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Harnessing the unconscious mind of the consumer: How implicit attitudes predict pre-conscious visual attention to carbon footprint information on products

Geoffrey Beattie and Laura McGuire

Abstract

Consumers clearly have a role to play in the global fight against climate change since even relatively small changes in patterns of household consumption could significantly reduce greenhouse gas emissions. But what evidence is there that consumers do consider the environmental impacts of products when shopping? Indeed, how psychologically salient are the carbon footprint labels now appearing on a range of products in various countries? Here we test the psychological salience of this information using eye-tracking to identify, on a frame-by-frame basis, individual fixations on various features of the packaging, including carbon footprint. We found that the mean fixation level for carbon footprint was 12.2%, indicating it was indeed as salient as other important features. High or low levels of carbon footprint had no significant

effect on gaze fixation. We also found no significant relationship between self-reported attitudes to low carbon products and overall level of fixation, nor was there any significant relationship between implicit attitude and level of fixation. But *implicit* attitude did significantly impact on the point of first fixation, in that those with a strong positive implicit attitude were significantly more likely to fixate first on carbon footprint information. This suggests that carbon labelling could potentially be effective for *some* consumers, those with the right implicit attitude. Measures of explicit attitude, on the other hand, seemed to be largely irrelevant. The implications of this finding for sparking a 'green revolution' in consumer habits through the provision of carbon footprint information for consumers is discussed.

Introduction

Enlisting the help of consumers in the fight against climate change is at the heart of many political and business agendae across the world (Walker and King 2008), and central to the strategic vision of many leading multinational companies including organisations like Unilever, P&G and Tesco. Many in the business and political spheres are optimistic about the chances of success here because there seems to be clear evidence, from self-report measures at least, that consumers are prepared to change their behaviour to help ameliorate the effects of climate change. These self-report attitude surveys repeatedly tell us that the public are aware of the environmental issues surrounding climate change and

that they are prepared to modify their consumer habits. For example, one survey reported that '70% of people agree that if there is no change in the world, we will soon experience a major environmental crisis' (Downing and Ballantyne 2007). Another survey reported that '78% of people say that they are prepared to change their behaviour to help limit climate change' and that '85% of consumers want more information about the environmental impacts of products they buy' (Berry, Crossley and Jewell 2008).

On the basis of such evidence many argue that one important weapon in the fight against climate change is the provision of carbon footprint information on products so that consumers can make informed decisions in the light of products' environmental consequences. In a speech in 2007, Terry Leahy, the then CEO of Tesco (the multinational supermarket chain), announced a call to arms to tackle the problem of climate change. His message was simple. He said that 'The green movement must become a mass movement in green consumption.' In order to achieve this goal Leahy argued that 'we must empower everyone - not just the enlightened or the affluent.' He believed that the market was ready for this green consumer 'revolution', and his proposed solution was to break down the barriers of price and information. In other words, he was arguing, from a marketing and business point of view, that we must make green choices affordable and give the consumer the right information in the supermarket itself to make informed decisions to produce a 'revolutionary' change in our patterns of consumption.

Some academics, however, have been more cautious and have argued that labels alone would not be 'sufficient to meet frequently stated targets'. But even they agree that carbon labels 'can play an important role in the near term' (Vandenbergh, Deitz and Stern 2011). Others fall somewhere in the middle; they have concluded that carbon labels have a *very* important role to play here because once consumers start to adapt their own behaviour in response to the carbon labels on products, then they will expect farmers, businesses, importers, manufacturers, multinationals, even governments to do more to reduce the carbon footprint of the products they, the consumers, require.

This general approach clearly has significant appeal at a number of different levels. It would seem to empower consumers to act in a positive way for the environment by providing them with basic knowledge and information. In addition, it would allow them to behave in accordance with their (apparent) underlying attitude towards the environment. It allows them to do what they really want to do anyway; it is an essentially liberating philosophy.

However, this approach does make several major assumptions about consumers, their attitudes, the efficacy and importance of self-report measures for predicting behaviour, the underlying values of consumers and the psychological salience of carbon labels, all of which do require careful testing. The first specific assumption that needs to be examined is that self-reports are the best way of measuring attitudes and the best predictors of actual consumer behaviour. Research has consistently shown that such self-report attitudes may

predict behaviour under certain situations, especially when people have the *motivation* and the *opportunity* to deliberate before making a behavioural choice, (Fazio, Jackson, Dunton and Williams 1995), but they are less good at predicting spontaneous behaviour under time pressure (Freise, Wanke and Plessner 2006; Beattie, 2010, Beattie and Sale 2011), or when consumers are under any sort of cognitive or emotional load, (Gibson 2008; Hoffman, Rauch and Gawronski 2007). Unfortunately, time pressure, cognitive load and the dreaded mental shopping list (What have I forgotten?) (see Block and Morwitz, 1999), and the absence of any opportunity to deliberate, characterises much of everyday supermarket shopping (Beattie and Sale, 2011). Supermarket shopping is rarely found to be a slow, deliberate, reflective process, the shopper passes about 300 brands per minute (Rundh 2007) and each individual choice is often quick and automatic (Zeithaml 2008). In such contexts, unconsciously held *implicit* attitudes might be a better predictor of actual consumer behaviour than explicit attitudes, where an implicit attitude is defined as 'the introspectively unidentified…trace of past experience that mediates ***R***' [where ***R*** is the response – the favourable or unfavourable feeling, thought, or action towards the social object] (Greenwald and Banaji 1995: 5). In other words, habitual consumer behaviour without much opportunity or motivation to deliberate might be driven by processes not open to introspection and therefore not picked up by self-report measures. They require a different sort of measure. In the words of Greenwald and Banaji (1995: 5) 'Investigations of implicit

cognition require indirect measures, which neither inform the subject of what is being assessed nor request self-report concerning it.'

