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The impact of nutritional labels and socioeconomic status on energy intake: an experimental field study.

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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 to 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 3-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.

Keywords: nutritional labelling, consumption, socioeconomic status, weight concern.

Background

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 manufactured 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 grams") 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 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, Wansink and Chandon 2006, McCann, Wallace, Robson, Rennie, McCaffrey, Welch, & Livingstone, 2013). 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, Evans, & Mela, 1995, McCann 2013), labelling indicating whether a product is high or low in nutrients such as fat (Wansink and 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, Evans, & Mela, 1995, McCann et al. 2013) those who are restrained eaters (Miller, Castellanos, Shide, Peters, & Rolls, 1998) and those who are more overweight (Wansink and 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 given a time to participate in the study.

Sample size

The progam *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=0.20 (medium) with significance of 0.05. The same sample size gives 90% power, at the 5% level of significance to detect a small to medium effect (f=.08) of a 3-way interaction (comprising 10 predictors) on consumption.

Study materials

The “low fat” and “high fat” labels were informed by the use 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 behaviour that changes with the awareness of observation, participants were told that the study was concerned with the impact of taste on emotion and no mention was made that popcorn consumption would be assessed. At the end of the study participants were debriefed as to the nature of the study and given the option of withdrawing from the study. No participants chose to do so.

Piloting

Piloting was used to identify palatable flavours and brands of popcorn. A group of eight colleagues blind tasted and rated seven varieties of pre-prepared and fresh popcorn.

Preference ratings were used to identify the sweet and savoury popcorn with the highest ratings for use in the main study.

Randomisation

On arrival at the cinema participants were given a card with their unique study number printed on it. Study numbers were allocated sequentially according to the order in which participants arrived at the cinema. Participants were then directed through two sets of doors to the auditorium where the experiment took place. On entering the auditorium a predetermined random number sequence was used to allocate participants, by unique study number, to study arm.

Procedure

Following randomisation participants were given their choice of toffee or salt popcorn which was bagged in pre-weighed quantities and the bag placed in a popcorn tub. To ensure participants received amounts of popcorn that were visually similar, participants received 120 grams of salted popcorn and 450 grams of the much heavier toffee popcorn. Participants also received a 500ml bottle of mineral water and a study questionnaire. To ensure participants observed the nutritional label, on giving participants their popcorn the researcher pointed to the study label, also indicating the flavour, and asked the participant if that was their flavour preference. Participants were shown to their seats by another member of the research team. Seats were spaced apart to avoid the sharing of popcorn and observation by participants of the different labels. Participants completed the first part of the questionnaire prior to tasting their popcorn. To maintain the appearance that the researchers were interested in the effect of emotion on taste, participants then watched a "sad" section of the Disney Pixar film Up! lasting approximately 25 minutes. There was then an interval during which they completed the second section of the questionnaire. A "happy" section of the same film, also lasting about 25 minutes was then shown after which participants completed the final section of the questionnaire. Participants were asked to leave their remaining popcorn under their seats as they left. They were then given the debriefing sheet and a £30 voucher as compensation for their time.

Measures

Primary endpoint

Total energy consumed: objectively assessed by weighing the popcorn remaining in the carton and subtracting it from the amount served. Energy consumption was chosen as the primary endpoint in line with previous studies which, regardless of whether the nutritional label highlighted energy or fat, have assessed energy consumption as the primary outcome.

Putative secondary endpoints (not reported here)

These were completed at the beginning, midpoint and end of the experimental session to maintain the appearance that the purpose of the study was to assess the impact of emotion on taste:

1. Taste of the snack: five items assessed the extent to which the participant rated the popcorn as good-tasting, strong tasting and unpleasant tasting.
2. Emotional state: six items assessed the extent to which the participant feels happy, relaxed, cheerful, tense, sad and upset.

Demographic characteristics

1. Age, gender and SES calculated using the Indices of Multiple Deprivation (Department for Communities and Local Government, 2010).
2. Body Mass Index: calculated from self-report of height and weight.
3. Weight concern: assessed using two items asking whether participants were currently dieting to try to lose weight or to maintain their weight (Stice, Presnell, Lowe, & Burton, 2006). This dichotomous measure was used in preference to a continuous measure of dietary restraint to minimize participant response burden.

