

Effects of prior nutrition education on knowledge of function of carbohydrates and content of individuals' food choices

Introduction

With increased access to endless information, due to our technological advancements, it can be safe to assume that there are vast amounts of individuals that have had or are currently reading up about nutrition in hopes of optimizing one's diet. Yet, this technological access is only one factor in the equation that influences individual food choices; with others being the changing environment, physical need, biological basis, and personal lifestyle (1).

The current literature on factors influencing food choices is rich with evidence, from varying research fields, that has been narrowed down to five main categories (1). These categories include food-internal factor via sensory and perceptual features; food-external factors that include information, social, and physical environment; personal-state factors involving individual biology, physiological needs, psychological factors, and individual experiences; cognitive factors such as knowledge, skill, preferences, anticipated outcomes, and identity; and lastly sociocultural factors that include an individual's culture, income, food costs, and policy (1). In summary, people choose their foods for a variety of reasons (2). But what is education's influence on this?

The purpose of our study was to identify cognitive factors of food choice, more specifically the participants knowledge of nutrition in relation to carbohydrates (CHO) and its impact on their food choices.

Methods

A survey was created using REDCap, combining multiple choice and free response questions for participants to answer. The survey was shared on social media websites. Paper copies of the electronic survey were printed and made available at a local food bank to make participation more accessible regardless of technology ownership.

134 total participants completed the survey in either electronic or paper form. The following information was collected from participants: age, gender identity, number of people in household, participants' highest level of education, whether or not participants were currently following a medically indicated diet, whether or not participants were currently following a self-prescribed diet, food allergies, food sensitivities/intolerances, social media use, what a CHO is in participants' own words, what a CHO does within the body in participants' own words, whether CHO content of foods affects the likelihood that they buy it, and whether or not the participant has any previous nutrition education. Captured answers were organized into data processing software in preparation for statistical analysis.

Analysis

Participants answers were cleaned up of inconsistencies in formatting due to the free response configuration of elements of the REDCap survey. Before formal analysis began, participants' definitions of having had previous "nutrition education" were made universal. To ensure a consistent definition of nutrition education, only those that received formal classes (at any level) or met with an RD Nutritionist were deemed to have received nutrition education for the purposes of this study. This was done in a duplicated column in data processing software (Microsoft Excel) in order to look at informal nutrition education that self-reported by participants and also formal education as defined by the research team.

Additionally, participants answers on what CHO is and what CHO does within the body where characterized for correctness and assigned a score of either "Yes" (Y), "No" (N), or "Partially correct" (P). If answers were robust and contained only correct elements, they were categorized as "Y". If only incorrect elements were present, the answer was categorized as "N". A "P" answer was either vague or contained both correct and incorrect elements. Individuals' dietary choices were also analyzed in regard to their prior self-reported nutrition education (informal nutrition education). People were asked if CHO content influenced whether or not they would buy and consume certain foods. Answer choices were: "Yes", "No", "I don't know", and "Sometimes".

Chi-squared (χ^2) analyses were performed between different sets of collected variables within the data set. Results are presented at the $\geq 95\%$ confidence interval.

Give you energy? Idk	P
Give you energy	P
Carbs provide our bodies with glucose, which is then used as energy in the body to help with our bodily functions.	Y
They breakdown into their simplest forms (glucose, fructose, galactose), are absorbed in our blood, and transported throughout our body to provide a source ATP (energy).	Y
No clue	N

Fig. 1: **Coded Survey Participant CHO Answers.** A few Participant answers are shown here categorized as either "Y", "P", or "N".

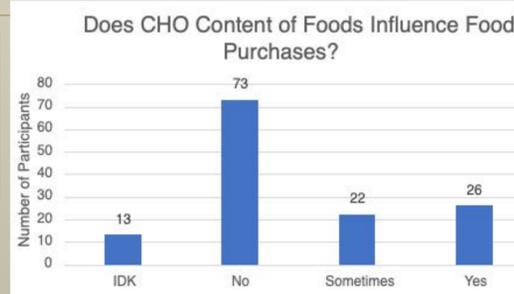


Fig. 2: **Effect On CHO Choices.** Participants answered whether the CHO content of foods influenced their buying habits. IDK= "I don't know"

Results

The first data set that that was cross-compared included participants who self-reported having nutrition education and their general knowledge of carbohydrates. Within this data set and out of the total participants, 74 participants self-reported not having any nutrition education whereas 60 participants reported nutrition education.

CHO Knowledge	Informal Nutrition Ed		Grand Total
	0	1	
N	30	7	37
P	35	31	66
Y	9	22	31
Grand Total	74	60	134

Fig. 3: **Effect of Informal Nutrition Education on CHO Knowledge.** Participants were categorized on the correctness of their answer of "What are carbohydrates?" and compared against self-reported prior informal nutrition education (0 = no prior nutrition education, 1= prior informal nutrition education).

This supports the theory that prior informal nutrition education serves as a predictor for knowledge of CHO function ($P < .0001$).

Results (continued)

The second data set included those same participants' answers on CHO definitions in their own words compared to prior standardized formal nutrition education. Within this data set and out of the total participants, 105 participants were found to not qualify as having had formal nutrition education whereas 29 participants had received formal nutrition education. 21.6% of study participants had received formal nutrition education before taking part in this survey.