Despite numerous surveys of self-reported explicit attitude to the environment, few studies have attempted to gauge implicit attitudes to the environment, or to more specific phenomena such as low carbon products, using measurement techniques like the implicit association test (IAT). This test uses speed of reaction and error rate as a measure of association in a simple and timed categorisation task. For example, one version of the test measures the relative association of the concepts of 'good'/'bad' with the concepts of 'high carbon footprint'/'low carbon footprint' products (Vantomme, Geuens, De Houwer and Pelsmacker 2005, Beattie 2010). Those studies that have measured both explicit and implicit attitudes within the same individual often find that there is little statistical relationship between the two measures, and that these two types of attitudes are 'dissociated'. Measures of explicit attitude, where such attitudes are considered to be conscious, controlled, reflective and slow, do not significantly correlate with measures of implicit attitude, where such attitudes are considered to be unconscious, automatic, impulsive and fast (Beattie and Sale 2009). Some psychologists argue that implicit and explicit attitudes have structurally distinct mental representations, including distinct neural pathways in terms of the fundamental architecture of the brain (Chaiken and Trope 1999; Wilson, Lindsey and Schooler 2000).

The IAT is now widely used in some domains in psychology, including the broad area of psychology and race. It has revealed some extraordinary and, on occasion, controversial results. The IAT yields a measure of implicit attitude (called a 'difference' or 'D' score) that is often discrepant with the scores that emerge from explicit measures like the prototypical Likert scale. For example, the IAT tends to reveal that although the majority of participants in certain Western countries (particularly the US and the UK) report that they have no racial preference in their self-reported attitudes; the vast majority of participants (including surprisingly a proportion of Black participants) seem to have a strong implicit pro-White preference, as reflected in a positive D Score, which is often significantly above the normal criterion of 'strong positive', namely +0.8. A high positive D score also predicts a bias towards selecting just White candidates in a simulated shortlisting task when White and Black and Minority Ethnic candidates are being considered for a post, even when the candidates are presenting with identical CVs (see Beattie 2013; Beattie, Cohen and McGuire in press).

Currently, despite the plethora of research on self-report attitudes to the environment we actually know very little about the nature of implicit attitudes in this important domain. But the carbon labelling approach to ameliorating the effects of climate change seems to be based on the premise that the kinds of attitudes that predict actual consumer behaviour are going to be positive. Given

that such attitudes are likely to be implicit rather than explicit this needs to be explicitly tested.

A second major assumption underlying the carbon labelling approach is that the carbon footprint image or icon is sufficiently salient to consumers that they will actually attend to it whilst shopping in supermarkets within the appropriate time frame. Without minimal attention (and perhaps more than minimal attention given the amount of information actually represented in the carbon label), carbon footprint cannot possibly influence consumer choice. However, shoppers pass brands every 1/5th second in supermarkets (Gelperowic and Beharrell 1994) and spend between 5 and 7 seconds looking at possible items for purchases. This means that the attention of the consumers needs to be highly selective. We have known for some considerable time that attention reflects individual needs and values (Bruner and Goodman 1947) but are consumer values towards the environment sufficiently positive here to direct attentional processes towards carbon labels? Carbon footprint information has to compete in this cognitively rich environment with all of the other important types of information on products, including price, calories or energy, fat content, brand, special offers, sell-by date etc., all vying for the attention of the consumer. So how salient is the carbon footprint on products to consumers?

We know from other domains that some information labels on products can influence consumer choice presumably because of the 'needs and values' of the consumer. The Guideline Daily Allowance (GDA) nutritional labelling

scheme is one such example, and one that has often been cited, not least by the CEO of Tesco himself when Tesco launched its own carbon labelling scheme. Tesco had found, by monitoring its own clubcard data, which records details of all transactions in its supermarkets, that sales of low fat meals increased when GDA was introduced whilst sales of high fat meals decreased, all in a relatively short time frame. For example, sales of their salmon en croute (with a GDA fat content of 53% and a saturated fat content of 91%) went down by 29% in the two month period after GDA information was introduced, whereas sales of their vegetable curry (with a GDA fat content of 25% and a saturated fat content of 20%) went up by 33%. This real world example suggests that GDA information on food products was attended to and acted on; indeed the effects on consumer choice were fairly rapid. The salience of nutritional labels for consumers is also backed up by experimental research in the area of visual processing of product labels using eye tracking technology, where people's patterns of eye movements and individual fixations are monitored as they look at products. Such eye tracking is viewed as 'an unobtrusive, sensitive, real-time behavioural index of ongoing visual and cognitive processing', which provides accurate data on the allocation of attention (see Beattie, McGuire and Sale 2010). Eye tracking is an important technique in this research because there is evidence that *self-reported* viewing of nutritional information tends to be higher than the objective figures as revealed by eye-tracking. In other words, when it comes to certain types of behaviour you cannot rely on what people say.

Visschers, Hess and Siegrist (2010), using eye tracking, found that 66% of their participants looked at the nutrition label on the front of cereal packets, and those packets with a simple design seemed to be more successful in drawing participants' attention to the nutrition label. They also found that those participants who approached the task with a particular 'health motivation' spent more time viewing the nutritional information than those participants who approached the task with a 'taste motivation'. Graham and Jeffery (2011) monitored adult participants viewing food items on a computer and found that calorie information was the most salient feature (71% of participants looked at this), with 61% looking at fat content and 40% at carbohydrate content

So the argument goes, carbon footprint could (and should) have a similar effect. Indeed, a piece in the *Economis*t in June 2011 reported encouraging signs of progress in the following words, 'In Britain, a pioneer in carbon labelling, nine out of ten households bought products with carbon labels last year….and total sales of such products exceeded £2 billion'. But what is interesting about the quote is that the missing words are 'albeit mostly unwittingly'. Nevertheless, the plan then was for Tesco to include carbon footprint on each of its 70,000 own brand products. Other major multinationals were to follow suit.