Analysis

Calculation of the energy consumed was based on the nutritional information provided by the popcorn manufacturer. Because the two types of popcorn have different weights by volume, consumption data were transformed and z scores used in analyses. BMI was used as a continuous variable in all analyses, but was categorised for graphical display into three groups representing under or normal weight, overweight and obese. SES was assessed using the Indices of Multiple Deprivation (Department for Communities and Local Government,

2007) derived from postcodes. Scores range from 1 (least socially deprived) to 100 (most socially deprived). As the scores do not represent an interval scale, the variable was recoded as an ordinal variable by dividing scores into tertiles to represent three levels of SES: highest, intermediate and lowest. Weight concern was treated as a dichotomous variable with participants who responded positively to either of the weight concern items considered to be currently weight-concerned.

Associations between the study variables were explored using chi square tests. To test Hypothesis I, a between- subjects one-way ANCOVA was conducted with label as the independent variable, flavour of popcorn as a covariate and energy consumption as the dependent variable. These data were not normally distributed with a substantial skew statistic of 1.257 (1.44) and thus ranked data were used in the ANCOVA. Cases were ranked using the *rank data* command in SPSS to create a new variable ranking cases from least consumption (rank=1) to greatest consumption (rank = 289).

To test Hypothesis II, four hierarchical multiple regressions were conducted with consumption as the criterion variable. For these regressions two dummy variables indicating the type of label seen were created. The low fat dummy label dichotomised participants in to those who saw a low fat label and those who did not see a low fat label (that is saw either a high fat label or no label). The high fat label dichotomised participants into those who saw a high fat label and those who did not see a high fat label (that is saw a low fat label or no label). The variables entered in each step of the model are shown in Table 1

To explore the research question assessing possible three-way interactions of label, BMI or weight concern, and SES on consumption, four hierarchical multiple regressions were conducted with consumption as the criterion variable and using the low and high fat dummy variables. The variables entered in each step of the model are show in Table 1. Given high levels of multicollinearity in the data used in the multiple regression analyses, mean centred data were used.

Results

Three hundred and twenty-five participants were recruited of whom 38 were excluded due to multiple attendances (n= 14), not leaving their popcorn bags (n=13) or for failure to consume any popcorn (n=11). Two hundred and eighty-seven participants were included in the final analyses of whom 36% were male, 37% were weight-concerned, 50% were overweight or obese and 51% were between 18 and 34 years of age. Chi^2 tests and one-way ANOVA indicated that randomisation had been successful: there were no significant demographic differences between participants in the three study arms.

The median Indices of Multiple Deprivation score (a higher score indicating greater deprivation) for those categorised as living in the least deprived areas was 23.22 (n=89), for those categorised as living in areas of intermediate levels of deprivation was 35.16 (n= 80), and for those living in areas of highest deprivation was 45.33 (n=82). This indicates a sample with greater levels of deprivation than would be expected from an English population sample for whom the comparable median scores would be 7.59 in the least deprived group, 17.24 in the group with intermediate levels of deprivation and 37.31 in the group with highest levels of deprivation.

Associations between participant characteristics and consumption are shown in Table 2. There were significant positive associations between BMI and gender, age and weight concern. Gender was also positively associated with weight concern. However, none of these variables was associated with consumption. The raw data for energy consumption across the two flavours of popcorn and experimental groups is shown in Table 3. Standardised consumption was compared between those eating toffee and those eating salt popcorn with a significant difference found ($t(285) = 8.61$, $p < .001$). Therefore in subsequent analyses popcorn flavour was entered as a covariate of consumption.

A priori analyses

Hypothesis I

Contrary to predictions, there were no main effects of experimental group on consumption ($F(2,283) = .317$, $p = .73$).

Hypothesis II

Figure 1 shows the effects of BMI and weight concern on the relationship between label and consumption. BMI did not moderate the effect on consumption of either a low fat label (β=-.03, t=-.30, *p*= .76) or a high fat label (β =-.13, t=-1.62, *p*=.11). Weight concern did not moderate the effect on consumption of seeing a low fat (β=.03, t=.31, *p*=.76) or a high fat label on consumption (β=-.12, t=-1.30, *p*=.19).

