Portion size labeling and intended soft drink consumption: The impact of labeling format and size portfolio

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ABSTRACT

Objective: To assess what portion size labeling format is most promising in helping consumers selecting appropriate soft drink sizes, and whether labeling impact depends on the size portfolio.

Methods: An experimental study was conducted in fast-food restaurants in which two labeling formats (i.e. reference portion size and small/medium/large labels) were compared to a control condition and two size ranges were assessed. The main outcome variable was participants’ intended soft drink size choices. Stimulus material was presented through photographs.

Results: There was a statistical trend for reference portion size labeling increasing the likelihood to choose small sizes \( (n = 158, \text{OR} = 2.55, p = .06, \text{CI: .84-7.70}) \).

Conclusions and implications: Reference portion size labeling is potentially most promising in reducing large portion size preferences. More research assessing the effectiveness of reference portion size labeling (combined with pricing strategies) on actual choices and consumption behavior in a realistic setting is recommended.

Key words: Food portion sizes; Labeling; Environmental interventions; Food choice behavior
INTRODUCTION

Food portion sizes are an important obesogenic factor within our nutritional environment [1]. In recent decades, both obesity prevalence and American and European portion sizes of high caloric food and drinks have grown [2-4].

Soft drinks have been recognized as an important contributor to obesity [5] and this will be the focus of this paper. An American study showed that the daily soft drink consumption among drinkers (i.e. ≥ 1 consumption occasion of beverages on the surveyed day) has increased by 6 oz from 1988-1994 to 1999-2004 [6]. In addition to growing portion sizes, there has been an increase in the variety of sizes that are offered. Over the years, many point-of-purchase settings have increased their portion size portfolio by adding larger portion sizes to the existing assortment [4]. Research has shown that, due to a preference for sizes in the middle of the range of available sizes, consumers are inclined to increase their consumption of soft drinks when the smallest size is dropped or when a larger size is added to the size portfolio [7]. It has been reported that when a serving of soft drink is increased by 50%, women increase their intake by 10% and men by 26% [8].

One of the reasons why larger portion sizes enhance consumption is “portion distortion” (i.e. perceiving large portion sizes as an appropriate amount to consume). Research has shown that portion distortion unfavorably affects the portion sizes that people select [9, 10].

All in all, the consumption of large soft drink sizes is an important area to be addressed in interventions targeted at reducing the prevalence of overweight and obesity. Some experts in the field of obesity have suggested portion size labeling as a promising intervention to help people decide and monitor how much they consume in a single sitting [11, 12]. Portion size labeling endeavors to provide consumers with information about suitable consumption quantities and to reduce portion distortion. Labeling portion sizes may be a helpful tool in terms of both stimulating people to choose reference sizes and tackling portion distortion in a food environment where multiple and large sizes are available. Another reason why portion size labeling is worth studying is that research has indicated
that labeling seems feasible to implement according to consumers and various point-of-purchase representatives [13, 14].

It appears that, while labeling seems a promising and feasible intervention strategy in helping consumers to choose appropriate portion sizes, it is presently unclear what the most promising labeling format would be. Although many studies have been conducted on reported label use and label format preferences [15], to our knowledge there is hardly any evidence available on the impact of labeling on actual size choices or consumption behavior. One recent study, however, assessed the impact of providing caloric information on participants’ size choices of different fast-food items [16]. No impact of labeling on choices was found. Further, in addition to the existing labeling formats providing consumers with caloric information, other formats are conceivable. For instance, an alternative format could designate a standard portion size of a certain product to consume at a single occasion. An experimental study that was conducted to investigate whether this label format affected how much participants consumed of a plate of pasta, did not find an effect of portion size labeling [17]. However, it is possible that portion size labeling is more effective in affecting choice behavior rather than how much is consumed of an amount that is already served.

Another labeling format could be based on the type of labeling that refers to small, medium and large sizes, which is common in many fast-food settings [18]. In fast-food settings however, the size that is referred to as “medium” (i.e. 12 oz) [18] is actually 50% larger than the reference size according to Dutch nutritional guidelines (i.e. 7.6 oz) [19]. To our knowledge, no scientific studies are available that have assessed the impact of labeling in terms of “small, medium, and large” with a “medium” labeled size that is in agreement with nutritional guidelines.

As mentioned, research has shown that contextual factors such as the available size portfolio [7] affect consumer behavior. Further, so far labeling has not been very effective in influencing consumption behavior [17]. Therefore, we postulate 1) that the impact of labeling is dependent on the number of sizes that are available and 2) that labeling has more potential in altering size choice behavior in comparison with the consumption of a served dish. As worldwide labeling is a debated issue [20], obtaining more insight into the effectiveness of different labeling formats and optimal contextual conditions could be very
helpful for developing policies around labeling. Therefore, the primary aim of this study is to assess which portion size labeling format (i.e. reference portion size labeling or small, medium and large labeling) is most effective in encouraging consumers to select smaller portion sizes. Secondly, this study assesses whether the impact of labeling depends on the size portfolio that is being offered.