But in a controlled eye tracking experiment (Beattie, McGuire and Sale 2010), it was discovered that carbon footprint was unfortunately not like GDA nutritional information. People were eye-tracked as they looked at images of

various products with carbon labels (Tesco low energy light bulb, orange juice and 'Non-Bio' liquid detergent). Each of these products had an array of competing information represented on their packaging. In this study, participants were shown simultaneous front and back views of each product (see Figure 1-3) on a computer screen (these were rotated on each successive trail with the position of the front and back views relative to each other switched) and point of gaze was analyzed on a frame-by-frame basis, 25 times per second, for a 10 second viewing time (indicative of the upper levels of attentional focus in a supermarket where customers consider an individual product).

Figure 1: One version of the light bulb stimulus used in the Beattie, McGuire and Sale (2010) eye tracking study.

Figure 2: One version of the orange juice stimulus used in the Beattie, McGuire and Sale (2010) eye tracking study.

Figure 3: One version of the detergent stimulus used in the Beattie, McGuire and Sale (2010) eye tracking study.

We analyzed level of fixation in the first 5 seconds, the second 5 seconds, and also the first fixation period of 200 milliseconds (or 5 successive gaze points). What we found was that the pattern of visual attention varied considerably depending on the product type. In the case of the clearly 'green' low energy light bulb, our participants looked at the carbon footprint (the carbon footprint icon plus the associated information) for a high proportion of the time (a mean of 65.3 frames across both right and left rotated views, or 26.1% of the time). See Figure 4.

Figure 4: An example of one participant's gaze at the carbon footprint label on the low energy light bulb

In the case of the orange juice they looked at the carbon footprint for a mean of 24.9 frames (or 10.0% of the total time), dipping to 5.7% for one stimulus view. In the case of the detergent the mean figures were 8.2 frames and 3.3% of the total time. In terms of the time course of gaze at the light bulb, attention was directed within the first five seconds at the carbon footprint icon, but attention only moved to the accompanying textual material in the second five second period. It seemed to take much longer for participants to attend to the basic carbon footprint icon in the case of the orange juice (only really appearing in the second five second interval), and in the case of this product they hardly attended to the accompanying information at all. In the case of the detergent, there was minimal visual attention to any aspect of the carbon footprint. Importantly, in less than 7% of cases overall did the participants fixate immediately on the carbon footprint icon or the accompanying carbon footprint information. And, these results may (if anything) represent an over-estimation of attention in situ because we simultaneously presented front and back views of the products; in supermarkets customers would have had to go to the trouble of turning the products around (GDA information is, of course, represented on the fronts of most products).

Psychologists have argued that 'Humans have an impressive capacity to determine what is salient in their environment and direct attention in a timely fashion to such items.' (Bowman, Su, Wyble and Barnard 2009). Carbon footprint labels *should* be salient to participants (and if you relied solely on what people reported in surveys then you would surely conclude that they are very salient indeed). But this preliminary eye tracking study, which did not rely on self report data, does raise some questions about their salience. It also raises some serious questions about the plausibility of igniting a 'green revolution' in consumer behaviour by presenting carbon labels on products. If people do not attend to such labels in the first place then the 'green revolution' is likely to be postponed for some considerable time.

This original study into carbon labels and visual attention (Beattie, McGuire and Sale 2010) clearly requires careful consideration. Perhaps, the most striking result in this study was the considerable variation in level of fixation towards carbon footprint information depending on the particular product. A high level of visual attention was directed at the carbon footprint of the low energy light bulb (18.2% of a 10 sec. interval) but the carbon footprint of other products (e.g. the detergent) received only minimal visual attention (see also Beattie 2010). But this study was, of course, exploratory and to a certain extent, inconclusive because although it did identify significant differences in level of fixation to various products it did not identify which features of the products were responsible for this. Did participants attend more to the carbon

footprint of the low energy light bulb because they knew that the footprint would be low, thus reflecting some sort of 'optimism bias' where gaze preference 'towards positive and away from negative images…reflect an underlying motivation to regulate emotions and to feel good.' Isaacowitz 2005; Isaacowitz 2006; but see also Beattie and McGuire 2011 for some contrary evidence). If this were the case, then it would have major implications for the potential efficacy of carbon labelling. Consumers might only check the carbon footprint of products that they know are low, not wanting to 'see' the bad news on others (like some weight-conscious consumers not checking the fat content of chocolates which they know already are 'naughty but nice' and which are bought regardless). Or, did the results reflect the fact that low energy light bulbs are highly associated in people's minds with being environmentally friendly, and therefore the unconscious eye movements move automatically to carbon footprint when this product is presented? Or, were the results affected by the physical features of the product labels, including simple things like the relative size of the different categories of information represented? And why did our participants look much less at the carbon footprint on the detergent? Was it because of how the footprint was represented on the detergent bottle (some physical attribute of the representation)? Or was it because the carbon footprint of the detergent was high? Or was it something to do with the strength of the mental association between (positive) environmental issues and detergent? These are all potentially extremely important questions because of

the emphasis being placed on carbon labelling as a potential solution to the issue of climate change. But without testing some of these basic alternative hypotheses, and determining the psychological salience of the carbon footprint, much effort in this domain could well be wasted.