Research Question

There was no significant interaction of low fat label, SES and BMI (β=-.02, t-.20, *p*=.84) but there was a significant 3-way interaction of low fat label, SES and weight concern on consumption such that among those of higher SES, weight concerned eaters seeing a low fat label ate more than non weight concerned eaters seeing a low fat label (β=-.27, t=-2.07, *p*=.04). Figure 2 illustrates that this effect was a consequence of weight concerned eaters of higher SES eating less if they saw a low fat label compared to seeing a high fat label or no label. In contrast, among non restrained eaters of higher SES similar amounts were consumed regardless of the label seen. There were no 3-way interactions between seeing a high fat label, SES and either BMI (β=-.13, t=-1.41, *p*=.16) or weight concern (β=-.01, t=-.01, *p*=.91 on consumption.

Post hoc analyses

The *a priori* analyses indicated possible effects of seeing either a high or a low fat label compared to seeing no label. Specifically, the data in Figure 1 suggested that, although there was no moderating effect of BMI on the relationship between label and consumption, obese participants seemed to eat less in response to seeing either a high or low fat label compared to no label. The data in Figure 2 suggested that weight-concerned participants of lowest SES seemed to eat less in response to seeing either a high or low fat label compared to no label.

Post hoc analyses were conducted to explore the effects on consumption of seeing either label compared to not seeing a label. The moderating effects of BMI and weight concern on the effect of seeing either label on consumption was explored. Hierarchical multiple regression analysis indicated a marginally significant moderating effect of BMI (β=-.22, t=-1.88, *p*= .06) such that in those who saw a label, as weight increased, consumption

decreased (see Figure 3). There was no moderating effect of weight concern on the relationship between seeing either label and consumption (β = -.12, t= -.993, p=.33).

Post hoc analyses were also conducted to explore the possible 3-way interactions of seeing either label compared not seeing a label, SES and either BMI or weight concern. There was no significant 3-way interaction of seeing either label, SES and BMI (β= -.09, t=-1.22, *p*=.22). The 3-way interaction of seeing either label, SES and weight concern was significant (β =-.34, t= -2.04, p = .04).

Discussion

Contrary to predictions, no main effects of nutritional labels on consumption were identified. There were no moderating effects of BMI or weight concern on the relationship between nutritional labels and consumption, Hypothesis II was therefore not supported. The research question explored possible modifying effects of SES and overweight or weight concern on the relationship between nutritional label and consumption. A significant interaction between low fat label, SES and weight concern was found. Specifically, among participants of higher SES and seeing a low fat label, there was greater consumption in those who were weight concerned compared to those who were not weight concerned. In contrast in those of lowest SES who saw a low fat label, there was no association between weight concern and consumption. There was no 3-way interaction of low fat label, SES and BMI. Post hoc tests indicated that seeing either label was associated with significantly reduced consumption as overweight increased and with significantly reduced consumption in weight-concerned participants of lowest SES.

These results provide some support for previous research finding paradoxical effects of nutritional labelling. However, taking account of the behaviour of non weight concerned eaters and those seeing different labels, it is apparent that this effect in those of higher SES is a consequence of reduced consumption in non weight concerned eaters seeing a low fat label rather than increased consumption in weight concerned eaters seeing the low fat label.

Of potentially greater interest are the high levels of consumption in weight concerned eaters of lower SES who did not see a label and the effect of seeing either type of label on reduced consumption. An explanation for this effect may be found within theories of self-regulation

and ego depletion. Self-regulatory models of behaviour describe the ways in which individuals use physical, psychological and social resources to adjust their behaviour to the environment (Baumeister & Vohs 2007). Theories of ego depletion suggest that we have limited resources to enable the exercise of self regulation (Spears, 2010) and that the depletion of these resources is associated with reduced self-control when faced with difficult decisions (Baumeister, 2002). Recent evidence suggests that poverty is associated with greater ego depletion (Spears, 2010). Poverty gives rise to greater numbers of difficult decisions. For example, if money is spent resolving one problem, it is not available to spend on another problem. These difficult decisions use and deplete the limited cognitive resources available leading to reduced behavioural control. Weight-concerned participants of lowest SES may experience greater difficulty in finding the cognitive resources to facilitate reduced consumption and in the absence of a label eat in response to the reward of satisfying physiological processes of hunger and satiety. In contrast, seeing a low or a high fat label may be a reminder of the goal of limiting energy intake, thus supporting consumption in line with the goal of reduced energy intake. Further research is needed to test these and other possible explanations for behavioural responses to nutritional labelling.

