Improving familiarity with legumes in an introductory tertiary nutrition course in Pennsylvania, USA

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Abstract

Design: Non-randomised, controlled intervention conducted over two semesters, with pre- and post-testing

Objectives: To assess US college students' familiarity with legumes and to test the effectiveness of a redesigned introductory nutrition course with a 'bean theme' (BT) compared to the standard nutrition (STD) course.

Subjects: These were 111 college students (44 M, 67 F), who were enrolled in undergraduate introductory nutrition courses at a state university in Pennsylvania, USA. BT group: n = 60, 25 M, 35 F; mean age (±SD) 20.3 ± 1.5 years; STD group n = 51, 19 M, 32 F, age 20.5 ± 1.6 years.

Methods: Baseline demographic data and legume familiarity were assessed by a questionnaire and a visual bean-recognition plate test. In the BT group, nutrition lessons highlighted legumes whenever possible to illustrate basic nutrition concepts, such as nutrient density, fibre-rich food choices and health promotion. In the STD group, whole grains, instead of legumes, were presented to teach these same concepts. Baseline and post-study 18-question quizzes were administered to measure any differences in legume knowledge acquisition after the one-semester course. Students in the BT group were also asked to complete evaluation forms to assess the acceptability of this new course emphasis.

Results: Baseline knowledge about legumes in both groups was poor. Familiarity with soy products was even more limited, as the median number of products ever tried was only one. After completing the course, compared to the STD group, the BT group had a significant improvement in bean plate recognition scores (24.2% ± 13.6 vs 3.6% ± 12.6, \( P < 0.001 \)) and in bean quiz scores (12.3% ± 15.7 vs 6.3% ± 15.9, \( P = 0.058 \)).

Conclusions/Applications: Increased emphasis on legumes can easily and successfully fit into a standard university-level introductory nutrition course. This represents an important opportunity to educate students on the variety, wholesomeness, and versatility of these economical and nutritious plant foods. Improved knowledge of legumes may help students alter their own dietary habits and be better equipped to support national (and international) recommendations regarding legume intake for others. Recipe handouts and sample testing were highly valued and are recommended for future classes of this nature.

Key words: legumes, vegetarian, soybeans, lysine

Introduction

A growing number of health promotion organisations are recommending the inclusion of plant foods, with decreased use of animal products (1–3). The transition to a plant-based diet involves a greater emphasis on beans as the protein source. It is well known that beans, as part of a healthy variety of food choices, can make an important contribution to protein adequacy, as well as soluble fibre, many vitamins and minerals (4–6). In particular, beans are rich in lysine, an essential amino acid that is not found in high amounts in many other plant foods (5,7). A new vegetarian food guide pyramid (4), developed by three US dietitians with expertise in vegetarian nutrition, recommends five servings per day of protein-rich foods, including cooked beans, peas and lentils. This category also contains soy products, dairy products, meat analogues, eggs, and nuts. This pyramid reflects the guidelines which emphasise those nutrients highlighted in the most recent American Dietetics Association (ADA) position paper on vegetarian diets (6).

The purpose of this research was twofold:

1. To examine students' baseline familiarity with legumes, and,

2. To assess whether a bean-theme (BT) nutrition course resulted in significantly increased understanding of

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Methods

Male and female college students were invited to participate in this study during any one of four sections (autumn and spring) of an introductory university nutrition course. At the start of each semester, basic demographic data were collected, along with a request to list all types of beans they were aware of, as well as the names of any soy product(s) they had tried. At the same class, an 18-question quiz focusing on legumes was administered. In addition, a ‘plate recognition’ test was given. This consisted of a styrofoam plate to which 10 different beans were glued and numbered from one to ten. Students were asked to write the names of any beans they recognised on an answer sheet consisting of 10 blank numbered lines.

In the two autumn-semester BT classes, nutrition topics utilised examples and worksheets which focused on legumes, by simply modifying STD assignments. For example, calculating nutrient density compared a chocolate bar with sunflower seeds for the STD class, while in the BT class, the comparison was between lentil soup and hot dogs. Discussions of lipids, diet and disease provided a forum for highlighting beans as a low-saturated fat, cholesterol-free protein source. The nutrient composition of beans and variety of cooking styles were demonstrated, with taste tests of chili, lentil soup and hummus (class demonstration). Recipes were also provided.

In the following (spring) semester STD courses, the same topics and elements were included, but with more of a focus on whole grains and their respective contributions to health and disease prevention. In the STD classes, whole grain products were provided. The same number and type of homework and general exams were administered in both semesters. In order to give students in the STD group the opportunity to try a legume product, at the end of the semester (after quizzes were completed), hummus samples were given out.

At the end of the course, a final post-test (identical to the pre-test) was administered, and the results compared both between groups and within each class for any improvements throughout the semester. An evaluation form was completed by students in the BT sections, to assess acceptability of the course structure, in consideration of adopting this format for future sections.

Data analysis

The data were analysed using a standard statistics package (SPSS Inc, Chicago, SYSTAT®, version 10 2000). Descriptive statistics were evaluated. Log-transformations were used to normalise the data for non-normally distributed variables. Student’s t-tests were used to examine whether differences existed in baseline data and test score improvements. Chi-square tests were employed for categorical data. P-values < 0.05 were considered statistically significant.

Ethics approval

The procedures for this study were approved by the Human Subjects Subcommittee of the West Chester University Institutional Research Risk Committee, which reviews all projects involving human subjects conducted by individuals affiliated with the university, to assure the protection of study participants’ rights, privacy, welfare, and civil liberties.