The present study was an attempt to test experimentally some of these basic alternate hypotheses. We investigated the salience of carbon footprint information by controlling the physical size of information labels for three attributes (carbon footprint, price, energy/calories) on a range of products which did not have ready made environmental associations (unlike low energy light bulbs which clearly do), but systematically changing both the price and the carbon footprint information to examine the impact of these changes on unconscious visual fixation. An additional question concerns whether implicit attitude predicts gaze direction and focus on carbon footprint, as it does in at least one other domain in the area of sustainability. Beattie and McGuire (2012) attempted to determine how eye movements towards or away from iconic images of climate change/environmental damage were affected by different attitudinal measures (either explicit or implicit). The theoretical justification for this work derived from the early research of the Nobel Laureate Daniel Kahneman (1973) on attention and effort. In Kahneman's words 'In the absence of a specific instruction to search for visual information, spontaneous looking is controlled by enduring dispositions that determine which parts of the

field of view should attract and hold the gaze' (ibid. 52). In our study we wanted to find out whether implicit or explicit attitudes were a good measure of 'enduring dispositions' here. We did this by projecting slides onto a computer screen, each slide containing three images, one positive image of nature, one negative image of climate change/environmental damage and one neutral image (pictures of cups, plates and other everyday objects). See Figure 5.

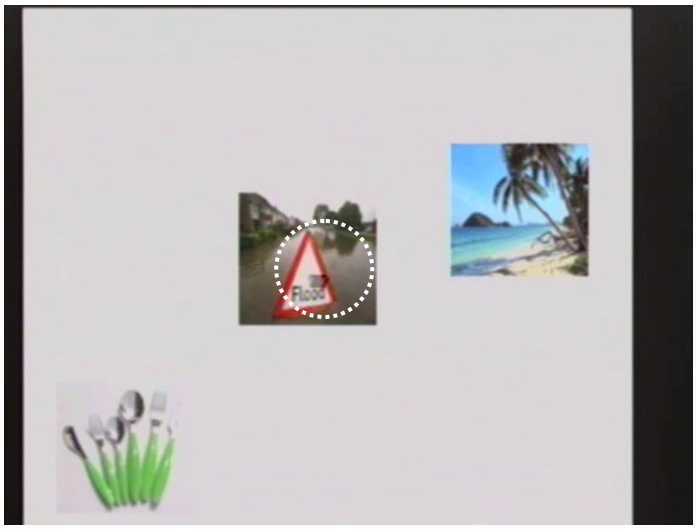


Figure 5: The eye gaze of one participant with one stimulus array. The gaze here is directed at the negative image in the middle of the screen (Beattie and McGuire 2011)

We found that people do not focus inordinately on the negative images of climate change/environmental damage when there are other positive images and neutral images available. They usually look less than 40% of the time at the negative images. But very importantly those who the IAT reveals have strong positive implicit attitudes to carbon footprint are significantly more likely to focus on the negative images of climate change/environmental damage than positive images of nature, and they focus more on these images than those who do not have such strong implicit attitudes. We also found that this even occurs in the first 200 milliseconds of viewing the slide. Those with a positive implicit attitude to low carbon footprint products looked more at the negative images of climate change/environmental damage in the first 200msecs compared with those with less strong positive implicit attitudes to low carbon footprint products. Measures of explicit attitude did not, however, predict patterns of eye movement towards the negative images in this way. It would seem that those who have strong implicit pro-low carbon attitudes are primed to attend to these sorts of images, whereas those who only report strong attitudes are not (they actually looked less).

This was both a novel and exciting finding in that we clearly build our representations of the world using those features of scenes that we notice and some significant association between attitudes and attentional focus might give us some insight into how and why people develop quite different

representations of the world and the dangers it faces (and presumably act differently as a consequence). This particular study suggested that there is a significant connection between implicit attitudes and gaze fixations. But how should we interpret this? After all, we merely observed an *association* between attitudes and behaviour (and, of course, association does not imply causality), but one that nevertheless opens up intriguing theoretical and practical possibilities. One interpretation of the results would be that those who have a strong implicit attitude towards low carbon footprint products (i.e. are more environmentally friendly) focus more on negative images of climate change/environmental damage and because of this essential 'priming' are in a position to receive other appropriate environmental messages (like carbon footprint). An alternative interpretation would be that causality works the other way around with attentional focus shaping the implicit attitude. Of course there is also the third possibility that both interpretations are correct and that causality works both ways. But going with the first interpretation for the moment, this significant pattern of 'primed' eye movement occurs in such a short interval (one fifth of a second) that it is pre-conscious. This might mean that those with positive implicit attitudes could potentially direct attention to any appropriate imagistic representations *relevant to* climate change/environmental damage (including, carbon footprint) very quickly. This, at least, is a potential hypothesis but one that offers some hope to the lobby that says we could change consumer behaviour by providing carbon footprint information to consumers.

But should we really expect this attentional focus to occur with carbon labels? This is not necessarily an easy question to answer at the present time. You could argue in the affirmative that a positive implicit attitude would predict an intrinsic interest in anything to do with the environment and climate change, be it an iconic image of the consequences of climate change, or an informational label on a product denoting what its carbon footprint actually is. But you could also argue the opposite case on the basis that we are now very familiar with iconic images of climate change, indeed one such iconic image, depicting the stranded polar bear on the diminishing ice floe, is an immediate and recognizable signifier of climate change. Indeed, this has become something of a clichéd image of climate concern. So much so that coming up to Christmas 2011 Coca Cola teamed up with the WWF to 'help the polar bear', and, in an attempt to publicly display their 'green credentials', changed the design of their famous cans. See Figure 6. They put polar bears on the cans, changed the colour of their cans from red to white, and launched 1.4 billion of these special edition cans onto the market.

Figure 6: An example of the special edition Coca Cola can, which was launched onto the market in 2011.

Muhtar Kent, Chairman and CEO of the Coca-Cola Company had this to say about the campaign 'We want to help the polar bear – a beloved Coca-Cola icon since 1922 – by helping conserve its Arctic habitat' (see the brandchannel October 25th 2011). As the British newspaper the Telegraph commented (3rd December 2011) 'It was the first time in 125 years that the regular product had been switched from its trademark red cans.'

The outcome, however, was not in the end positive. The design and the colour had to be abandoned because consumers complained that the white cans were too easily confused with the silver Diet Coke brands. And, in addition, the new colour also seemed to affect the taste of the product, which in fact was unchanged. One should perhaps remember that a change in taste perception as a function of visual cues is not unusual (see Ghose and Lowengart 2001). Market forces inevitably won out in the end and the cans were dropped.

