College Students’ Understandings of, Perceptions Towards, and Usage of Canned Foods Based on Exposure to Canned Foods During Childhood

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COLLEGE STUDENTS’ UNDERSTANDINGS OF, PERCEPTIONS TOWARDS, AND USAGE OF CANNED FOODS BASED ON EXPOSURE TO CANNED FOODS DURING CHILDHOOD

by
Robert H. Drury

Submitted to Brigham Young University in partial fulfillment of graduation requirements for University Honors

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ABSTRACT

Objective: To evaluate if frequent usage of canned foods in childhood households affected college students’ current understandings of, perceptions towards, and usage of canned foods.

Methods: A secondary data analysis was conducted based on data collected from students who completed The Perceptions and Use of Canned Foods questionnaire. ANOVA statistics were used to make comparisons between students exposed (ECF; n=65) and not exposed (NECF; n=237) to canned foods during childhood.

Results: Compared with NECF, the ECF more strongly agreed that canned foods counted towards United States’ dietary recommendations (p<0.001). The ECF, compared to NECF, showed a trend towards significance related to canned foods’ ability to contribute to easy meal preparation (p=0.006).

Conclusions and Implications: Frequent usage of canned foods during childhood positively affected students’ perceptions towards canned foods’ ability to meet dietary recommendations. Encouraging parents to incorporate healthy canned foods in meal preparation may help promote positive perceptions about canned foods.

Key words: canned foods, college students, exposure
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INTRODUCTION

Dietary parental role modeling has been defined as parents' eating habits that affect, both intentionally and unintentionally, the eating habits of children.\textsuperscript{1} Through role modeling, research has shown that parents positively impact the amount of healthy foods consumed by their offspring,\textsuperscript{2} specifically related to children’s increased consumption of fruits, vegetables,\textsuperscript{3-6} and dairy,\textsuperscript{6} decreased consumption of total fat,\textsuperscript{7} and moderated intake of daily mean calories.\textsuperscript{8} Family meals are considered to be a powerful opportunity for dietary parental role modeling.\textsuperscript{9-10} However, even when family meals are not regularly held, parents’ modeling of healthy eating has still been shown to increase their adolescents' consumption of fruits and vegetables.\textsuperscript{5} Brown and Ogden\textsuperscript{11} concluded that positive parental role modeling may be more effective at improving children’s diets than attempting to control what children eat.

More recently, research has demonstrated the affect parental role modeling has on the dietary habits of college students. University students’ food preferences have been shown to be similar to their respective mothers’ food preferences.\textsuperscript{12} Likewise, Branen and Fletcher\textsuperscript{13} found that university students’ diets tended to resemble what they remember their caretakers’ eating habits were growing up. Even when certain foods were disliked during childhood, college students were more likely to consume those foods if they saw their parents eating them during childhood.\textsuperscript{14}

In the United States (US), college students’ eating habits have not been consistent with the Dietary Guidelines for Americans (DGA).\textsuperscript{15-17} In general, the majority of college-aged adults in 2001-2004 did not meet the recommendations for consuming fruits, vegetables, whole grains, and nutrient-rich options within each food group.\textsuperscript{18-19}
Other studies have also shown that college students consume excessive amounts of foods high in salt and fat, as well as sugar-sweetened beverages.\textsuperscript{20-23} Barriers to healthy diets for university students have included the cost of home cooking;\textsuperscript{24-27} limited time to shop, cook, and clean up;\textsuperscript{24-27} and the fear that spoilage will happen before home cooked foods can be eaten.\textsuperscript{27}

Canned foods may be a plausible option of improving university student’s diets while overcoming obstacles to a healthy diet. Compared with fresh or frozen goods, certain canned foods have been shown to be less expensive and to contain higher nutritional content.\textsuperscript{28-30} Canned foods are generally convenient to use\textsuperscript{31} and have been shown to extend shelf life without refrigeration, thus preventing spoilage.\textsuperscript{32-33} In general, people who ate canned produce had higher nutrient intakes, better quality eating habits, and higher vegetable and fruit consumption compared with non-users.\textsuperscript{34} Thus, these characteristics and benefits of canned foods may be helpful in overcoming barriers college students have identified in relation to healthy eating, and if consumed, may better help them meet the dietary recommendations. However, it is not known what factors influence students’ perceptions and use of canned foods. One reasonable barrier may be misconceptions about their nutritional value. Surveys have shown that the nutritional value of canned foods is often misunderstood. In 2013, 42% of consumers were unaware that canned foods could contribute to a healthy diet,\textsuperscript{33} despite the DGA stating, “all forms of foods, including fresh, \textit{canned}, dried, and frozen, can be included in healthy eating patterns.”\textsuperscript{35}

The purpose of this study was to investigate whether parental usage of canned foods affects university students’ understanding, perceptions, and usage of canned foods.
It has previously been illustrated that parents’ eating habits affected the dietary practices of both children and university students. Thus, it is plausible that parents’ perceptions and usage of canned foods during one’s childhood may be a positive influence on their feelings towards and utilization of canned foods later in life. Our main hypothesis was that college students who reported parental usage of canned foods would have more accurate understandings of, positive perspectives towards, and more frequent consumption of canned foods.