Some limitations of the current study should be acknowledged. We assessed dietary restraint using a very brief measure of weight concern and not a validated questionnaire to assess dietary restraint (e.g. Strien, Frijters, Staveren, Defares, & Deurenberg, 1986). This was done to minimise the response burden for a population with limited literacy and to maintain the covert purpose of the study. In the context of a field experiment it was not possible to accurately measure height and weight and thus these data were self reported, which is known to be associated with underestimation of BMI. However, underestimation is likely to be modest and unlikely to have affected the results of this experiment (Lin, DeRoo, Jacobs, & Sandler, 2011). There are also limitations in that only one type of labelling was examined in one very particular environment and so these results cannot be extrapolated to other types of labels across wide range of situations in which people consume foods. In addition we could not assess whether individuals might compensate for their popcorn consumption by eating more or less at subsequent meals. However, given the impossibility of testing the impact of multiple labelling formats across multiple situations, carefully

controlled studies such as this allow high quality evidence to inform systematic reviews and meta-analyses from which widely applicable conclusions can be drawn.

There was high multicollinearity in the regression analyses assessing the 3-way moderating effects, thereby reducing the statistical power of these analyses. ANOVA was not appropriate given unequal group sizes and the reduced power that would follow from using BMI as a categorical variable. Therefore, the results of the 3-way interactions explored in the research question warrant replication.

We assessed emotion at the three time points across the study. It would have been interesting to have been able to assess whether emotional state had an effect on consumption. However as consumption was only measured once at the end of the study, it was not possible to do this. While we made every effort to exclude repeat attenders, it is possible that some are included in the dataset. Having read the debriefing sheet on their first attendance, they would have been aware of the purpose of the study. Additionally, some participants might have heard about the study, and its purpose, from those attending previous sessions. Those who knew the purpose of the study would know that all the popcorn had the same nutritional content regardless of label and thus their consumption would be unaffected by the label. However, any such participants would have been randomised across the groups so their knowledge would be likely to reduce rather than increase the effects found.

This study contributes to the very limited evidence exploring the effects of nutritional labelling on consumption in a general population sample. The results highlight the different effects of labelling across those with different SES. The findings add to the evidence suggesting paradoxical effects of nutritional labelling, but only in those of higher SES. In those of lower SES there is evidence that nutritional labelling, at least in the case of simple colour coded labels, may support weight-concerned participants in achieving their goal of limiting intake.

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Table 1: Variables entered at each step of regression analyses used in a priori and post hoc analyses

Analysis	Step 1:	Step 2	Step 3	Step 4	Step 5
Hypothesis II: 2-way interaction effects on consumption					
Interaction: BMI and low fat label. Interaction: BMI and high fat label Interaction: weight concern and low fat label. Interaction: weight concern and high fat label.	Age* Gender SES**	Popcorn flavour	BMI Low fat label BMI High fat label Weight concern Low fat label Weight concern High fat label	2-way interaction: BMI x low fat label 2-way interaction: BMI x high fat label 2-way interaction: Weight concern x low fat label 2-way interaction: Weight concern x high fat label	
Research Question: 3-way interaction effects on consumption					
Interaction: BMI, low fat label and SES. Interaction: BMI, high fat label and SES Interaction: weight concern, low fat label and SES. Interaction: weight concern, high fat label and weight concern.	Age Gender	Popcorn flavour	BMI Low fat label SES BMI High fat label SES Weight concern Low fat label SES Weight concern High fat label SES	2-way interactions: BMI x low fat label, BMI x SES SES x low fat label 2-way interactions: BMI x high fat label BMI x SES SES x high fat label 2-way interactions: Weight concern x low fat label Weight concern x SES SES x low fat label 2-way interactions: Weight concern x high fat label Weight concern x SES SES x high fat label	3-way interaction: BMI x low fat label x SES 3-way interaction: BMI x high fat label x SES 3-way interaction: weight concern x low fat label x SES 3-way interaction: weight concern x high fat label x SES

Post hoc analysis I: 2- way interaction effects on consumption					
Interaction: BMI and seeing either label.	Age Gender SES	Popcorn flavour	BMI Seeing either label	2-way interaction: BMI x seeing either label	
Interaction: weight concern and seeing either label.			Weight concern Low fat label	2-way interaction: Weight concern x seeing either label	
Post hoc analysis II: 3 way interaction effects on consumption					
Interaction: BMI, seeing either label and SES.	Age Gender	Popcorn flavour	BMI Seeing either label SES	2-way interactions: BMI x seeing either label BMI and SES Seeing either label and SES	3-way interaction: BMI x seeing either label x SES
Interaction: weight concern, seeing either label and SES.			Weight concern Low fat label SES	2-way interaction: Weight concern x seeing either label Weight concern and SES Seeing either label and SES	3-way interaction: Weight concern x seeing either label x SES

*Age categorised as younger (18 – 34 years) or older (35 or over).