Of course, the 'meaning' of the polar bear (and our emotional response) to it has changed significantly between 1922 and the present day but by using the polar bear image Coco-Cola simultaneously signified its product's long tradition (in the period leading up to Christmas tradition is, of course, a very important concept), but it explicitly tried to communicate that a sugary brand of

drink with no nutritional content that is sold in aluminium cans is actually very 'environmentally sensitive'.

But the important point in the present context is that if *iconic* images signifying climate change are used to market products like Coca Cola then this indicates how immediate (and how emotional) our response to them must be. This emotional response could be crucial to driving our behaviour in the appropriate time frame (see Damasio 1994). Presumably, a market leader like Coca Cola would have tested this very carefully before it proceeded. Would carbon footprint labels, without that significant period of association with climate change, and without the same emotional response (see Beattie 2012), have the same effect and draw the eyes unconsciously towards them as a function of our underlying implicit values? The answer could well be negative.

Of course, if those with positive implicit attitudes did show higher levels of fixation on carbon footprint labels, or more immediate fixations on the carbon footprint information, this could have important implications for the efficacy of carbon labelling schemes. It would also have potentially important implications for the likelihood (or not) of a 'green revolution' in consumer habits merely through careful marketing and informed consumer choice. In other words, it is a question of some considerable practical as well as theoretical importance.

Method

Four different non-branded packages were created for muesli, cake mix, ice lollies and detergent (see Figures 7 - 10). On each slide – there were 6 features, namely (1) product name, (2) product image, (3) carbon footprint (icon plus text 'working with the carbon trust', and carbon value e.g. 0.6g CO_2), (4) price, (5) energy value (calories, number of washes) and (6) bar code. Product image was in colour, the rest were all in black and white.

Figure 7: The stimulus used for the muesli product.

Figure 8: The stimulus used for the washing powder product.

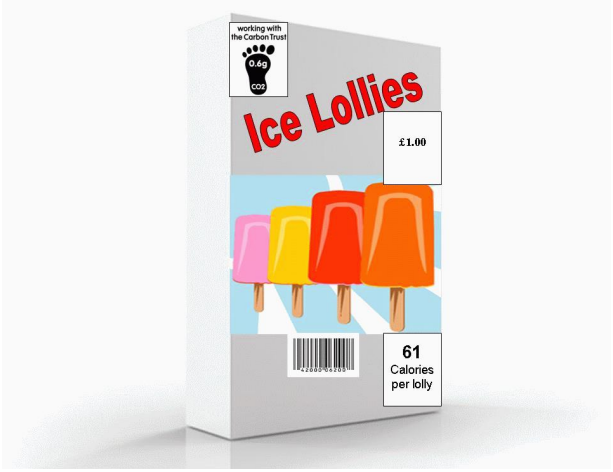


Figure 9: The stimulus used for the ice lollies product.

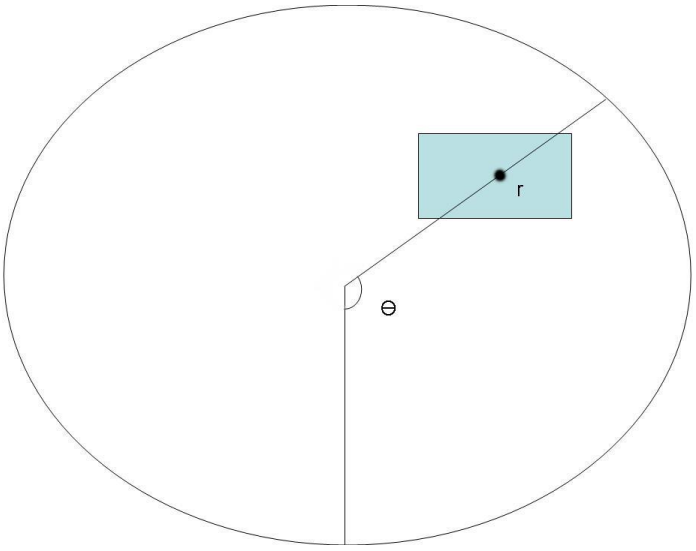
Figure 10: The stimulus used for the cake mix product.

Price and carbon footprint information were systematically varied yielding 4 combinations of high price/high carbon footprint (CF); high price/low CF; low price/high CF; low price/low CF. Energy value (calories or

number of washes for detergent), bar code, product name and image were all kept constant. Sixteen different stimulus slides were used (4 products times 4 combinations); each contained one product name and image plus bar code with three different information labels (carbon footprint, price, and energy). The position of these different information labels was systematically rotated on the product (See Figure 11). The information labels were always the same size, 3cm x 2.5 cm = (7.5 cm^2), and the monitor was 33cm x 24 cm = (792 cm^2). The order of presentation of the slides was randomised.

Figure 11: How CF, energy and price labels were rotated on one product.

The image of the product was always located in the middle of the slide. An angle Θ for the location of each information label was selected using the randomization algorithm below and a point for the centre of the image was calculated using the formula for r:



ϴ = Random ((J-1) * 120 + Z - 20, J * 120 + Z + 20)

(Where J=group number; Z= random (0, 90))

r = Random (picturesizewidth, displaysizewidth)

loop until no overlap.

Figure 12: The randomization algorithm for assigning position of images on the screen

The slides were shown for 10 seconds and then replaced by the next slide in the sequence. The focus was on spontaneous looking at these slides, following the logic of Kahnemann 'In the absence of a specific instruction to search for visual information, spontaneous looking is controlled by enduring

dispositions that determine which parts of the field of view should attract and hold the gaze.' There were 22 participants in total; all were university undergraduates paid £5 for their participation.

