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The influence of calorie and physical activity labelling on snack and beverage choices

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ABSTRACT

Background: Much research suggests nutrition labelling does not influence lower energy food choice. This study aimed to assess the impact of physical activity based and kilocalorie (Kcal) based labels on the energy content of snack food and beverage choices made.

Methods: An independent-groups design, utilizing an online questionnaire platform tested 458 UK adults (87 men), aged 18–64 years (mean: 30 years) whose BMI ranged from 16 to 41 kg/m^2 (mean: 24 kg/m^2). Participants were randomized to one of four label information conditions (no label, Kcal label, physical activity label [duration of walking required to burn the Kcal in the product], Kcal and physical activity label) and were asked to choose from higher and lower energy options for a series of items.

Results: Label condition significantly affected low vs. high-energy product selection of snack foods ($p < 0.001$) and beverages ($p < 0.001$). The physical activity label condition resulted in significantly lower energy snack and beverage choices than the Kcal label condition ($p < 0.001$). This effect was found across the full sample and persisted even when participants' dietary restraint, BMI, gender, socioeconomic status, habitual physical activity, calorie and numerical literacy were controlled.

Conclusion: The provision of physical activity information appeared most effective in influencing the selection of lower Kcal snack food and beverage items, when compared with no information or Kcal information. These findings could inform the debate around potential legislative policies to facilitate healthier nutritional choices at a population level.

1. Introduction

Global rises in overweight and obesity have been related to a myriad of factors, owing to the complex nature of weight gain, which incorporates environmental, lifestyle, physiological, and cognitive elements among others, (Bellisle & Blundell, 2013; Booth, Pinkston, & Poston, 2005; Marti, Moreno-Aliaga, Hebebrand, & Martinez, 2004). In 2014, over 60% of UK adults were overweight or obese, (England, 2014). Numerous public health policies have been designed to address this problem, often with the dual aims of encouraging product reformulation and altering the food environment to facilitate healthier nutritional choices. For example, in 2011, as part of the Department of Health's voluntary Responsibility Deal programme, some manufacturers pledged to implement energy (kilojoules, kJ; kilocalories, Kcal) labelling on food and non-alcoholic drinks in out of home settings, (Health, 2013a). Subsequently, a number have also pledged to adopt and implement the UK Governments' 2013 recommended Front of Pack (FoP) Nutrition Labelling Scheme, (Health, 2013b), which uses colour coding of the nutrient content (e.g. red to indicate that a product is high in an undesirable nutrient), in addition to the full mandatory ("back of pack") nutrition declaration which reports on the energy, fat, saturates, carbohydrate, sugars, protein and salt levels in the item, (Ministers, 2013). Studies have shown that calories and fat are most frequently cited as the most important nutrition information consumers seek about a product, with the back of pack label used as the main source for this information, but critically few consumers actually consult the back of the pack, (Storcksdieck genannt Bonsmann et al., 2010). Simple FoP labelling is understood by consumers (Grunert & Wills, 2007), and would enable rapid evaluation of purchase options at the point of sale, thus supporting more informed decision making (Brownell & Koplan, 2011), and perhaps a more promising avenue for public health policy.

Several studies have suggested that, when incorporated into a menu in a restaurant setting, nutrition labelling does encourage the selection of lower energy items, thereby reducing the total chosen

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energy content of a meal, (Avcibasioglu & al., 2011; Bassett et al., 2008; Bollinger, Phillip, & Sorensen, 2011; Brissette, Lowenfels, Noble, & Spicer, 2013; Downs, Loewenstein, & Wisdom, 2009; Krieger et al., 2013; Pulos & Leng, 2010; Roberto, Larsen, Agnew, Baik, & Brownell, 2010; Wisdom, Downs, & Loewenstein, 2010). However, other studies have found similar interventions to only be successful in slim women, (Temple et al., 2011), those high in dietary restraint, (Girz, Polivy, Herman, & Lee, 2012), or not at all, (Downs, Wisdom, Wansink, & Loewenstein, 2013; Dumanovsky, Huang, Bassett, & Silver, 2010; Elbel, Gyamfi, & Kersh, 2011; Elbel, Kersh, Brescoll, & Dixon, 2009; Finkelstein, Strombotne, Chan, & Krieger, 2011; Harnack et al., 2008; Holmes, Serrano, Machin, Duetsch, & Davis, 2013; Swartz, Braxton, & Viera, 2011; Tandon et al., 2011). There is a notable lack of empirical research regarding the influence of FoP nutrition labelling on food choice, but it has been suggested that consumers find typical FoP information to be too detailed (Feunekes, Gortemaker, Willems, Lion, & van den Kommer, 2008), and therefore confusing, (Brownell & Koplan, 2011; Grunert & Wills, 2007). As a result, the information is often ignored, (Magnusson, 2010), particularly in low socioeconomic status groups (Variyam, 2008), and in those with poor nutrition knowledge, (Grunert, Wills, & Fernández-Celemín, 2010; Guthrie, Fox, Cleveland, & Welsh, 1995; Li, Miniard, & Barone, 2000; Misra, 2007; Rasberry, Chaney, Housman, Misra, & Miller, 2007). This may be due, at least in part, to the notion of calories (Kcal) being interpreted as too abstract a concept to understand or utilize as part of total daily energy intake, (Blumenthal & Volpp, 2010; Fitch et al., 2009). Similarly, with FoP, the volume of information may overwhelm understanding of the message. Given that consumers spend an average of 6 s looking at food before making a purchase decision, (Hamlin, McNeill, & Moore, 2015), it is clear that more visible, simple and tangible forms of FoP labelling might be more impactful, (Fitch et al., 2009). Indeed, recent research suggests that consumers pay little attention to the nutritional information of regularly purchased goods, and instead efforts to provide visual information may be a more effective means of encouraging healthier food choices without cognitive burden (FSA, 2016).