**SES categorised as socially deprived (lower SES) or not socially deprived (intermediate or higher SES)

Table 2: Associations between key study variables (Pearson chi square statistic)

	Gender	Age	SES	Weight concern
BMI†	5.53 (*p*=.06)	19.09*	8.30 (*p*=.08)	7.52*
Gender		3.54	2.49	7.45**
Age††			10.91	6.38
SES†††				8.17*

* *p*<.05 ** *p* <.01

† Coded: 1= not overweight, 2= overweight, 3= obese.

†† Coded: 1= 18-24, 2= 25-34, 3=35-44, 4= 45-54, 5=>55.

†† †Coded: 1= least deprived, 2= intermediate levels of deprivation and 3 highest levels of deprivation.

Table 3: Descriptive statistics for energy consumption (in calories) by experimental group and popcorn flavour chosen (M(SD)

	Toffee		Salt	
	N	m(sd)	n	m(sd)
No label control group	56	599.69 (385.69)	32	237.73 (132.84)
Low fat label	63	502.39 (313.12)	40	245.03 (143.31)
High fat label	58	524 .06 (337.60)	38	244.63 (137.52)
Total	177	540.27 (345.92)	110	242.77 (319.05)

Figure 1: Effect of label on standardised energy consumption by a) BMI and b) weight concern