Procedure

An ASL Model 504 remote eye tracker was set up in front of the computer monitor on which the stimulus material was shown. The eye tracker employs a camera surrounded by infrared emitting diodes to illuminate the eye of the participant looking at a screen. The participants' point of gaze on the screen is determined by the camera combining the position of the pupil and the corneal reflection. The remote camera in the eye tracker fed into a screen for the experimenter's observation of the positioning of camera observing the eye. From a separate computer, the experimenter was able to adjust the illumination of the infra red camera and the 'pan/tilt' of the camera in the eye tracker to enable recognition of the pupil and corneal reflection. Participants were seated in front of the eye tracker. The eye tracker was adjusted to record each participant's right eye, the participant then had to undergo a 9-point calibration procedure. The calibration was carried out by asking each participant to gaze at each of the nine numbers on the screen in front of them (and told by the experimenter when to look at each number in turn). The numbers were on the extreme left, middle and extreme right of the screen, at the top, middle and bottom of the screen. If the dots signifying gaze were not on the numbers as

required, when the recordings were checked, then adjustments to the settings were made, and the participant was restarted in the calibration procedure. Finally, participants were told simply that they were going to be shown a series of images, which were not specified in advance.

Scoring

The recordings were analysed using a freeware mpeg2 video editing program (mpeg2cut2) with frame advance function to analyse mpeg2 video clips. Each 40 ms frame was coded by a human observer in terms of where each of the participants was looking. There were 22 participants (16 slides x 10 seconds x 25 frames per sec.) generating 88,000 individual data points individually coded and analyzed. Each frame was scored as having gaze focus on carbon footprint/price/energy/product image/other. See Figure 13.

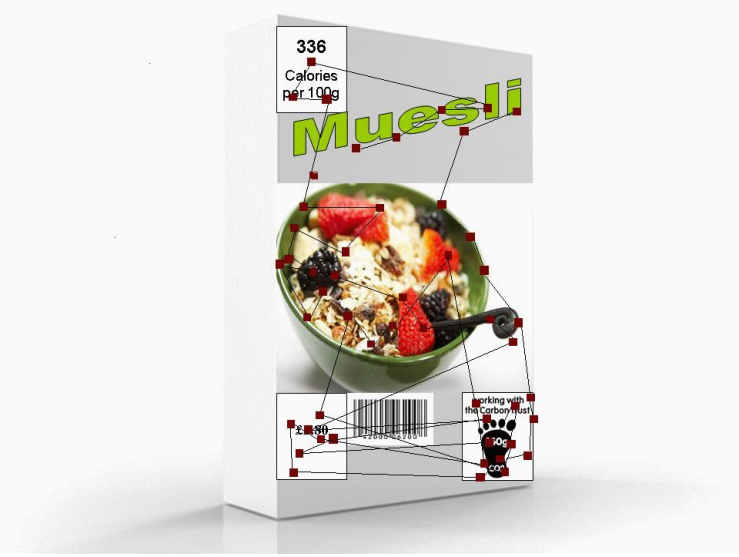


Figure 13: The pattern of gaze at one stimulus slide (every 10th frame is represented here)

Attitude measurement

Participants completed two computerised self-report attitudinal measures (a Likert scale and a Feeling Thermometer) after the eye tracking was complete (see Figures 14 and 15). The Likert scale assesses explicit preference towards high/low carbon footprint products. Participants were asked: 'Which statement best describes you?' on a 5-point scale (1 = 'I strongly prefer products with a high carbon footprint to a low carbon footprint'; 5 = 'I strongly prefer products with a low carbon footprint to a high carbon footprint'). The Feeling Thermometer assesses explicit feelings of warmth and coldness towards products with high/low carbon footprints. Participants were asked: 'Please rate how warm or cold you feel toward the following products' (1 is 'very cold'; 5 is 'very warm'). Thermometer difference (TD) scores (ranging from - 4 to + 4) were calculated by subtracting the score given to the high carbon product from the score given to the low. Positive scores indicate a preference for products with a low carbon footprint.

Figure 14: A computerised version of the Likert scale for measuring attitudes to carbon footprint.

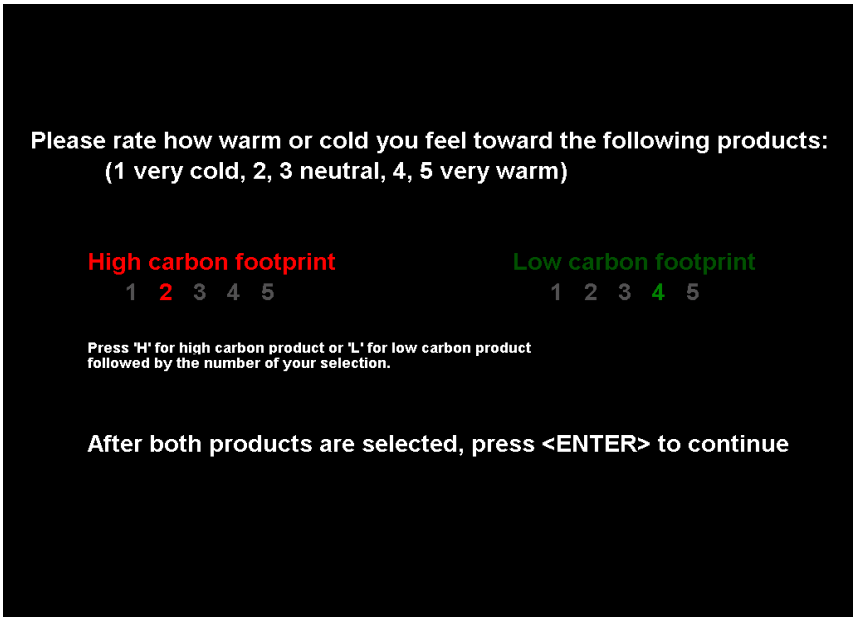


Figure 15: A computerised version of the Feeling Thermometer scale for measuring attitudes towards high and low carbon footprint products.