**METHODS**

**Study Design**

This study was a secondary data analysis of data acquired from college students via a validated questionnaire: The Perceptions and Use of Canned Foods (PUCF). This questionnaire was pilot tested and shown as valid and reliable through cognitive interviews, university reviewers, and test-retest procedures. The subjects in our study consisted of a convenience sample of college students (n=658) enrolled in an introductory nutrition course. The original study was conducted to determine whether implementing a class assignment to prepare a home-cooked meal using a canned food as one of the ingredients helped students become more confident with both cooking and using canned foods. Questionnaires were administered at pre- and post-intervention periods. Data for current study (except demographics) were based on completed responses from the pre-intervention questionnaire (n=582). Demographic information was only collected in the post-intervention questionnaire; thus, this data was only available for a subset of those
who completed the pre-intervention questionnaire (n=515). The Institutional Review Board at Brigham Young University approved this study.

**PUCF Questionnaire**

A brief overview of the PUCF online questionnaire will be provide herein; a more detailed description of questionnaire development can be found in Richards et al. The questionnaire consisted of 65 total items, which were organized into 5 theoretic constructs: knowledge (9 items), attitude (30 items), self-efficacy (12 items), canned food use (8 items), and environment (6 items). On the PUCF questionnaire, canned foods were defined as foods that are shelf-stable after being processed in bottles, plastic containers, or metal cans. Canned legumes included beans that are already softened and cooked, packaged in cans, and ready-to-use, such as black, kidney, pinto, garbanzo, lentils, but not green beans or green peas. Canned meats included chicken, tuna, salmon, Vienna sausages, SPAM®, etc. Canned fruits and vegetables were not defined.

Within each theoretic construct, we selected questions from the original questionnaire whose answers would reasonably be influenced by a student’s parent’s use of canned foods. Within the knowledge construct, we used 1 item: “I think that canned foods can count toward recommendations for good nutrition in the US” (item #1). Using a 5-point Likert scale, students selected answers ranging from 1=”strongly disagree” to 5=”strongly agree.” Within the attitude construct, we used 17 items, such as, “I think that canned vegetables are as nutritious as fresh vegetables” (items #7,15-30). The same 5-point Likert scale as above was used, as well as an additional 5-point Likert scale which included answer options ranging from 1= “I really like” to 5=“I am not sure if I like” for 4 items. Within the likeability construct, a 7-point Likert scale was used ranging from
1="dislike very much" to 7="like very much." Within the self-efficacy construct, we used 5 items, such as, “I am confident that I can prepare recipes using canned vegetables” (items #8-12). The same 5-point Likert scale ranging from 1="strongly disagree" to 5="strongly agree" was used. Within the canned food use construct, we used 4 items, such as, “Over the past 7 days (1 week), estimate how often you ate canned vegetables” (items #1-2, 5, and 7). Answer options ranged from “Never” to “More than 7 times in the past 7 days (more than 1 time per day).” Within the environment construct, we used 1 item: “As I was growing up, canned foods were frequently used in meal preparation” (item #1). The same 5-point Likert scale of 1="strongly disagree" to 5="strongly agree" was used for the environment construct.

**Data Analysis**

Descriptive statistics were used to analyze demographic variables. Students who responded “Strongly Agree” or “Agree” to the question, “As I was growing up, canned foods were frequently used in meal preparation," were classified as "exposed to canned foods (ECF)," while students who responded with “Strongly Disagree, or “Disagree” were classified as "not exposed to canned foods (NECF)." Students who answered “neither agree nor disagree” were classified as “neutral (NE).” ANOVA statistics were used to detect differences among ECF, NECF, and NE. All analyses were performed in Statistical Analysis System software (version 9.2, SAS Institute, Inc, Cary, NC, 2007). To account for multiple comparisons bias, p<0.001 was considered statistically significant.
RESULTS

Approximately two thirds of students were female and of freshman or sophomore year (Table 1). Approximately 14% of the students agreed that canned foods were frequently used during childhood meal preparation (Table 1).

