middle, and high school education, an independent college level nutrition course may not be warranted.

The concern becomes whether state and local nutritional standards and guidelines are being taught to school age children and adolescents and whether this fundamental knowledge is adequate for those entering professions that necessitate nutrition knowledge. The U.S Department of Education (2000) determined that the average time spent addressing nutrition education by public school teachers were less than 13 hours per year. Nutrition education is included in many national and local health education content standards. Currently there is evidence that supports a lack of knowledge and preparation among these professionals to effectively and accurately provide nutrition education (Jeffries & Matthias, 2007; Sack, Raddler, Mairella, Touger-Decker, & Khan, 2009; Torres-McGehee, Pritchett, Zippel, Minton, Cellamare, & Sibilia, 2012; Ettienne-Gittens, Lisako, McKyer, Goodson, Guidry, & Outley, 2012). This inadequacy should necessitate the reevaluation of professional preparation programs to assess if graduates possess fundamental nutritional knowledge necessary to serve as a resource for schools and the community.

California State University, Stanislaus

Kinesiology courses at California State University, Stanislaus provide a background in physical education for those planning to enter the teaching field, an educational foundation for those planning to undertake graduate work, or a program for preprofessional work in fitness, education, coaching, and allied health fields. The coursework necessary to fulfill program requirements varies based on the individual track option selected by the students. A large majority of the students within the Department of Kinesiology choose the track option that provides a concentration in health and wellness promotion, and is often utilized by those who plan to

enter allied health fields or as an option to pursue a graduate degree. A smaller percentage of students within the Kinesiology Department are pursuing the track option for a singular degree in Kinesiology or Kinesiology single-subject preparation program in physical education. Kinesiology track options and their alignment to eventual career paths are presented in Figure 1.

Within these track options, students pursuing the concentration in health and wellness are the only segment within the major that are required to enroll in and complete a college-level nutrition course in order to meet graduation requirements. The inconsistency regarding nutrition education between track options leads the researchers to ponder the potential relevance and necessity of such a course within the Kinesiology curriculum. The benefit of college-level nutrition education for future professionals whose profession may require fundamental nutrition knowledge to disseminate information in an auxiliary capacity may be minimal. It is possible that students choosing to major in Kinesiology may have acquired the basic knowledge through elementary, middle, and high school education making a singular nutritional course superfluous. The reverse may also be true; students in the department of Kinesiology may lack adequate content knowledge and application skills to effectively serve as a resource indicating a need for the college-level nutrition course to be maintained and potentially incorporated into all track options. The purpose of this study was to assess nutrition knowledge of Kinesiology students in order quantify student understanding of fundamental nutrition principles and determine any potential difference between students who have completed a college-level nutrition course versus those who had not. Additionally, the researchers aim to ascertain whether students, regardless of nutrition course completion, are able achieve fundamental nutrition proficiency as determined by a criterion reference performance standard. The researchers expect that individuals who have completed a college-level course will score significantly higher than those who have not.

Methods

Participants

The University Institutional Review Board approved the research study upon confirmation of informed consent, which was obtained via the online system used to develop and administer the survey; the Qualtrics Software System. Inclusion in the study was limited to students at California State University, Stanislaus currently declared within the Department of Kinesiology. This convenience sample was a representation of students who plan to pursue careers where nutrition education may be incorporated in an auxiliary capacity. Only students age 18 and older were included in the study and were recruited from current declared majors through department email as well as interpersonal communication to increase participation rates. Further promotion of the study was incorporated through requests for participation in individual course classrooms in which Kinesiology students were enrolled. Specific emphasis was placed on recruiting Kinesiology students that completed a college-level nutrition course. Participation of all volunteers was voluntary and assured of the maintenance of confidentiality and the anonymity of responses. To avoid possible coercion or undue influence, the survey was voluntary and in no way was language for participation coercive.