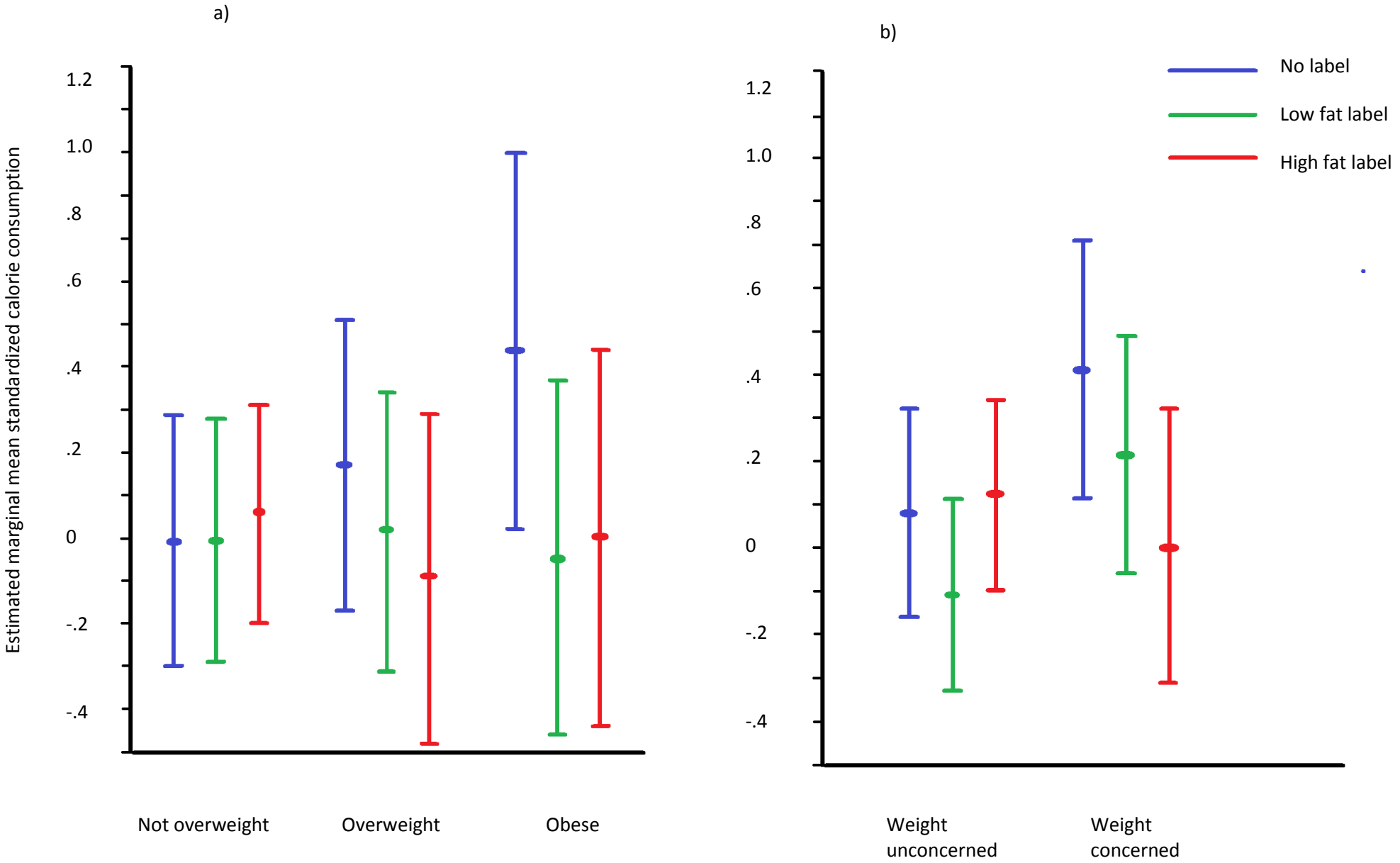


Figure 2: Moderating effects of weight concern on the relationship between label and standardised energy consumption in those with higher and lower SES.

