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Research report

Influence of simplified nutrition labeling and taxation on laboratory energy intake in adults

Jennifer L. Temple [a,*], Karena M. Johnson [a], Kelli Archer [a], Allison LaCarte [a], Christina Yi [a], Leonard H. Epstein [b]

[a] Department of Exercise and Nutrition Sciences, School of Public Health and Health Professions, University at Buffalo, 3435 Main Street, 15 Farber Hall, Buffalo, NY 14214, USA
[b] Department of Pediatrics, Medicine and Biomedical Sciences, University at Buffalo, Buffalo, NY 14214, USA

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ABSTRACT

The purpose of these studies was to test the hypotheses that simplified nutrition labeling and taxation alter food selection and intake. In Experiment 1, participants consumed lunch in the laboratory three times with no labels, standard nutrition labels, or traffic light diet labels at each visit. In Experiment 2, participants were given $6.00 with which to purchase lunch in the laboratory twice with standard pricing on one visit and a 25% tax on "red" foods on another visit. Participants received a brief education session on the labeling systems being used. Total energy intake and energy intake and number of foods purchased from each traffic light category were measured. Nutrition labeling decreased energy intake in lean females, but had no effect in men or in obese females. Traffic light labels increased consumption of "green" foods and decreased consumption of "red" foods. Taxation decreased the purchasing of "red" foods in obese, but not non-obese participants. There were no interactions between taxation and simplified nutrition labeling. Although generalization to real-world purchasing and consumption is limited by the laboratory study design, our findings suggests that taking multiple, simultaneous approaches to reduce energy intake may have the greatest impact on food purchases and/or nutrient consumption.

Introduction

The nutrition facts label was initiated by Congress in 1990 under the Nutrition Labeling and Education Act (NLEA) as an attempt to help consumers to make healthier dietary choices when purchasing foods by requiring that all packaged foods display standard nutrition information (NLEA, 1990). Despite the availability of nutrition information on the vast majority of foods in the United States, obesity prevalence continues to rise among children and adults, suggesting that individuals do not use and/or do not understand the information provided on the nutrition facts label. For this reason, there is interest in exploring alternative approaches to providing point-of-purchase nutritional information and encouraging consumers to make healthier food choices.

One option to improve usefulness of nutrition information is the development of nutrient profiling systems that provide simplified nutritional point-of-purchase information through the use of symbols or numbers. One such nutrition labeling system is the traffic light diet (TLD) labels which divide all foods into three categories (green, yellow, and red) based on fat and sugar content (Epstein & Squires, 1988; Valoski & Epstein, 1990). "Green" foods are low in calories, added sugar (<10% of calories/serving) and fat (0–1 g fat/serving). "Yellow" foods are moderate in calories, added sugar (10–25% of calories/serving), and fat (2–5 g fat/serving). "Red" foods are higher in calories, added sugar (>25% of calories/serving), and fat (>5 g fat/serving). The criteria for food categorization used in this study are based on the traffic light diet and are different from those highlighted below that are used as a nutrient profiling system in grocery stores in the UK. We chose to use the more restrictive categorization because this system has been used in behavioral interventions treating childhood obesity as part of a comprehensive treatment plan; resulting in successful decreases in obesity in preadolescent children (Epstein, Myers, Raynor, & Saelens, 1998; Epstein, Wing, Koeske, Andrasik, & Ossip, 1981a; Epstein, Wing, Koeske, & Valoski, 1984; Epstein, Wing, Penner, & Kress, 1985; Valoski & Epstein, 1990). Use of the TLD labels has been associated with enhanced nutrient intake from protein, calcium, iron, vitamin A, thiamine, and riboflavin with reduced total fat consumption in obese preadolescents (Valoski & Epstein, 1990). All of these changes in intake corresponded with either weight loss (Epstein, Wing, Koeske, Andrasik, & Ossip, 1981b) or a decreased percentage of overweight status (Duffy & Spence, 1993).

* Corresponding author.
E-mail address: Jltemple@buffalo.edu (J.L. Temple).

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In addition to its use in obesity treatment, the traffic light labeling system is used in grocery stores in the UK and in Australia as a way to improve dissemination of nutrition information at the point-of-purchase (Kelly et al., 2009; Lobstein & Davies, 2009). Several studies comparing the ability of consumers to identify foods as more or less healthy, foods given traffic light labels were correctly categorized more often than those with other types of labels, suggesting that this system does help people identify healthier options (Borgmeier & Westenhoefer, 2009; Gorton, Ni Mhurchu, Chen, & Dixon, 2009; Kelly et al., 2009). Despite these findings, preliminary field work examining the impact of traffic light labels on purchasing of prepared meals and sandwiches suggests that sales of specific categories of foods did not change after the traffic light labels were introduced (Sacks, Rayner, & Swinburn, 2009). This suggests that more research needs to be done on simplified nutrition labeling before its widespread introduction as a public health strategy to improve dietary quality.