Implicit Association Test (IAT)

There were two target categories (low carbon footprint/high carbon footprint) and two attribute categories (good/bad). Exemplars from these categories appeared in the middle of the screen and participants were asked to sort the exemplars into their respective categories which appeared at the top left- and right-hand corners of the screen. To sort exemplars into the left-hand category, participants were asked to press *z* (on the left-hand side of the keyboard) and to sort exemplars into the right-hand category participants were asked to press *m* (on the right-hand side of the keyboard). In total, there were seven trials where trial blocks 1, 2 and 5 were practice trials and trial blocks 3, 4, 6 and 7 were the critical trials where participants were required to sort exemplars into one of two categories that appeared simultaneously. The reasoning behind the IAT is that participants should find it easier to sort exemplars if the paired target categories are associated (therefore responding faster with fewer errors) and harder to sort exemplars if the paired target categories are not associated (therefore responding slower with more errors). Thus, participants who associate low carbon footprint products with 'good' and high carbon footprint products with 'bad' should respond slower on trials where the pairs are good/high carbon footprint and bad/low carbon footprint and faster on trials where the pairs are good/low carbon footprint and bad/high carbon footprint. The converse should be true for participants who associate low

carbon footprint products with bad and high carbon footprint products with good.

The computerised versions of the seven trials are shown below in Figures 16 - 22. This is what the participants actually saw on the computer screen in our IAT:

Figure 16: 1st trial: low vs. high carbon footprints.

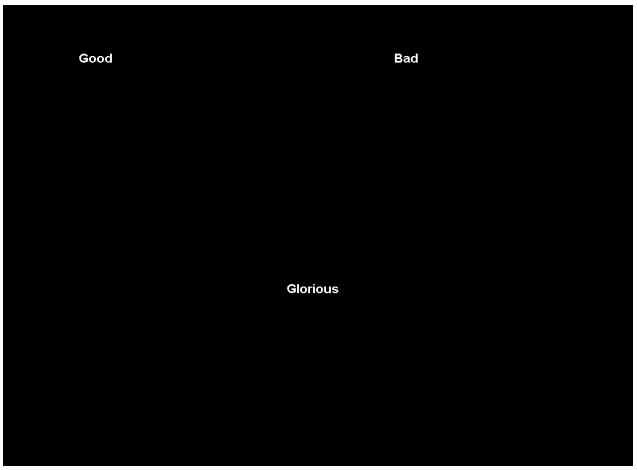
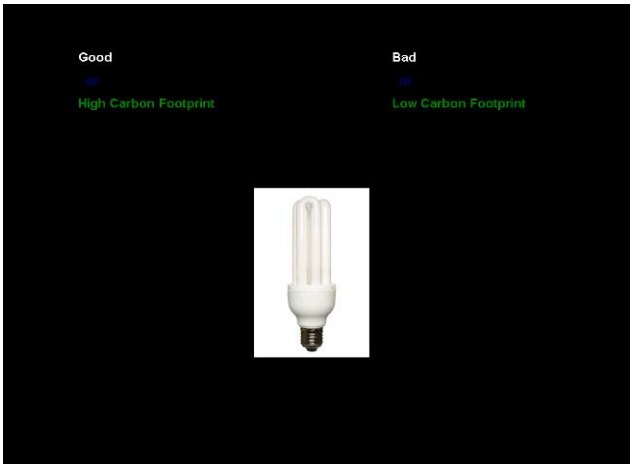


Figure 17: 2nd trial: good vs. bad.



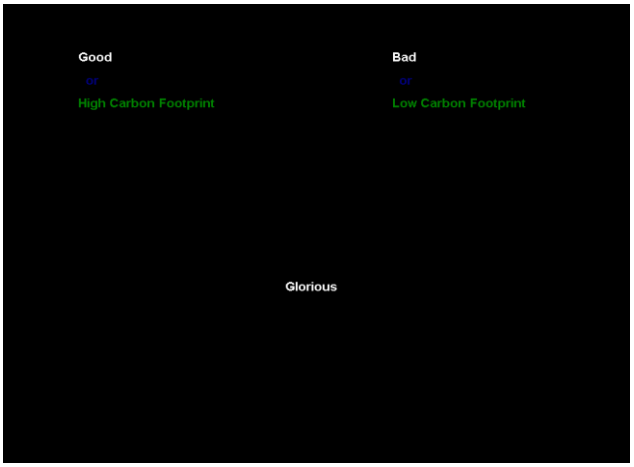


Figure 18 and 19: 3rd and 4th trial:
Good or high carbon footprints vs. bad or low carbon footprints.

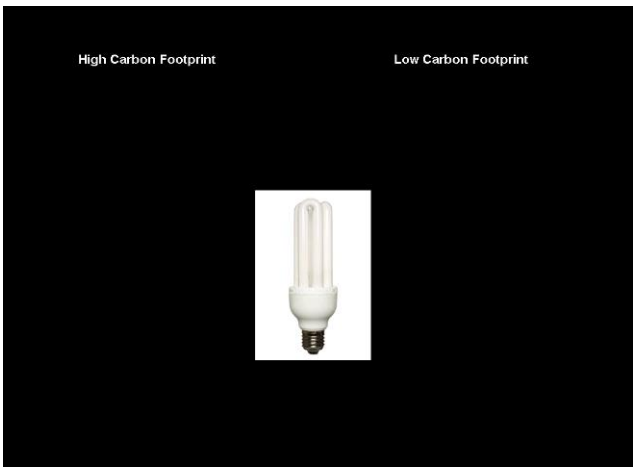
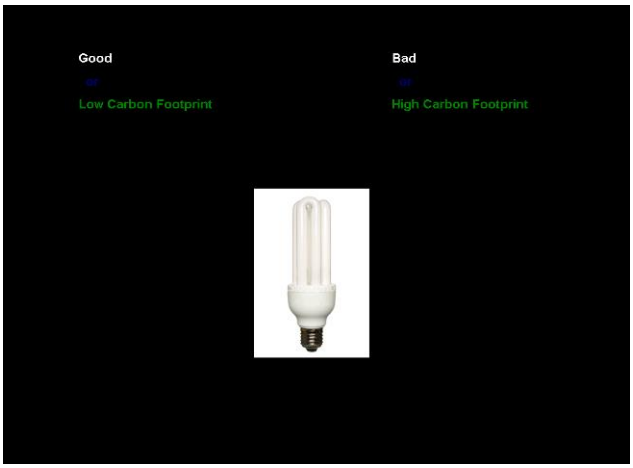


Figure 20: 5th trial: high vs. low carbon footprints.