Significant differences were observed between the ECF group, compared with the NECF group, related to perceptions regarding canned foods counting towards recommendations for good nutrition in the United States (Table 2). There was also a trend towards significance between ECF and NECF groups regarding canned foods' ability to contribute to easy meal preparation (p=0.006; Table 2). There was no significant difference between ECF and NECF groups for likeability; nutrition compared with fresh, frozen, or dried counterparts; and convenience (Table 2). There was also no significant difference between the two groups for frequency of canned food consumption within the past 7 days (Table 3).
Table 1. Demographic data of college students (n=515)

<table>
<thead>
<tr>
<th>Demographic category</th>
<th>Students, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>165 (32.0)</td>
</tr>
<tr>
<td>Female</td>
<td>351 (68.0)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td>20.7±2.6</td>
</tr>
<tr>
<td><strong>Year in College</strong></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>164 (31.8)</td>
</tr>
<tr>
<td>Sophomore</td>
<td>185 (36.1)</td>
</tr>
<tr>
<td>Junior</td>
<td>114 (22.1)</td>
</tr>
<tr>
<td>Senior</td>
<td>49 (9.5)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (0.4)</td>
</tr>
<tr>
<td><strong>Major</strong></td>
<td></td>
</tr>
<tr>
<td>Nutrition, Dietetics, and Food Science (NDFS)</td>
<td>42 (8.1)</td>
</tr>
<tr>
<td>Non-NDFS</td>
<td>465 (90.9)</td>
</tr>
<tr>
<td>Other/undeclared</td>
<td>5 (1)</td>
</tr>
<tr>
<td><strong>“As I was growing up, canned foods were frequently used in meal preparation”</strong></td>
<td></td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>27 (5.7)</td>
</tr>
<tr>
<td>Disagree</td>
<td>210 (44.7)</td>
</tr>
<tr>
<td>Neither agree nor disagree</td>
<td>168 (35.7)</td>
</tr>
<tr>
<td>Agree</td>
<td>52 (11.1)</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>13 (2.8)</td>
</tr>
</tbody>
</table>

1 Age, year in college and major variables based on responses to the post-intervention questionnaire. Additionally, the "As I was growing up, canned foods were frequently used in meal preparation" variable based on responses to the pre-intervention questionnaire.
2 Missing data, n=1
3 Missing data, n=3
4 Missing data, n=112
Table 2. Perceptions of canned foods among college students, based on exposure to canned foods during childhood (n=582)

<table>
<thead>
<tr>
<th>Questionnaire response</th>
<th>ECF, MEAN±SE (n=65)</th>
<th>NE, MEAN±SE (n=168)</th>
<th>NECF, MEAN ±SE (n=237)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Perceptions</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I think that canned foods help to make easy meals&lt;sup&gt;2&lt;/sup&gt;</td>
<td>4.4±0.1</td>
<td>4.3±0.1</td>
<td>4.1±0.0</td>
</tr>
<tr>
<td>I think that canned foods can count towards recommendations for good nutrition in the United States</td>
<td>4.0±0.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.8±0.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.4±0.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>I am confident that recipes I prepare with canned foods can taste good</td>
<td>4.0±0.1</td>
<td>3.8±0.1</td>
<td>3.9±0.1</td>
</tr>
<tr>
<td><strong>Likeability</strong>&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canned Vegetables</td>
<td>4.6±0.3</td>
<td>5.1±0.2</td>
<td>5.2±0.1</td>
</tr>
<tr>
<td>Canned Fruits</td>
<td>4.9±0.3</td>
<td>5.5±0.2</td>
<td>5.5±0.1</td>
</tr>
<tr>
<td>Canned Legumes</td>
<td>5.9±0.2</td>
<td>6.2±0.1</td>
<td>6.6±0.1</td>
</tr>
<tr>
<td>Canned meats</td>
<td>4.3±0.3</td>
<td>4.5±0.2</td>
<td>4.5±0.2</td>
</tr>
<tr>
<td><strong>Nutrition</strong>&lt;sup&gt;1&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As nutritious as fresh vegetables</td>
<td>2.1±0.1</td>
<td>2.1±0.1</td>
<td>2.3±0.1</td>
</tr>
<tr>
<td>As nutritious as frozen vegetables</td>
<td>2.8±0.1</td>
<td>2.7±0.1</td>
<td>2.6±0.1</td>
</tr>
<tr>
<td>As nutritious as fresh fruits</td>
<td>2.3±0.1</td>
<td>2.0±0.1</td>
<td>2.1±0.1</td>
</tr>
<tr>
<td>As nutritious as frozen fruits</td>
<td>2.7±0.1</td>
<td>2.4±0.1</td>
<td>2.5±0.1</td>
</tr>
<tr>
<td>As nutritious as dry legumes that have been cooked</td>
<td>3.0±0.1</td>
<td>2.7±0.1</td>
<td>3.1±0.1</td>
</tr>
<tr>
<td>As nutritious as fresh meats</td>
<td>2.1±0.1</td>
<td>2.0±0.1</td>
<td>2.1±0.1</td>
</tr>
<tr>
<td><strong>Convenience</strong>&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More convenient than fresh vegetables to use in recipes</td>
<td>3.3±0.1</td>
<td>3.2±0.1</td>
<td>3.4±0.1</td>
</tr>
<tr>
<td>More convenient than frozen vegetables to use in recipes</td>
<td>3.2±0.1</td>
<td>3.0±0.1</td>
<td>3.0±0.1</td>
</tr>
<tr>
<td>More convenient than fresh fruits to use in recipes</td>
<td>3.0±0.1</td>
<td>3.0±0.1</td>
<td>3.1±0.1</td>
</tr>
<tr>
<td>More convenient than frozen fruits to use in recipes</td>
<td>3.1±0.1</td>
<td>2.9±0.1</td>
<td>2.9±0.1</td>
</tr>
<tr>
<td>More convenient to use in recipes than dry legumes that need to be soaked and then cooked</td>
<td>4.1±0.1</td>
<td>4.1±0.1</td>
<td>4.3±0.1</td>
</tr>
<tr>
<td>More convenient than fresh meats to use in recipes</td>
<td>3.1±0.1</td>
<td>2.9±0.1</td>
<td>2.7±0.1</td>
</tr>
</tbody>
</table>

