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Research report

The impact of nutritional labels and socioeconomic status on energy intake. An experimental field study [☆]Rachel A. Crockett ^{a,1,*}, Susan A. Jebb ^{b,2}, Matthew Hankins ^c, Theresa M. Marteau ^{a,d}^a Section of Health Psychology, King's College London, Guy's Campus, London Bridge, SE1 9RT, UK^b Elsie Widdowson Laboratory, MRC Human Nutrition Research, 120 Fulbourn Road, Cambridge, CB1 9NL, UK^c Faculty of Health Sciences, University of Southampton, Highfield, Southampton, SO17 1BJ, UK^d Behaviour and Health Policy Research Unit, University of Cambridge, Institute of Public Health, Forvie Site, Robinson Way, Cambridge, CB2 0SR, UK

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ABSTRACT

There is some evidence for paradoxical effects of nutritional labelling on energy intake particularly amongst restrained eaters and those with a higher body mass index (BMI) resulting in greater consumption of energy from foods with a positive health message (e.g. "low-fat") compared with the same foods, unlabelled. This study aimed to investigate, in a UK general population sample, the likelihood of paradoxical effects of nutritional labelling on energy intake. Participants ($n = 287$) attended a London cinema and were offered a large tub of salted or toffee popcorn. Participants were randomised to receive their selected flavour with one of three labels: a green low-fat label, a red high-fat label or no label. Participants watched two film clips while completing measures of demographic characteristics, emotional state and taste of the popcorn. Following the experiment, popcorn consumption was measured. There were no main effects of nutritional labelling on consumption. Contrary to predictions neither BMI nor weight concern moderated the effect of label on consumption. There was a three-way interaction between low-fat label, weight concern and socioeconomic status (SES) such that weight-concerned participants of higher SES who saw a low-fat label consumed more than weight unconcerned participants of similar SES ($t = -2.7, P = .04$). By contrast, weight-concerned participants of lower SES seeing either type of label, consumed less than those seeing no label ($t = -2.04, P = .04$). Nutritional labelling may have different effects in different socioeconomic groups. Further studies are required to understand fully the possible contribution of food labelling to health inequalities.

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Introduction

The ready availability of cheaply priced ready-prepared foods contributes to increased consumption of energy-dense, nutrient-poor foods and the rise in preventable disease including obesity, cardiovascular disease, type 2 diabetes and various cancers. One of the challenges that consumers face, even when motivated to eat more healthily, is that the nutritional composition of these manufac-

tured foods may not be immediately evident. There is growing interest in packaging and labelling such foods more clearly in terms of nutritional value to promote healthier food choices. The impact of a very wide range of labelling schemes providing information about aspects of the nutritional content or health effects of a food have been researched. For the purposes of this paper a nutritional label is considered to be information given about at least one nutrient or energy in a relative (e.g. "low") or absolute (e.g. "2 g") amount format where the information is visible at the point at which choices about what is to be consumed are made (Crockett, Hollands, Jebb, & Marteau, 2011).

Research has assessed the impact of various nutritional labelling schemes on a variety of intended and behavioural outcomes across different populations. However, neither the overall effects of nutritional labelling in promoting healthier eating, nor the identification of which of many labelling schemes are most effective, have been established. In assessing the impact of nutritional labelling in assisting people towards eating more healthily a key consideration is the impact of nutritional labelling on food consumption behaviour. Currently the evidence on the effectiveness of

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nutritional labelling in achieving healthier consumption behaviour is limited and with mixed evidence regarding the direction of effect. When consumption following exposure to a nutritional label has been objectively measured, overall consumption has been found sometimes to decrease (Roberto, Larsen, Agnew, Baik, & Brownell, 2010; Temple, Johnson, Recupero, & Suders, 2010) and, paradoxically, sometimes to increase, at least in samples recruited from university campuses (Aaron, Evans, & Mela, 1995; McCann et al., 2013; Wansink & Chandon, 2006). These effects have been found across a range of labelling formats including labelling of absolute amounts of energy and nutrients contained in the product (Aaron et al., 1995; McCann et al., 2013), labelling indicating whether a product is high or low in nutrients such as fat (Wansink & Chandon, 2006), and labelling indicating that the food is more or less healthy (Temple et al., 2011). Paradoxical effects of nutritional labelling have been found to be moderated by a number of participant characteristics, with greater consumption observed in males (Aaron et al., 1995; McCann et al., 2013) those who are restrained eaters (Miller, Castellanos, Shide, Peters, & Rolls, 1998) and those who are more overweight (Wansink & Chandon, 2006). However, these moderating effects are not consistently found with contrasting evidence suggesting no moderating effects of BMI (Temple et al., 2011) on consumption of products where a label indicated that food items were either a more or less healthy choice.