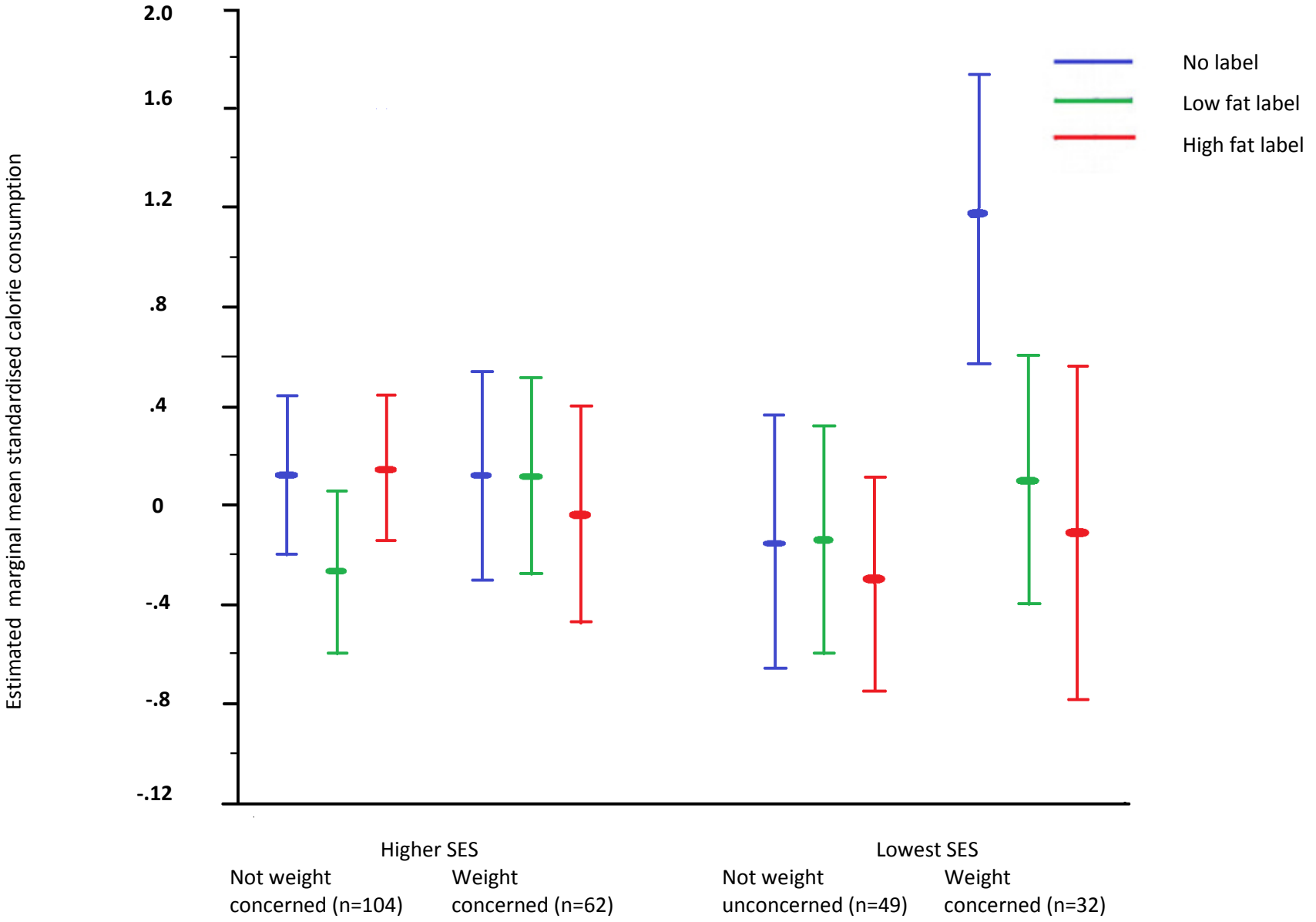


Figure 3: Marginal moderating effect of BMI on the relationship between seeing a label or no label on standardised energy consumption