<sup>1</sup>A 5-point Likert scale was used ranging from 1=strongly disagree to 5=strongly agree

<sup>2</sup>Comparison between ECF and NECF had a p=0.006, which suggests a trend towards significance.

<sup>3</sup>The question item stated, "Considering your overall impression of each canned food in general, how much do you like or dislike each of the following canned foods?" and was based on a 7-point Likert scale with 1=dislike very much to 7=like very much.

Differing alphabetical/letters across rows indicate significance (p<0.001)
Table 3. Current consumption (within the past 7 days) of canned foods among college students (n=582)

<table>
<thead>
<tr>
<th>Questionnaire Response</th>
<th>ECF, n (%) (n=65)</th>
<th>NE, n (%) (n=168)</th>
<th>NECF, n (%) (n=237)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canned vegetables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers²</td>
<td>31 (47.7)</td>
<td>83 (49.4)</td>
<td>132 (55.5)</td>
</tr>
<tr>
<td>Non-consumers</td>
<td>34 (52.3)</td>
<td>85 (50.6)</td>
<td>105 (44.5)</td>
</tr>
<tr>
<td><strong>Canned fruits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers²</td>
<td>20 (30.8)</td>
<td>56 (33.3)</td>
<td>84 (35.4)</td>
</tr>
<tr>
<td>Non-consumers</td>
<td>45 (69.2)</td>
<td>112 (66.7)</td>
<td>153 (64.6)</td>
</tr>
<tr>
<td><strong>Canned legumes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers²</td>
<td>38 (58.5)</td>
<td>92 (54.7)</td>
<td>148 (62.5)</td>
</tr>
<tr>
<td>Non-consumers</td>
<td>27 (41.5)</td>
<td>76 (45.2)</td>
<td>89 (37.5)</td>
</tr>
<tr>
<td><strong>Canned meats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers²</td>
<td>32 (49.2)</td>
<td>65 (38.7)</td>
<td>80 (33.8)</td>
</tr>
<tr>
<td>Non-consumers</td>
<td>33 (50.8)</td>
<td>103 (61.3)</td>
<td>157 (66.2)</td>
</tr>
</tbody>
</table>

¹Missing data, n=112
²Consumers are those who consumed canned vegetables, fruits, etc. at least 1-2 times in the past 7 days

Totals may not add up to 100% because of rounding.
DISCUSSION

The purpose of the current study was to investigate household use of canned foods during college students' childhoods and its effect on students' current understandings of, perceptions towards, and usage of canned foods. We found that those who experienced frequent utilization of canned foods during childhood meal preparation, compared to those who did not, more strongly agreed that canned foods could count towards dietary recommendations in the United States (US). Given parents most likely were the primary food preparer in the home, it is reasonable to infer that college students’ parents were the ones using canned foods during their childhood. The presence of canned foods in the home could have positively influenced students’ perceptions about these foods being nutritious. Previous research has suggested that parenting practices, such as role modeling, can shape children's attitudes and beliefs about food. An additional explanation may be that by the time the PUCF questionnaire was administered, students had been taught in class that canned foods count towards US dietary recommendations. If students had frequently seen canned foods utilized in their household, they may have been more inclined to believe this in-class teaching.

