An Objective Measure of Nutrition Facts Panel Usage and Nutrient Quality of Food Choice

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ABSTRACT

Objective: The relationship between time viewing nutrition information and nutrient quality of foods chosen in a food selection task was objectively evaluated through direct observation using an eye-tracking camera.

Methods: A total of 202 participants' food choices were scored for nutrient density. Multivariate linear regression analysis was conducted with mean nutrient density of foods selected regressed on mean label viewing time and participants' sociodemographic characteristics.

Results: Label viewing time was not significantly associated with nutrient density food score. A significant relationship emerged between the covariate, age, and mean nutrient density food score such that mean nutrient density scores were higher for older participants compared with younger ones ($P = .04$). Foods selected by males had a higher mean nutrient density score than foods selected by females ($P = .03$).

Conclusions and Implications: Findings suggest that those who spend more time viewing nutrition facts panels during a single shopping trip may not select more nutritious foods.

Key Words: food labeling, nutrition policy, eye tracking (*J Nutr Educ Behav*. 2014;46:589-594.)

Accepted April 21, 2014. Published online June 24, 2014.

INTRODUCTION

Nutrition labels can provide a population-level mechanism to help consumers make healthy food choices by providing nutrition information before the point of purchase.[1,2] Nutrition labels are designed to protect and enhance public health by providing consumers information to help them make informed food choices.[3,4] Recently, nutrition labeling has received considerable attention.[5-7]

Current US nutrition labeling guidelines are based on the 1990 Nutrition Labeling and Education Act (NLEA), which regulates labeling and mandates a standardized nutrition table format on most packaged food products regulated by the Food and Drug Administration.[8] The NLEA was predicted to decrease health care costs and benefit public health by providing consumers access to easily understandable nutrition information in the form of nutrition facts panels (NFPs).[9,10] Despite these intentions, NFPs are often misunderstood or misinterpreted and the cost and prevalence of diet-related diseases have increased nationwide since implementation of the NLEA.[11,12]

Previous studies identified certain individual characteristics associated with nutrition labels use, including being female, married, more literate or educated, older, and regularly physically active, and having a larger household size.[13-15] Although between 45% and 80% of US adults report reading nutrition labels while shopping, studies using objective measures such as eye tracking report lower rates of label use.[16,17] In addition, there is limited research on the relation between overall diet quality and nutrition label use.[18] Previous research is limited to mainly cross-sectional studies examining the association between self-reported label use and individual nutrient or energy intake, typically not examining overall dietary quality.[19-21]

The current study makes a contribution by objectively measuring label use and assessing overall dietary quality based on a market basket of foods selected during a food selection task. To the authors' knowledge, no published work to date has objectively evaluated whether people's food choices are actually more nutritious when they use NFPs. Thus, the aim of this study was to evaluate, via direct observation, the influence of time spent viewing the NFP on the nutrient quality of food choices.

METHODS

The researchers obtained data from a cross-sectional study conducted at the University of Minnesota in 2010. This study was a simulated food shopping experiment in which adults were asked to report whether they would consider purchasing 64 individual food items they viewed on a computer. An eye-tracking camera precisely recorded the amount of time consumers spent

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http://dx.doi.org/10.1016/j.jneb.2014.04.296

viewing the NFPs on a variety of foods while these individuals considered purchasing each product. An on-campus laboratory equipped with a computer and a desk-mounted eye-tracking camera (EyeLink 1000, SR Research, Mississauga, Canada) served as the study setting.

Each food was scored for nutritional quality based on a nutrient density index algorithm developed by Drewnowski and colleagues.[22] An average nutrient density food score was calculated for each participant based on products they indicated they would consider buying. The researchers examined the association between average time spent viewing NFPs and average nutrient density food score to test the hypothesis that more time spent viewing nutrition labels would be associated with more nutritious food selections. In addition, sociodemographic-specific analyses were conducted with regard to average viewing time and average nutrient density score.

