



Research report

Substitution of healthy for unhealthy beverages among college students. A health-concerns and behavioral-economics perspective

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ABSTRACT

Excessive intake of sugar-sweetened beverages by undergraduates is closely related to the increasing prevalence of obesity, making investigations of the substitution of healthy for unhealthy beverages imperative. According to the concept of price elasticity in behavioral economics, the choice of healthy over unhealthy behaviors is facilitated by increasing the cost of less-healthy alternatives or reducing the cost of healthier alternatives. Furthermore, evoking health concerns by using health claims may induce substitution of healthy for unhealthy beverages. A total of 108 18–22-year-old undergraduates participated in a laboratory experiment and were given a certain amount of money and allowed to purchase a healthy beverage and a less-healthy beverage with or without receiving health claims. Increasing the price of a type of beverage was shown to reduce purchases of that beverage type and lead to substitution with the alternative type. Moreover, the effect of price elasticity on healthy beverage substitution was more pronounced when participants' health concerns were evoked. The results suggest that lowering the cost of alternative commodities and evoking health concerns by health-related claims would foster the substitution of healthier for unhealthy beverages among college students.

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Introduction

Overweight and obesity have increased dramatically worldwide and in the United States over the past 30 years among both adults and children (Adderley-Kelly, 2007; Hedley, Ogden, & Johnson, 2004; Huang et al., 2003; Mokdad, Bowman, & Ford, 2001), and concern is growing that sugar-sweetened beverage (SSB) consumption may contribute to increasing obesity rates (Huffman & West, 2007). Frary, Johnson, & Wang (2004) reported that patterns of beverage consumption are associated with adolescent obesity and overweight and those unhealthy beverages (e.g., sugar-sweetened or soft drinks) have a negative impact on adolescent diet quality. Furthermore, a randomized controlled study reported that SSB consumption might promote obesity and that reducing consumption would benefit body weight (Ebbeling et al., 2006). A self-report survey about sugared beverages indicated that SSB consumption among undergraduates is substantial and probably contributes considerable non-nutritive calories, which may contribute to weight gain (West et al., 2006). Hence, interventions targeting excess SSB intake may have an

important role in obesity-prevention efforts for college-aged populations (Huffman & West, 2007). Given that healthy or unhealthy beverage consumption is a crucial factor in college student obesity and overweight, research on how to decrease unhealthy beverage purchases is important.

Most studies of obesity or unhealthy food and beverage consumption have focused on demographic (DeBate, Topping, & Sargent, 2001; Huffman & West, 2007; West et al., 2006), biological (Lee et al., 2007; Talpade, 2006), psychological (Newell, Hammig, Jurich, & Johnson, 1990; Stevenson, Doherty, Barnett, Muldoon, & Trew, 2007), behavioral (Kremers, van der Horst, & Brug, 2007; Rao, 2006), and socio-cultural (Klaczynski, Goold, & Mudry, 2004; Wichrama, Wichrama, & Bryant, 2006) correlates. Few studies have examined effects of the interplay of price and purchase on unhealthy beverage consumption. Obesity is due, in part, to excess intake of energy-dense, nutrient-poor foods and a sedentary lifestyle (Epstein, Roemmich, & Raynor, 2001). Interventions to treat or prevent obesity must shift food choices from energy-dense foods to healthier low-fat, nutrient-dense alternatives. One way to encourage such shifts is to limit access to unhealthy foods (Goldfeld & Epstein, 2002; Smith & Epstein, 1991). According to behavioral-economic findings, one approach is to vary the cost of alternative commodities (Dufwenberg, 2007; Harrison, 2005; Rachlin, 1989). For example, consumption of less-healthy foods can be reduced by

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taxing high-fat, low-nutrient snack foods (Jacobson & Brownell, 2000), whereas consumption of healthy alternatives can be increased by reducing the price of healthier, low-fat snack foods in vending machines (French et al., 1997) and the prices of fruits, vegetables, and low-fat foods in cafeterias (Cinciripini, 1984; Jeffery, French, Raether, & Baxter, 1994).

Based on a behavioral-economics perspective, increasing the price of a commodity should reduce its consumption, a phenomenon termed “same-price elasticity” (Bickel, Madden, & Petry, 1998). However, increasing the price of one commodity may also increase consumption of a substitute commodity, a phenomenon called “cross-price elasticity.” The present study tested the relationship between changes in price and purchases of beverages in a laboratory setting. Previous research suggests that college students will be less likely to choose unhealthy (or healthy) beverages as their price increases. Moreover, college students will be more likely choose healthier beverages when the price of less-healthy beverages increases, despite a preference for unhealthy beverages.