Exposure to canned foods while growing up was not related to students' perceptions of canned foods being as nutritious as fresh, frozen, or dried counterparts. Overall, both groups perceived canned foods as less nutritious than the other food forms. However, research has elucidated that some canned foods may be a comparable—if not better—source of nutrition than fresh or frozen foods. Miller et al compared the nutritional value of various produce that were either fresh, frozen, or canned and found that canned vegetables were nutritionally comparable among all three forms, with the
canned vegetables costing significantly less. Rickman et al\textsuperscript{29} found that some fat-soluble nutrients, such as B-carotene and lycopene, were more bioavailable after canned processing compared with fresh or frozen options. Likewise, canned peaches have been shown to be nutritionally richer than fresh peaches.\textsuperscript{30} Researchers have also concluded that consumers may underestimate the nutrients lost in fresh produce and that many water-soluble nutrients may be better retained during canning or freezing processes.\textsuperscript{39} If a person's experience is with the less nutritious canned food options (e.g. those with high amounts of added sugars or higher sodium contents), they may generalize and assume all canned foods are less nutritious compared to fresh and frozen counterparts. The Dietary Guidelines of America acknowledges that some canned foods are healthier than others and recommends that consumers choose canned fruits and vegetables with limited added sugars and sodium, respectively.\textsuperscript{35} Exposure to less nutritious canned food options may partially explain why, in 2013, 42\% of consumers were unaware that canned foods could contribute to a healthy diet.\textsuperscript{33} Results from our study suggest that additional nutrition education efforts in homes and the community may be needed to shift parents' and students' perceptions about the health benefits of specific canned food types compared to other forms.

Results from our study also showed a trend toward students' perceptions that canned foods help with easy meal preparation, if their households used canned foods during their childhood. Canned foods typically require little preparation beyond heating or in some cases, can be consumed directly from the can.\textsuperscript{31} Perhaps the sheer exposure to parents using canned foods in meal preparation when students were growing up helped students to see that meals could be made easily using canned foods. However,
interestingly, there were no significant differences between the two groups and perceived convenience of canned foods compared to fresh or frozen forms, consumption of canned foods, or likability of canned foods. Throughout the average week, both the exposed and the unexposed consumed the same amount of canned foods and had positive feelings towards canned foods' likeability.

The main limitation in our study was that exposure to canned foods was analyzed via one question, which asked about the frequency with which canned foods were used in household meal preparation during a student's childhood. It is therefore unclear if students were doing the food preparation themselves or if they were helping parents with household cooking. If students did not significantly assist with meal preparation, they may have had little knowledge that canned foods were being used during meal preparation. An additional limitation was that only 65 of the respondents were classified as ECF, compared with 235 who were NECF. This uneven representation may have affected the overall means for each group. Another limitation was that, in the survey, students were only asked about their current usage of canned foods within the last 7 days; it is probable that this is too short of a time period to fully understand students' current usage of canned foods. Lastly, "frequency" was not defined on the survey item related to canned food usage when students were growing up, thus it was left up to the interpretation of the students to infer the definition of "frequency." More thorough questioning is needed to better understand the extent students assisted with home meal preparation, the types of canned foods that were utilized during students’ childhoods, how canned foods were used in meal preparation (whether the meals were perceived by students to be tasty), and the frequency with which parents prepared meals.
IMPLICATIONS FOR RESEARCH AND PRACTICE

In conclusion, frequent usage of canned foods during a student's childhood positively affected students' perceptions towards canned foods' ability to meet dietary recommendations, though it did not affect students' actual usage. Encouraging parents to use canned foods in meal preparation may help promote positive perceptions that can last until adulthood. However, more in-depth questioning is still needed to discern the extent to which parental role modeling affects children's overall opinions towards and usage of canned foods and the ability of these perceptions to persist over time. Interventional studies in which canned foods are introduced to children at home and then children’s canned food perceptions and usage are monitored over time would be of great value in discerning how parental role modeling, exposure to canned foods, and home availability affects students' current perceptions and use of canned foods.
References:


31. Canned Food Alliance. 6 Reasons Canned Foods Fill My Pantry

32. Canned Food Alliance. The science behind canned food.
33. Canned Food Alliance. Canned food myths—busted!