Most of the research exploring the impact of nutritional labelling on consumption has been conducted with university students, staff and families who represent groups that are well educated and low in material and social deprivation. There has been very little research exploring the impact of nutritional labelling on consumption across different socioeconomic (SES) groups. One study found that self-reported use of nutritional labelling decreased with lower education and income and that label use was positively associated with healthier consumption, as assessed by 24 hour recall of food consumption (Ollberding, Wolf, & Contento, 2010). To our knowledge there has been no research assessing paradoxical effects of nutritional labelling in groups with lower SES. As these groups have higher rates of overweight and obesity and diseases associated with being overweight (Bachmann et al., 2003; Coleman et al., 2004; Foresight, 2007; Heraclides, Witte, & Brunner, 2008) it is particularly important to know the impact of nutritional labelling in this group. Thus an exploration of the impact of nutritional labels in general populations, including those of lower SES, is warranted.

The current study seeks to investigate further the effects of nutritional labelling on consumption by testing the impact of the presentation of a green "low fat" label, a red "high fat" label or no label on a snack package. The expected main effect of labelling on consumption is equivocal. However, following the findings of Roberto et al. (2010) and Temple et al. (2010), we tested the following as Hypothesis I:

- i. a low fat label is associated with greater consumption of the labelled product
- ii. a high fat label is associated with lower consumption of the labelled product.

Hypothesis II predicts that the effect of label on consumption is moderated by BMI and weight concern such that higher BMI or weight concern result in

- i. greatest consumption of the labelled product in those seeing a "low fat" label
- ii. least consumption of the labelled product in those seeing a "high fat" label.

Additionally, given the associations between lower SES and diet-related disease, it was considered important to explore the impact

of SES on the relationship between a nutritional label and consumption and its moderators. However, the limited research in this area precluded the credible formulation of an *a priori* hypothesis and thus the following research question was addressed:

What are the modifying effects of SES and

- i. overweight
- ii. weight concern

on the relationship between nutritional label and consumption?

These hypotheses and research question are tested in an experimental field study of the impact of nutritional labelling on objectively assessed snack food consumption in a general population sample of mixed SES.

Method

Study design

An experimental design with participants randomised to one of three groups to receive a snack with no nutritional label, a green "low fat" or a red "high fat" label.

Participants and recruitment

Participants were recruited in streets surrounding a cinema in Streatham in South London in the United Kingdom, an area with mixed SES, where the study was conducted. The only inclusion criterion was that participants were over 18 years of age. Recruitment was conducted by a research agency on the day of each of the experimental sessions. Interviewers approached potential participants and asked if they would be interested in participating in the study. Possible selection bias was minimised by providing interviewers with minimal information about the study (i.e. just general information about the study with no reference to study hypotheses) and instructing them to approach all who passed by. Those who expressed an interest were given more information about the study and screened to assess eligibility. Any individual over 18 years of age, and willing to participate was asked to sign a consent form and was given a time to participate in the study.

Sample size

The programme *G Power* (Heinrich Heine University) was used to calculate the sample size required. Previous research suggested a medium effect of label on consumption (Wansink & Chandon, 2006). However, given that the current study aimed to recruit a more heterogeneous general population sample, we conservatively estimated a small to medium effect of labels on consumption. Thus a sample of 266 participants gives 80% power to detect a main effect of $f = .20$ (medium) with significance of .05. The same sample size gives 90% power, at the 5% level of significance to detect a small to medium effect ($f = .08$) of a three-way interaction (comprising 10 predictors) on consumption.

Study materials

The "low fat" and "high fat" labels were informed by using the UK Food Standards Agency Traffic Light labelling scheme. Specifically the "low fat" label was coloured green and the "high fat" label coloured red.

Ethics approval

This study received approval from the King's College London Research Ethics Committee (PNM/09/10-121). As consumption is a

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