Cho Knowledge	Formal Nutrition Ed		Grand Total
	0	1	
N	36	1	37
P	54	12	66
Y	15	16	31
Grand Total	105	29	134

Fig. 4: **Effect of Formal Nutrition Education on CHO Knowledge.** Participants were categorized on the correctness of their answer of "What are carbohydrates?" and compared against standardized prior formal nutrition education (0 = no prior nutrition education, 1= prior informal nutrition education).

This supports the theory that prior formal nutrition education strongly serves as a predictor for knowledge of CHO function ($P < .0000001$).

When food choice was analyzed, no significant connection between food choice was determined to exist with prior informal nutrition education. ($P = 0.1399$). Food choice compared to formal nutrition education exhibited the same spread of answers but with the distribution of prior formal nutrition education being different. Overall, no significant connection between food choice was determined to exist with prior formal nutrition education ($P = 0.1803$).

Food Choice	0	1	Total
Y	11	15	26
S	10	12	22
N	43	30	73
U	10	3	13

Fig. 5: **Does the carbohydrate content of foods affect food choices compared to prior informal nutrition education.** Participants answered whether the CHO content of foods affected their buying habits with "Yes" (Y), "Sometimes" (S), "No" (N), or "Unsure" (U). (0 = no prior nutrition education, 1= prior informal nutrition education).

Food Choice	0	1	Total
Y	18	8	26
S	17	5	22
N	57	16	73
U	13	0	13

Fig. 6: **Does the carbohydrate content of foods affect food choices compared to prior formal nutrition education.** Participants answered whether the CHO content of foods affected their buying habits with "Yes" (Y), "Sometimes" (S), "No" (N), or "Unsure" (U). (0 = no prior nutrition education, 1= prior formal nutrition education).

Conclusion

In conclusion, this study has shown a distinct and significant relationship between an individual's prior nutrition education, in relation to CHO, and its impact on the knowledge of CHO function. Yet there was no evidence that the nutrition knowledge affected participant food choices. The study did show 13 participants who were unsure if CHO content influenced food purchases; none of which had formal nutrition education. Although there were many other confounding variables that were not controlled for, such as socioeconomic factors, psychological factors, culture, and environment, inferences can still be made for increased efforts to promote nutrition knowledge for individuals to better equip them to make better educated food choices.

Due to the survey design, the data that participants had given was somewhat abstract when answering questions such as "What are CHOs?" and "What do CHOs do in the body?". Since there were no clear cut answers, a scoring system had to be established in order to make use of the data; in doing so it did add a level of bias through the non-standardized method of establishing correctness in participant answers. Defining right or wrong answers, possibly in multiple choice format, may be something to consider for future replications of this study. This would give a more distinct representation of nutrition knowledge compared to giving partial credit and further complicating the analysis.

There are many studies that show how incomplete, or incorrect, knowledge of food composition and understanding of dietary guidelines, paired with incorrect beliefs about food and health, could place individuals who attempt certain self-prescribed diets at nutritional risk; if it is not professionally guided (3). With future revisions of this study, it is with hope to find a relationship between food knowledge and food choice. Doing so would imply that the promotion of nutrition education could lead to better dietary management, effective nutrition therapy compliance, and preventative health maintenance if individuals have better understanding behind the mechanisms of CHO and the body.

Recommendations

- Look further into data sets including household size, ages within household, and nutrition education of individuals within household size and its influences on household CHO purchases.
- Consider further research into food access delivery methods (WIC, SNAP, CSFP) in lieu of nutrition education and its influences on dietary habits (CHO choices for meals).
- Look at population's CHO consumption and compare to Dietary Guidelines for Americans.
- When designing future studies, it may be beneficial to emphasize different CHO types; such as complex vs. simple, whole grains, etc.
- For future replication of studies, consider wording and biases for questions that may influence participant answers.

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References

- Chen PJ, Antonelli M. Conceptual models of food choice: Influential factors related to foods, individual differences, and society. *Foods*. 2020;9(12):1898. Published 2020 Dec 18. doi:10.3390/foods9121898
- Leng G, Adan AH, Belot M, Brunstrom JM, de Graaf K, et al. The determinants of food choice. *Proceedings of the Nutrition Society*. 2016; 2017(76):316-327. doi:10.1017/S002966511600286X
- Churangsuk C, Lean MEJ, Combet E. Carbohydrate knowledge, dietary guideline awareness, motivations and beliefs underlying low-carbohydrate dietary behaviours. *Scientific Reports*. 2020;10(1):14423. doi:10.1038/s41598-020-70905-2
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics*. 2009; 42(2): 377-381. doi:10.1016/j.jbi.2008.08.010
- Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics*. 2019; 95: 103208. doi:10.1016/j.jbi.2019.103208
- Obeid JS, McGraw CA, Minor BL, et al. Procurement of shared data instruments for Research Electronic Data Capture (REDCap). *Journal of Biomedical Informatics*. 2013; 46(2) :259-265. doi:10.1016/j.jbi.2012.10.006