An alternative approach to modifying purchasing behavior is manipulating price (Faith, Fontaine, Baskin, & Allison, 2007). Basic economic theory suggests that as the price of a commodity is increased, purchasing of that product will decrease. Thus, one way to achieve the goal of reducing purchasing and consumption of nutrient poor foods and beverages would be to increase the price of these foods. Price manipulations have been shown to modify purchases of food in laboratory settings (Epstein, Dearing, Handley, Roemmich, & Paluch, 2006; Epstein, Dearing, Paluch, Roemmich, & Cho, 2007; Epstein, Dearing, Roba, & Finkelstein, 2010), vending machines (French et al., 2001), cafeterias (Hannan, French, Story, & Fulkerson, 2002; Lowe et al., 2010), and restaurants (Horgen & Brownell, 2002). The majority of studies that have been conducted have focused on providing subsides to increase purchasing of nutrient dense foods (reviewed in French, 2003). Relatively few studies have examined selective taxation of nutrient poor foods to try and reduce purchasing. One such study, using a laboratory-based grocery store design in which food prices could be manipulated, Epstein and colleagues showed that selective taxation of high calorie for nutrient food decreased the total energy purchased with the greatest influence on energy from fat and carbohydrate (Epstein et al., 2010). Studies have examined taxation of individual food types, such a sugar-sweetened beverages. These studies find that as the price of sugar sweetened beverages increases, purchasing decreases (Brownell et al., 2009; Finkelstein, Zhen, Nonnemaker, & Todd, 2010). In addition to reduction in purchasing, tax policies such as this one would generate revenue that could be used to further educated the public on proper nutrition and health (Brownell et al., 2009). More studies need to be conducted to examine the impact of price increases on nutrient poor foods on food selection and energy intake, but preliminary studies suggest that this broader taxation policy (Ex. a "junk food tax") could have a small, but significant impact on energy intake and chronic disease risk (Mytton, Gray, Rayner, & Rutter, 2007; Sacks, Veerman, Moodie, & Swinburn, 2010).

This purpose of the studies presented here was to examine the independent and interactive effects of simplified nutrition labeling, education on how to read and interpret nutrition labels, and taxes on food selection and energy intake in a laboratory-based, cafeteria analogue. In Experiment 1, we tested the hypothesis that providing TLD labels at a buffet lunch would decrease energy intake and increase the purchase of nutrient dense ("green") foods when compared to either standard nutrition information or to no nutrition information. In Experiment 2, we tested the hypothesis that providing both TLD labels and increasing the price ("taxation") of nutrient poor ("red") foods would lead to greater reductions in energy intake and "red" food purchasing than either TLD labels or "taxation" alone. Although these studies are conducted in laboratory environments where findings may not always generalize to "real-world" situations, they will provide preliminary information on the potential usefulness of these strategies for improving healthy eating and reducing energy intake.

Methods

Participants

Participants in this study were 18–50-year-old University at Buffalo students, staff, and community members who were in good general health. They were recruited through flyers posted and distributed on the University at Buffalo North and South campuses and through word of mouth. Participants were excluded from the study if they self-reported current dieting, medical conditions or medications affecting appetite (i.e. methylphenidate), a dislike for study foods, eating disorders assessed by concurrent scores of >28 on the Binge Eating Scale (BES) and a binge-eating disorder indication on the Questionnaire of Eating and Weight Patterns (QEWP), or indications of restraint or disinhibition assessed by the Three Factor Eating Questionnaire (TFEQ). Participants were scheduled and categorized according to weight status and gender. In Experiment 1, we recruited overweight/obese ($n = 35$) and lean ($n = 16$) males ($n = 23$) and females ($n = 28$). In Experiment 2, we recruited non-obese ($n = 21$) and obese ($n = 20$) males ($n = 20$) and females ($n = 21$). Weight status stratification was initially conducted using BMI calculated from participant reported weight and height and then adjusted when necessary based on anthropometric measurements taken in our laboratory. This protocol was approved by the Social and Behavioral Sciences Institutional Review Board of The State University of New York – University at Buffalo.

Screening procedures

To determine eligibility, potential participants were emailed a brief survey (using Survey Monkey™), which collected demographic, anthropometric (i.e. height, weight) and basic medical information (i.e. current medications used, medical illnesses, food allergies), as well as food preferences. To obtain food preferences, they were asked to rate a list of study foods (described later) on a 7-point Likert scale ("1" meaning "do not like at all" and "7" meaning "like very much"). A participant was considered ineligible if they were taking any medications that interfered with eating or appetite (ex. methylphenidate) or if they did not report at least a moderate liking (a 4 on a 7 point Likert scale) of 5 or more of the study foods. If participants were eligible, they were telephoned and provided a brief description of the study. If they were interested in participating, they were scheduled for visits to our laboratory.

Point-of-purchase nutrition information

In both studies, there were several possible nutrition information conditions: no labels (NL), standard nutrition labels (SL), or TLD labels (TLD). For the SL visit (Experiment 1 only), participants were provided nutrition information to resemble the manufacturer's label, following the standard USDA format, but information regarding servings (i.e. serving sizes, serving per container) corresponded with the amounts presented at this buffet lunch. Also, labels were made to be larger in size (4 in. width × 6 in. height) to ensure that they could be read easily. The researcher briefly demonstrated to each participant how to read and interpret major concepts on the standard nutrition labels including servings, calories, macro- and micronutrients, and percent daily values. This demonstration was scripted to assure each participant received the same information. This procedure and these labels have been used previously (Temple, Johnson, Recupero, & Suders, 2010). For the