Results

Study participants

Out of a total class sample size of 151 students, 111 students (44 males, 67 females) agreed to participate and completed the study (84% class participation rate). In the BT group (n=60) were 25 males and 35 females, whose average age was 20.3 ±1.5 years (mean ± SD), and in the STD group (n=51) were 19 males and 32 females, aged 20.5 ±1.6 years. Fifty percent of students in both groups lived on campus. There were 76% of STD students and 88% of BT students who reported growing up on a ‘standard American diet’, that is, one which is meat-based. Only five students (one BT and four STD) reported being vegetarians.

Baseline bean knowledge

The median number of types of beans that students were able to list was four. The median number of soy products students reported ever trying was one; 44% had never tried any soy product. Initially, the average quiz score was 59.1% ± 18.4 and the average bean recognition plate score was 36.9% ± 15.4. Less than half of the students (42%) correctly placed beans in the meat and alternates category of the US Department of Agriculture food guide pyramid (8). Forty-eight percent of students thought beans were in the vegetables category and 11% selected grains.

Students were first asked to list the names of beans that they knew, and the most commonly listed beans were lima (78% of students), kidney (68%), red beans, including Mexican, baked, chili, etc. (51%), and soybeans (41%). Less than one-quarter of participants listed black beans (23%), pinto (14%), navy (12%), or green peas (whole or split) (10%); few listed black-eyed peas (9%), chickpeas (9%) or lentils (5%).

Initial bean plate recognition assessments revealed that most students were unfamiliar with several beans; only 6% correctly identified pinto beans, 9% soybeans, 16% lentils, 26% black-eyed peas, and 33% chickpeas. From the beginning, however, a majority of students were able to correctly label kidney beans (80% of students), lima beans (79%) black beans (69%), and split peas (56%).

Regarding soy products, only 38% of students had ever tried soy milk, 13% had tried soybeans, but fewer than 10% had ever tried tofu (9%), soyburgers (6%), soy nuts (6%), soy sauce (5%), shakes, powders or meal replacers (5%). Two percent or less reported ever having tried soy bars, soy ice cream, meal analogues, yoghurt, miso, soy cheese, soy dogs or soy butter. Of the total group, 30% reported that they did not like the texture of beans, while 25% did not like the taste.

Between-group differences

The two groups did not differ in age or baseline scores for quiz or bean recognition, except that the STD group had significantly greater numbers of students who could iden-
tify black beans (Chi square \( P = 0.001 \)). Once students had finished the course, there was a significantly different improvement in the ability to recognise lentils and chickpeas in the BT group compared to the STD group 71% vs 6% increase for lentils (\( P = 0.001 \)) and 58% vs 11% increase for chickpeas (\( P < 0.001 \)). Plate scores improved significantly more in the BT group, with an increase of 24.2 ± 13.6 percentage points compared to 3.6 ± 12.6 points in the STD group (\( P < 0.001 \)). Quiz scores also improved more, increasing by 12.3% ± 15.7 in the BT group vs only 6.3% ± 15.9 in the STD (\( P = 0.058 \)).

BT course evaluations

Students in the BT course filled out class evaluations, and a majority of students (59%) rated the course as excellent, 39% as good. Ninety-four percent rated the emphasis on legumes as excellent (41%) or good (53%). All participants agreed that they learned a lot about beans (88% 'strongly agreed'). Seventy-five percent felt that the information was very useful; 86% said they would be more likely to try beans in the future. Two students (4%) reported that there was too much emphasis on beans. Many submitted positive written comments including: 'I never knew how good beans were for you'. 'This class gave us alternatives to meat and the samples were very useful!'. 'The emphasis on beans made me very aware of their health benefits...I have tried to incorporate them into my diet'. Suggestions for improving the course included showing examples of all types of beans in class, as well as having samples of each to taste.

Discussion and conclusions

The results of this intervention highlight the lack of solid, consistent information and experience regarding legumes among college-age students, the majority of whom were raised on a 'typical meat and potatoes diet'. The need to place more importance on this area of food and nutrition is raised on a 'typical meat and potatoes diet'. The need to place more importance on this area of food and nutrition is evident, as is the importance of providing samples.

In the field of public health nutrition, advice for improving chronic disease prevention often includes incorporating more plant-based, in place of animal, sources of protein. Legumes, which are becoming a central part of food guide pyramids throughout the world, are an inexpensive yet nutrition-rich 'package', high in protein, fibre, folate, potassium, magnesium and phytochemicals, cholesterol-free and very low in fat (9). Increasing the consumption of these versatile and satisfying legumes, in place of more saturated-fat-rich animal protein choices, may help to decrease risks for cancer, type 2 diabetes, obesity, heart disease and hypertension. As students become more familiar with the variety of legumes and their preparation methods, they would also be more likely to incorporate them into their own diets, present them to family members, and encourage their inclusion to their future clients in counselling sessions.

Many individuals may not be aware of the best cooking methods, or may not have been exposed to beans while growing up. In addition, an experience of flatulence with improperly prepared (or undercooked) beans may have caused an aversion to all types. This is due to the relatively high concentrations of soluble dietary fibre and the carbohydride stachyose (an \( \alpha \)-galactoside) present in most beans (10). Appropriate preparation styles, such as use of soaking, discarding soaking water and pressure cooking, can greatly improve digestibility and therefore acceptability and enjoyment. Furthermore, an important topic for the unit on trace minerals would be ways to boost the absorption of non-heme iron in beans, for example, by including a vitamin-C-rich food in the same meal (6).

Evaluation forms revealed that students desired even more sampling and wished to see all the dried beans, in order to have direct experience. Actual food demonstrations and taste testing of bean recipes gave students the tools to incorporate beans into their diets. Such an approach helps to bridge the gap between theory—that protein-rich beans are a healthy alternative to meats—and practice (11), that is, practical, acceptable and delicious ways to prepare and enjoy them.

References