The Royal Society for Public Health (Royal Society for Public Health: Vision, 2016), has recently called for 'activity equivalent' calorie labelling to be placed on food packaging, alongside current FoP information, showing the amount of physical activity required to burn off the caloric content of the product. The RSPH have also called for more research into the efficacy of this approach as data are extremely limited, (Royal Society for Public Health: Vision, 2016). However, it has previously been shown that providing activity equivalent information for sugar-sweetened beverages at point of sale reduced the odds of purchase among low-income Black adolescents in the US, (Bleich, Herring, Flagg, & Gary-Webb, 2011). Such labelling has also been shown to reduce the energy selected from a hypothetical fast food menu (Dowray, Swartz, Braxton, & Viera, 2013). However, in order to evaluate the potential utility of physical activity labels for encouraging healthier food choice at a population level, it is important to understand not only whether these labels are more effective than no label at all, but also whether they are more effective than a standard Kcal label, and, finally, whether or not a combination of Kcal and physical activity labelling may be additionally effective. Thus the current proof-of-concept study aimed to elucidate the impact of an energy (Kcal) label, a physical activity label and a Kcal and physical activity label, relative to no label, on hypothetical snack and beverage choices (higher energy vs. lower energy snack) in a forced choice questionnaire paradigm. We hypothesised that all labels would lead to a greater selection of lower energy snack and beverage items, but that a physical activity label would be particularly effective due to the simplicity and concrete nature of the message.

2. Methods and materials

2.1. Design

An independent-groups design was used within a forced choice questionnaire paradigm. Participants were randomized to one of four label information conditions (no label, Kcal label, physical activity label [duration of walking required to burn the kilocalories in the product], Kcal and physical activity label) and were asked to choose from higher and lower Kcal options for a series of snack food and beverage items (Fig. 1).

2.2. Participants

A sample size calculation was conducted based on a small to moderate effect size of the labeling condition ($f = 0.15$), we conservatively estimated this to be lower than the effect size ($f = 0.18$) found by Dowray et al., (Dowray et al., 2013). Assuming an alpha of 0.05 and for 80% power with four experimental conditions and three correlated dependent variables (estimated correlation $r = 0.7$) power indicated a sample size of 392 participants ($n = 98$ in each group). 555 participants took part online, of which 458 completed all required sections. Cases in which no choice was made for a beverage or product were not included in the final analysis. Only adult volunteers currently residing in the UK were accepted onto the study, in order to ensure that the stimuli depicted snack and beverage items that the participants were likely to be familiar with. All participant demographics can be seen in Table 1, with data demonstrating that the groups were well matched on all variables. Physical activity, SES quintile, numeracy and literacy score breakdown by group can be seen in Supplementary Tables 1–3.

2.3. Test stimuli

The foods and beverages depicted were all packaged snacks and café-style items, which have been shown to be most consistent at derailing dieting efforts (Urbszat, Herman, & Polivy, 2002; Vohs & Heatherton, 2000), as well as being commonly consumed as snacks in the UK. Specifically, the items covered a range of foods, specifically five different food types (breakfast bar, café muffin, biscuits, chocolate bar and crisps) and five different beverage types (cola, sports drink, milkshake, café coffee and fruit juice). For each food or beverage type, participants were provided with higher Kcal and lower Kcal equivalent food pairs (e.g. latte and cappuccino) and were required to choose one. All options were matched for type and brand to ensure selections were not based on brand preference. The serving shown was based on manufacturer instructions of portion size.

The labels were designed to provide simple information to minimize the likelihood of confounds based on the type of label shown (including ability to understand the label and liking of the label; see Fig. 1 for examples of the label designs). All energy information was provided as the number of Kcal in the item as taken from the FoP or from the online nutritional information (for the café products). Physical activity information was provided as minutes required to walk off the Kcal in the product. This was calculated using the energy expenditure of a 72 kg adult walking at a rate of 30 min per mile (3.2 kcal/min) as assessed by dividing total Kcal in the item by the energy expenditure rate. This was based on Dowray et al., (Dowray et al., 2013). Walking was selected to ensure the physical activity information provided was relatable to the larger population. The order in which the various products were displayed to participants was fully randomized, as was the position of the items on the screen (whether the lower or the higher Kcal item was shown on the left).