Previous studies have suggested that consumer health concerns are closely related to dietary consumption (e.g., Ares, Giménez, & Gámbaro, 2009; Kähkönen, Hakanpää, & Tuorila, 1999; Sun, 2008). Recent years have seen a significant increase in concerns about health and wellness and a corresponding growth in consumer demand for healthy food products (Glazer, 2008). For example, consumers in the United States are turning to food and beverages to help address specific health concerns (Landi, 2007). Moreover, consumer health concerns are influenced by health claims (e.g., Silvergrade, 1991; Wansink, van Ittersum, & Painter, 2004). Therefore, we predicted that health concerns evoked by health claims would induce substitution of healthy for unhealthy beverages. Health claims regarding beverage consumption may facilitate the effect of cross-price elasticity on purchases of healthy beverages. Following this logic, it was also predicted that health claims may weaken the effects of increasing prices for healthy beverages (i.e., the same-price-elasticity effect).

Methods

Participants and design

The participants were 108 college students (56 women, 52 men; ages 18–22 years; M age = 19.60, SD = 1.36) from nine colleges in southern Taiwan who were recruited through online and printed ads. Interested students were screened with a face-to-face interview to ensure that they met the following study criteria: at least moderate preference (rating ≥ 4 on a 7-point Likert-type scale) for one unhealthy beverage (e.g., sugared soda, sugared fruit drinks, sweet ice tea, or sports drinks) and one healthy beverage (e.g., fresh milk, 100% fruit juice, sugar-free green tea, or mineral water); no current psychopathology or developmental disability; and no intervention that would prevent them from consuming a specific beverage. Of these participants, 23% were overweight according to the non-gender specific BMI criterion, i.e., a BMI of ≥ 25.0 , published by World Health Organization (1998).

Design

Participants were randomly assigned to a 2 (health claims, with vs. without) \times 2 (price change of preferred beverage, healthy vs. unhealthy) mixed factorial design. The health-claim factor was manipulated between subjects, whereas the price change of the preferred beverage was manipulated within subjects.

Participants exposed to health claims were asked to read an article about overweight among college students and the importance of a healthy diet. The article included a discussion of the role of sugar-sweetened beverages in health and weight management.

Participants without health claims read a similar-length annual report of beverage consumption in a foreign country that included no-health-related claims.

Two price-change beverage conditions involved the purchase of an unhealthy vs. a healthy beverage. In one condition, the cost of a preferred unhealthy beverage varied from \$1.00 to \$3.00 in \$0.50 increments (US dollars), whereas the cost of a preferred healthy beverage remained constant at \$2.00. In the other condition, the cost of a preferred healthy beverage was varied from \$1.00 to \$3.00, and the cost of a preferred unhealthy beverage remained constant at \$2.00. The order of price manipulations was counter-balanced across subjects. For each trial, the participants began with \$7.00 (leftover money did not apply to later trials) and were allowed to purchase as many items of either or both beverage types as they wanted within that amount.

Procedure

All participants read and signed consent forms upon arrival at the laboratory. Each participant was also asked to list the foods that he or she had eaten that day, and the respondent's level of hunger was measured on a 5-point Likert-type scale (1 = *not hungry*, 5 = *extremely hungry*). Participant weight was measured on a digital scale, a stadiometer was used to measure height, and BMI (kg/m^2) was calculated.

Participants were then presented with mouth-sized portions of eight different beverages to taste, in which four (unhealthy or healthy) beverages were presented first followed by the other four (healthy or unhealthy) beverages. The taste order of beverages was counter-balanced. They were asked to rate how much they liked each beverage using a 7-point scale (1 = *not at all*, 7 = *very much*) and to indicate their favorite unhealthy and healthy beverages; these favorites were then used in the beverage-choice task.

In the choice tasks, half of the participants were exposed to an appeal to health concerns, and the other half were not. All participants were given cash to purchase beverages. For each trial, their favorite unhealthy and healthy beverages were available for purchase. The experimenter placed two trays of beverages on the table. One held a \$2.00 item of the participant's favorite unhealthy beverage, and the other held a \$2.00 item of the participant's favorite healthy beverage. In one choice task, the price of one commodity (e.g., sweet ice tea) was changed from \$1.00 to \$3.00 (in \$0.50 increments) over five trials, while the price of the other commodity (e.g., sugar-free green tea) remained at \$2.00. In the other choice task, the commodity that previously rose in price (e.g., sweet ice tea) was held constant at \$2.00, and the price of the other commodity (i.e., sugar-free green tea) changed from \$1.00 to \$3.00 across five trials. Prior to the choice trials, the participants were told that they would be making several beverage purchases and that the cost of each beverage could change for each purchase. They were provided a practice trial to ensure that they understood the instructions. After the experimental trials were completed, the participants were provided the beverages purchased on an arbitrarily selected choice trial.

While making decisions on the beverage-choice task, all participants were asked to rate their general health concern on a 7-point scale (1 = *not at all*, 7 = *very much*). A t -test indicated that participants in the health-claim condition felt a greater health concern (M = 5.70, SD = 1.02) than did participants who did not receive health claims (M = 2.09, SD = 0.85), $t(106) = 19.95$, $p < .001$, Cohen's $d = 3.82$.

Results

Chi-square tests and an analysis of variance (for continuous variables) were employed to determine whether the women and

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