Instrument and Data Analysis

The instrument utilized to assess nutrition knowledge among Kinesiology students was a modified questionnaire originally developed by Parmenter and Wardle (1999) to be utilized for studying the relationship between nutrition knowledge, demographics, and dietary behavior. Question items were categorized into four distinct sections including: Sources of nutrients, dietary recommendations, identification of optimal dietary choices, and awareness of diet-disease relationships. Original measures of the questionnaire established construct validity and attained high internal reliability (Cronbach's $\alpha = 0.70\text{-}0.97$) and test-retest reliability with an overall measure of 0.97

(Parmenter & Wardle, 1999). Question items were modified to reflect cultural differences in terminology and food alternatives as the original questionnaire was utilized in the United Kingdom. The modified questionnaire contained 54 questions of which 11 were independent variables related to demographic information. The remaining questions assessing nutrition knowledge were comprised of 98 individual items for scoring. Prior to primary study implementation, the questionnaire was piloted among students not currently majoring in the Department of Kinesiology in order to reduce ambiguity and maximize clarity of questions and their content.

The data were extracted from Qualtrics and imported into the Statistical Package for the Social Sciences (SPSS). The knowledge questions were coded to represent correct and incorrect answers and descriptive statistics were assessed in both groups within the study. An analysis of data included independent t-tests to assess statistically significant differences between knowledge scores within each survey section and groups within a priori significance of $p < .05$. Additionally the Cohen's effect size was calculated to measure magnitude of significance between survey sections and groups. A Modified Angoff Method was incorporated to determine a cutoff score for minimum survey proficiency as assessed by two independent content raters.

Results

Analysis of means indicated that individuals (n = 62) previously enrolled in a college-level nutrition course scored higher (M = 57.49, SD = 13.22) than those (n = 46) who had not completed a nutrition course (M = 51.07, SD = 13.47). Additionally, those who had completed a nutrition course scored higher in dietary recommendations, sources of nutrients, optimal food choices, and diet-disease relationship (M = 7.36, SD = 1.92, M = 40.18, SD = 9.73, M = 4.33, SD = 1.68, M = 5.62, SD = 2.16) than those who did not (M = 6.61, SD = 1.93, M = 35.72, SD = 9.63, M = 3.83, SD = 1.99, M = 4.91, SD = 2.62). Percent of questions answered correctly for students within each section and total survey are presented in Table 1. Cohen's kappa was analyzed to determine if there was agreement among raters in determining a performance standard. An interrater reliability analysis using the kappa statistic was performed to determine consistency among raters. The interrater reliability for raters was found to be significant for dietary recommendations (κ = .621, p = .026), sources of food (κ = .639, $p < .001$), optimal food choices (κ = 714, p = .035), diet-disease relationship (κ = .683, p = .009), and total (κ = .657, $p < .001$). Interrater reliability and the averaged cutoff score are presented in Table 2.

To test the hypotheses that students who had previously taken a college nutrition course (n = 62) and students who had not (n = 46) were associated with statistically significant differences in nutrition knowledge, independent samples t-tests were performed. The assumption of homogeneity of variance was tested and satisfied via Levene's F test for overall score, dietary recommendations, and sources of nutrients ($F(106) = .414$, p = .522; $F(106) = .016$, p = .899; $F(106) = .126$, p = .724) but was not satisfied for the identification of optimal dietary choices and diet-disease relationship ($F(106) = 3.03$, p = .085; $F(106) = 5.19$, p = .025). As seen in Table 3, the independent sample t-tests for total scores, dietary recommendations, and sources of nutrients was associated with a statistically significant effect ($t(106) = 2.487$, p = .014; $t(106) = 2.006$, p = .047; $t(106) = 2.368$, p = .02). Thus, a statistically significant difference in mean nutrition knowledge was observed within the three categories between students who had taken a nutrition course versus those who had not. However, the independent sample t-tests for identification of optimal dietary choices and diet-disease relationship were not associated with a statistically significant effect ($t(86.65) = 1.371$, p = .174; $t(85.41) = 1.546$, p = .126). Additionally, Cohen's effect size value suggested a moderate practical significance for total score and sources of nutrients (d = .46; d = .48) and a low to moderate practical significance for dietary recommendations, diet-disease relationship, and optimal dietary choices (d = .39; d = .31; d = .27) respectively.

Discussion

It is necessary to acknowledge the limitations of the study design and specific methodology utilized. One limitation to the study is the utilization of non-random sampling in the selection of participants for this survey study, which disallows for any inferences to a larger population. Due to this non-randomized sampling, some measure of selection bias is probable regarding individuals who chose to participate versus those who abstained. Additionally, there was no distinction between student tracks, which left researchers unable to determine if there were significant differences between the options. Finally, only utilizing two raters to determine cutoff scores may have inflated the determined values as well as the inherent limitations of the Modified Angoff Method including the subjective nature of determining cutoffs.