**METHODS**

**Study design**

In order to assess both labeling formats in combination with both a larger and a smaller size portfolio, the study employed a 2 x 3 quasi-experimental design with 2 size portfolios (3 versus 5 size options) and 2 labeling formats (versus 1 control condition). The soft drink sizes were presented through photographs on the questionnaire that participants were to complete. For practical purposes, photographs were used instead of real objects. Next to each cup, a pair of dice was presented so as to provide participants with an accurate impression of the cups’ actual size. Dice were chosen as reference material because it was assumed that dice are common objects that are familiar in size. The pictures were located on the first page of the questionnaire, and were 3 by 2.5 cm in size. The portion size labels were located at the bottom of each picture (see Figure 5.1). In the 3-sizes conditions, participants could choose between 7, 9, and 14 oz cups. In the 5-sizes conditions, 18 and 24 oz cups were added. All 5 sizes were representative of the sizes available in the Netherlands. Depending on the study condition, participants received 1 of 6 versions of the questionnaire. Before handing out the questionnaires, they were put in a random order. In the fast-food restaurant, all people sitting at a table were asked if they were willing to complete a short questionnaire. If they were, they received the questionnaire that was on top of the pile.

In the reference portion size condition, the labeling format referred to portion sizes as defined by guidelines from the Netherlands Nutrition Centre (an institution that provides information and education about healthy nutrition, financed by the Dutch government), which defines a reference serving as 7.6 oz. However, as 7.6 oz cups are unavailable on the market, 9 oz was designated as the reference size. In the small/medium/large condition, the
labeling format consisted of fast-food-style labeling that ranged from small to extra extra large. In the control condition, the labeling format solely indicated the amount in milliliters (which is standard in the Netherlands) without any portion size information to refer to. See Table 5.1 for an overview of the study conditions and the different labeling formats.

Figure 5.1 Examples of cup sizes and reference portion size labeling as presented on the questionnaire.

Participants and procedures
A total of 189 questionnaires were administered in 3 different fast-food restaurants on 6 different occasions; 168 questionnaires were completed (88.9%). Gift vouchers were raffled among participants.

The questionnaire started with asking participants to imagine that they were in a cinema (where soft drinks are generally available) and that they were offered a free cup of regular cola. Then, participants were asked to circle the picture with the cup size that they would choose. Once participants had chosen a cup size, they proceeded with the rest of the questionnaire. The VU Medical Center’s Institutional Review Board approved of this study.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of sizes</th>
<th>n</th>
<th>Labeling formats</th>
</tr>
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<tbody>
<tr>
<td>Reference portion size</td>
<td>3</td>
<td>32</td>
<td>0.8 portions</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>22</td>
<td>0.8 portions</td>
</tr>
<tr>
<td>Small/Medium/Large</td>
<td>3</td>
<td>29</td>
<td>Small</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>30</td>
<td>Small</td>
</tr>
<tr>
<td>Control</td>
<td>3</td>
<td>29</td>
<td>200 ml (= 7 oz)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>26</td>
<td>200 ml (= 7 oz)</td>
</tr>
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Measures
A number of scales were included in the questionnaire to control for variables that were expected to be related to cup size choices.

First, thirst was measured with 4 items that were derived from Rolls and colleagues [21]. One of the 5-point scaled items was “How thirsty do you feel at this moment?” The internal consistency reliability was $\alpha = .60$.

Second, the dietary restraint and external disinhibition scales derived from the Dutch Eating Behavior Questionnaire (DEBQ) [22] were included in the questionnaire. Both scales have been proven to be reliable and valid [23]. The dietary restraint scale consisted of 10 5-point scaled items (e.g. “Do you try to eat only a little when you want to eat a lot?”), with $\alpha = .94$. External disinhibition was measured with 10 5-point scaled items (e.g. “If food smells yummy, do you eat a lot of it?”), with $\alpha = .94$.

Third, participants were asked to report how often they consumed cola, and whether they normally drank regular or diet cola.

Participants were also asked to report their body weight in kilograms and their height in centimeters. Last, the questionnaire included questions about participants’ gender and age.