Participants

Participants ≥ 18 years of age (n = 202) and able to read English without hard contact lenses were recruited via advertisement placed in a magazine published and distributed in Minneapolis/St Paul, MN. Potential participants were informed that their eye movements would be monitored while they engaged in a simulated grocery shopping experience. Interested individuals provided verbal consent to participate, completed a 1-hour laboratory visit, and received a $40 gift card as compensation. Participants were blinded to the true intent of the study. This study was approved by the University of Minnesota's Institutional Review Board.

Procedures

A simulated grocery shopping computer program was created using SR Research's Experiment Builder software. The eye tracker enabled precise measurement of time that participants spent viewing NFPs while deciding whether they would purchase each food. The camera, which was positioned beneath and in front of a computer monitor, recorded the user's eye position 1,000 times/s. Before beginning the simulated shopping experiment, participants were told they would see a total of 64 foods. They were instructed to select "would not buy," "would buy," or "not applicable" (for any item to which they had a food allergy or dietary restriction that would preclude consumption). All participants completed the eye-tracker portion of the study in < 20 minutes and the entire study (food selection task with eye tracking, plus post-task survey completed without eye tracking) in < 1 hour.

During the shopping task, participants saw 64 foods across a variety of categories, presented in random order. Categories included snacks (eg, nuts, crackers), desserts (eg, ice cream, cookies), vegetables/fruits (canned and frozen), and meals (eg, cereal, pizza, soup). Included foods were of similar types with different degrees of nutritional quality (eg, shredded wheat cereal vs sugar-frosted shredded wheat cereal). Products were shown 1 at a time without brand names or packaging. The computer monitor displayed the following pieces of information for each food product: the food's photograph, price, product description, ingredients, and NFP. After participants finished indicating whether they would consider purchasing each of the 64 foods, they completed a survey assessing demographics, food consumption frequency, exercise habits, and nutrition information usage.

Measures

Measured viewing time. The authors used the EyeLink 1000 eye tracker to measure the time participants viewed each NFP component (serving size, calories, total fat, saturated fat, trans fat, sodium, total carbohydrates, dietary fiber, sugar, protein, vitamin A, vitamin C, calcium, and iron). Although the EyeLink 1000 records eye position every millisecond, ≥ 50 ms is necessary to read a piece of information.[23,24] Thus, 50 ms was the minimum amount of viewing time required for each NFP component to be considered viewed.

Food scores. To rate the overall nutritional quality of participants' food choices, the Nutrient Rich Food index algorithm was used to calculate nutrient density scores for the 64 included foods. Development of the nutrient density algorithm has been previously summarized.[22] Briefly, the Nutrient Rich Food index algorithm is the difference between the unweighted sum of the percent daily values of 6 nutrients to encourage (protein, fiber, vitamins A and C, and minerals calcium and iron) and the sum of percent maximum recommended values for 3 nutrients to limit (saturated fat, total sugar, and sodium) divided by energy density (gram weight of serving divided by calories per serving). Nutrient density food scores were calculated per Food and Drug Administration–defined serving size, (ie, the reference amount customarily consumed) and nutrients were capped at 100% Daily Value. Foods received a higher score (eg, 51.00 for frozen mixed vegetables) if they contained more nutrients to encourage compared with their quantity of nutrients to limit. Foods containing high amounts of nutrients to limit received a lower score (eg, 4.77 for ice cream).

Survey. Participants self-reported age, sex, race, income, marital status, weight, and height. Body mass index (BMI) was calculated (kg/m^2) from self-reported height and weight.

Analysis

Tests of normality indicated no concerning skew for mean nutrient density food score. However, because there was skew present in the dwell time outcome variable, the researchers also conducted analyses using a log-transformed variable. This transformation did not change the pattern of results, so the untransformed values are presented. Paired comparison *t* tests were used to determine whether there were differences in time spent viewing NFPs or in nutrient density of selected foods by sex, race, marital status, education, and BMI category. Analysis of variance was used to determine whether there were differences in NFP viewing time or nutrient density across income levels. The omnibus *F* statistic was used to determine whether there was an overall effect of income on dependent variables of interest (ie,