The results of this study support the assertion that students who complete a college-level nutrition course score significantly higher on nutrition knowledge surveys than those who have not completed similar course content. This finding builds on previous literature that indicates increased nutrition knowledge scores from professionals whose college coursework required nutrition. Bahl, Hamilton, and Ormesher (1993) reported that allied health students who completed a college-level nutrition course scored significantly higher on a nutrition knowledge survey. Similarly, coaches (Seminara, 2007), athletic trainers (Farthing, Graves, Smith, & Turchi, 1991), physical educators (Conkle & Tishler, 1992), and physical therapists (Sack et al., 2009) demonstrated an increased capacity for nutrition knowledge after similar nutrition education.

Participant scores also support a lack of knowledge and preparation among these individuals in auxiliary professions that would allow for effective and accurate dissemination of nutrition information and the need for further education (Kitchen & Clark, 2009; Ettienne-Gittens et al., 2012; Turner, Knol, & Meyer, 2012). While there was a significant difference between students who had completed a nutrition course versus those who had not, the overall score totals indicate a lack of proficiency in fundamental nutrition knowledge scores as compared to raters' cutoff score values. The only domain within the survey that individuals who completed a nutrition course scored higher than the raters' cutoff was the dietary recommendations portion. In all other sections of the survey, participants scored significantly lower than the projected estimate for minimal proficiency established by the raters. To score well on the survey, it was necessary to not only understand concepts related to optimal nutrition, but also be able to apply them in practical applications that may be common in nutrition education settings. These results among students who had previously completed a nutrition course may be indicative of a curriculum without sufficient focus on the applicatory nature of nutrition.

Future research should seek to further elucidate the relationship between participant factors that may influence nutrition knowledge and may include previous nutrition education and a distinction between various track options within the degree program. Additionally, evaluation regarding the alignment of nutrition course content and pedagogical methods to established competencies such as the California Nutrition Education Standards may further illustrate optimal pathways and processes to maximize student mastery of fundamental nutrition concepts and their application.

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Table 1. Percent answered correctly among students previously enrolled and students never enrolled in a college nutrition course

	Previously Enrolled (n = 62)		Never Enrolled (n = 46)
Knowledge domain (max score)	*Percent Correct*		*Percent Correct*
Dietary recommendations (11)	66.8		60.1
Sources of nutrients (66)	60.8		54.1
Identifying optimal dietary choices (8)	54.0		47.9
Diet-disease relationship (13)	43.5		37.8
Total score (98)	58.7		52.1

Table 2. Interrater agreement for test item difficulty and criterion-reference cutoff score determined by a Modified Angoff's Method

Knowledge section (max score)	*Rater 1*	*Rater 2*	*Inter-Rater Agreement (Reliability)*	*Cutoff*
Dietary recommendations (11)	6	8	.621	7
Sources of nutrients (66)	54	50	.639	52
Identifying optimal dietary choices (8)	6	5	.714	6
Diet-Disease Relationship (13)	8	8	.683	8
Total Score (98)	73	69	.637	71

*Standards of strength of kappa coefficient (Landis and Koch, 1977)
< 0 = poor; .01-.20 = slight agreement; .21-.40 = fair agreement; .41-.60 = moderate agreement; .61-.80 = substantial agreement; .81-1.0 = almost perfect agreement

Table 3. Differences in knowledge scores between students previously enrolled and students never enrolled in a college nutrition course.

	Previously Enrolled (n = 62)		Never Enrolled (n = 46)			
Knowledge section (max score)	*Mean (s.d.)*		*Mean (s.d.)*		*p**	*Cohen's d*
Dietary recommendations (11)	7.35 (1.90)		6.61 (1.93)		.047*	.39
Sources of nutrients (66)	40.16 (9.65)		35.72 (9.63)		.020*	.46
Identifying optimal dietary choices (8)	4.32 (1.67)		3.83 (1.99)		.174	.27
Diet-Disease Relationship (13)	5.65 (2.15)		4.91 (2.62)		.126	.31
Total Score (98)	57.48 (13.11)		51.07 (13.48)		.014*	.48
**p < 0.05*						

Figure 1. Major and track option with articulating career paths