Data analysis
The main ordinal outcome variable in this study was participants’ soft drink size choices. Logistic regression analyses were run to calculate the odds ratios for participants’ size choices. Size choices were coded in 2 different ways. First, size choices were dichotomized in order to assess whether labeling encouraged participants to choose equally to or smaller than the reference size. Therefore, participants’ size choices were coded as either the reference size (i.e. 7 or 9 oz), or as larger than the reference size (i.e. 14, 18 or 24 oz). The data were also coded in a second manner, in order to assess the effect of labeling on discouraging participants to choose 1 of the 2 largest sizes. Therefore, the data were dichotomized as either choosing 1 of the 2 largest sizes (i.e. 18 or 24 oz), or as not choosing 1 of the 2 largest sizes (i.e. 7, 9 or 14 oz).
Further, interaction-effects were assessed between the number of size options and labeling, sex and labeling, and BMI and labeling. Results were considered significant with p < .05. All analyses were adjusted for BMI, sex, thirst, dietary restraint, external disinhibition, and preferences for diet versus regular cola. Analyses were performed in SPSS version 15.0 (SPSS Inc., Chicago, IL, 2007).

RESULTS

Descriptive statistics
The participants’ mean age was 26.4 years (SD = 10.3), 50.3% of the participants were female. Further, 4.8% were underweight (BMI < 18.50), 76.4% had a healthy weight (BMI 18.50-24.99), 15.2% were overweight (BMI 25.00-29.99), and 3.6% were obese (BMI ≥ 30.00). The overweight and obesity prevalence was lower than in the general Dutch population, in which 46.5% of adults are overweight and 11% are obese [24].

More than 86% of the participants reported that they drank cola at least sometimes. Finally, 67.5% of all participants had a preference for regular as opposed to diet soft drink.

Overall size choices and impact of the size portfolio
Overall, 51% chose the reference soft drink size or smaller. Further, when 2 larger sizes were added, the proportion of participants that chose the reference size dropped from 68% to 31%. In fact, when the 2 larger sizes were made available, 45% chose one of these sizes. This is more than the 32.2% that chose the largest available size (i.e. 14 oz) when only 3 sizes were available.

Effect of labeling on cup size choices
There was a positive borderline statistically significant effect of reference portion size labeling on the likelihood of the reference size being chosen (n = 158, OR = 2.55, p = .06). Bootstrapping techniques were used to calculate the confidence interval around the OR (CI: .84-7.70). None of the interaction terms reached statistical significance. No
interaction-effects were found between the number of available sizes and the impact of labeling.

**DISCUSSION**

From the results of this study, we can conclude that among the formats that have been assessed, reference portion size labeling is potentially the most effective in stimulating consumers to select smaller sizes of soft drink (although this was borderline statistically significant). Furthermore, as expected, adding larger sizes to the portfolio enhanced large size choices, which is in line with previous research [7].

Although, the results show that eliminating large sizes from the portfolio would be the most effective strategy in scaling back consumers’ soft drink intake, labeling is perceived as a more feasible and accepted intervention strategy [13, 14]. Therefore, although only modest effects are to be expected from labeling, further research into the effectiveness of reference portion size labeling is worthwhile.

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

The findings of the current study give insight into the effectiveness of various portion size labeling formats. To our knowledge, no other studies are available that have assessed different portion size labeling formats. One of the strengths of this study was that participants were asked to make a size choice instead of reporting their use of nutrition labels (which is more likely to induce socially desirable responses). In fact, reviews on nutrition labeling have recommended that more experimental research is done in this field instead of merely assessing reported label use [25]. Nevertheless, it should be noted than an important limitation of this study was that questionnaires were used to present soft drink sizes and portion size labeling, and to measure size choices. As a result, the effectiveness of labeling on actual consumption was not assessed. In this respect it is worth mentioning that Sharpe and colleagues [7] have assessed the validity of virtual size choices and concluded that both real-world and virtual manipulations yielded comparable results. Sharpe and colleagues, however, developed a virtual road trip in order to simulate a purchase situation,
a procedure that might be more realistic than a questionnaire. Altogether, this study should be replicated using procedures comparable to Sharpe et al. or, even better, to assess the impact of portion size labeling on actual size choices in a realistic setting.

Another limitation is that this study did not take pricing into account. It is unclear how pricing would affect the impact of labeling. On the one hand, the fact that no prices were mentioned underneath the soft drink photographs might have encouraged participants to select larger sizes than they would normally do. On the other hand, in general, point-of-purchase settings employ value size pricing, encouraging consumers to choose large sizes too [26, 27]. Experimental research is necessary in order to get more insight in the effectiveness of portion size labeling combined with pricing strategies.

Based on the results of this study it seems that reference portion size labeling is promising in reducing consumers’ soft drink size choices. However, since this result was borderline statistically significant, it should be interpreted with caution. Future research should assess the effectiveness of reference portion size labeling (combined with pricing strategies) on actual choices and consumption behavior in a realistic setting.
REFERENCES