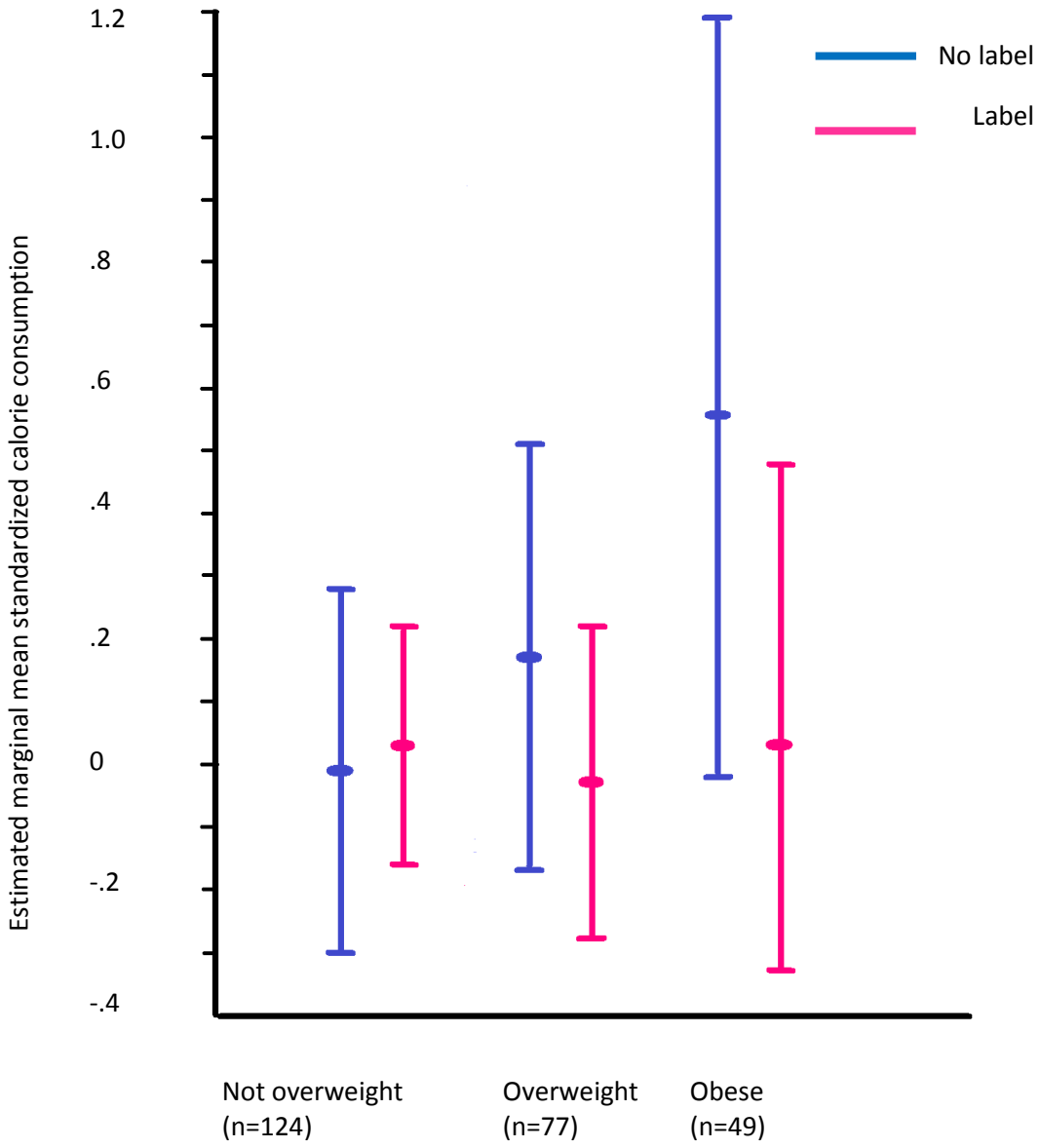
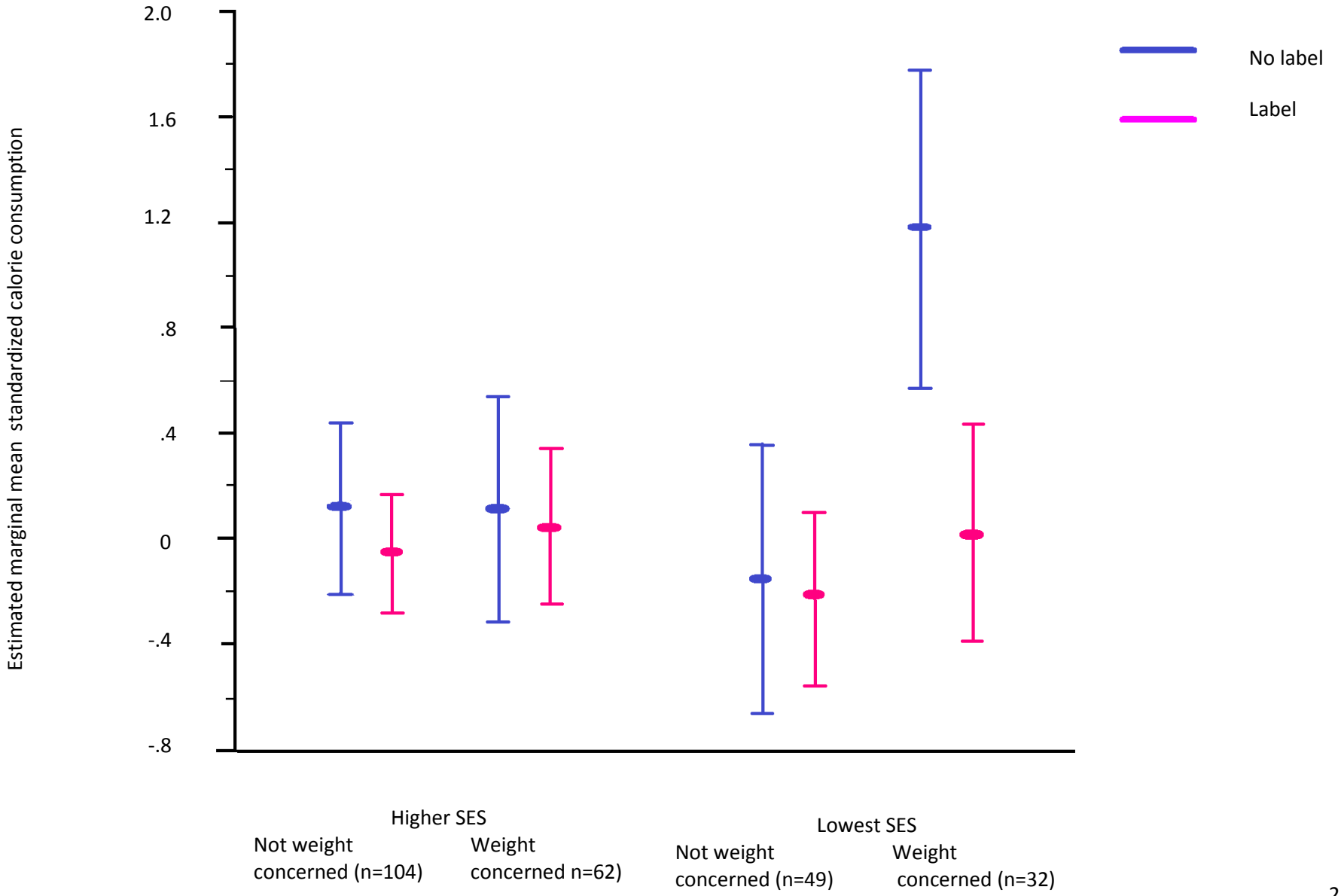


Figure 4: Three way interaction of seeing a label or not, SES and weight concern on estimated marginal standardised energy consumption.



Appendix 1: Labels indicating flavour of popcorn and fat content.