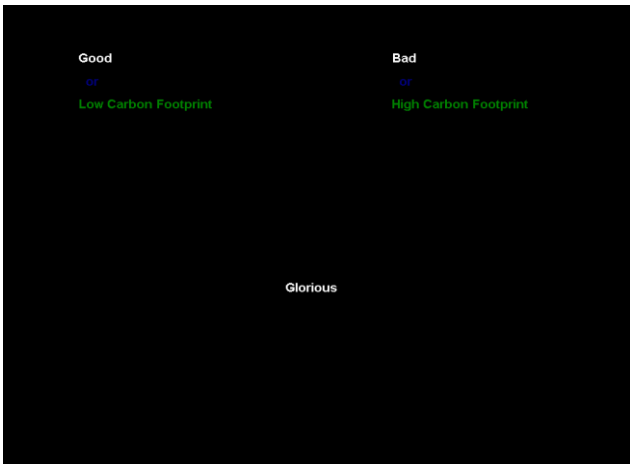


Figure 21 and 22: 6th and 7th trial:
Good or low carbon footprints vs. bad or high carbon footprints.

IAT effect scores were computed by following the following scoring algorithm:

1. Exclude trials where latencies are above 10,000 ms.

2. Exclude trials where over 10% of trials had latencies lower than 300 ms.

3. Calculate mean response latencies for Blocks 3 and 4, and Blocks 6 and 7.

4. Calculate the difference score for Blocks 3 and 4 and Blocks 6 and 7.

5. Divide the two difference means by their standard deviations.

6. Average the scores to compute the D score for each participant.

There was no specific time penalty for errors in this version of the IAT. If participants made a mistake then they had to press the correct key before moving on and this additional step represented the time penalty.

The D score reflects the difference in latencies during the critical trials and the error rate. D score effect sizes are similar to Cohen's *d* (Cohen 1988) and usually take the form of small, medium and large values of 0.2, 0.5 and 0.8 respectively. Positive IAT effect scores reflect a preference for low carbon footprint products, negative effect scores reflect a preference for high carbon footprint products (D scores between - 0.2 and + 0.2 are considered neutral).

Results

The mean amount of time spent looking at the carbon footprint label was 12.2%, with a range from 8.8% (low CF/high price muesli) to 16.2% (low CF/low price cake mix). Participants spent significantly more time spent looking at carbon footprint than they did at price across the 16 stimuli (Wilcoxon Matched-Pairs Signed-Ranks Test, T= 19½, n = 21, p< 0.001, 2-tailed test), but not significantly more time looking at carbon footprint than energy value (T= 58, n = 19, n.s.). See Fig. 23.

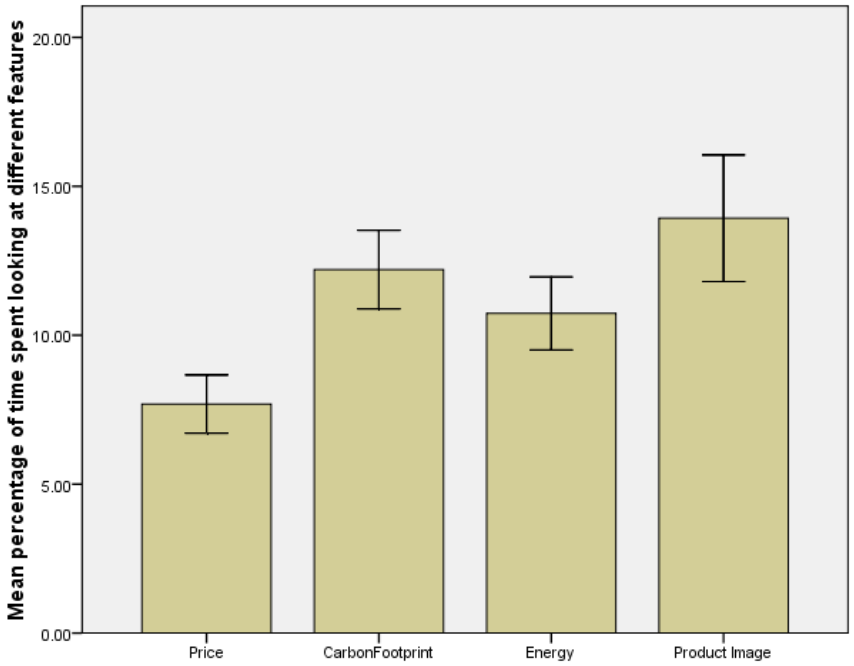


Figure 23: Mean percentage of time spent looking at different features of products.

These results suggest that carbon footprint is intrinsically salient when the size of the label is carefully matched with other labels (like price and energy value) and when the information is represented on the front of the product. Of course, in a real shopping situation price is likely to be significantly more important than it was in this particular experimental task where no actual purchase had to be made

Whether the carbon footprint information was high or low had no significant effect on level of fixation (all 8 Wilcoxon tests here were non-significant with T values ranging from 75.5 to 121). See Figure 24.

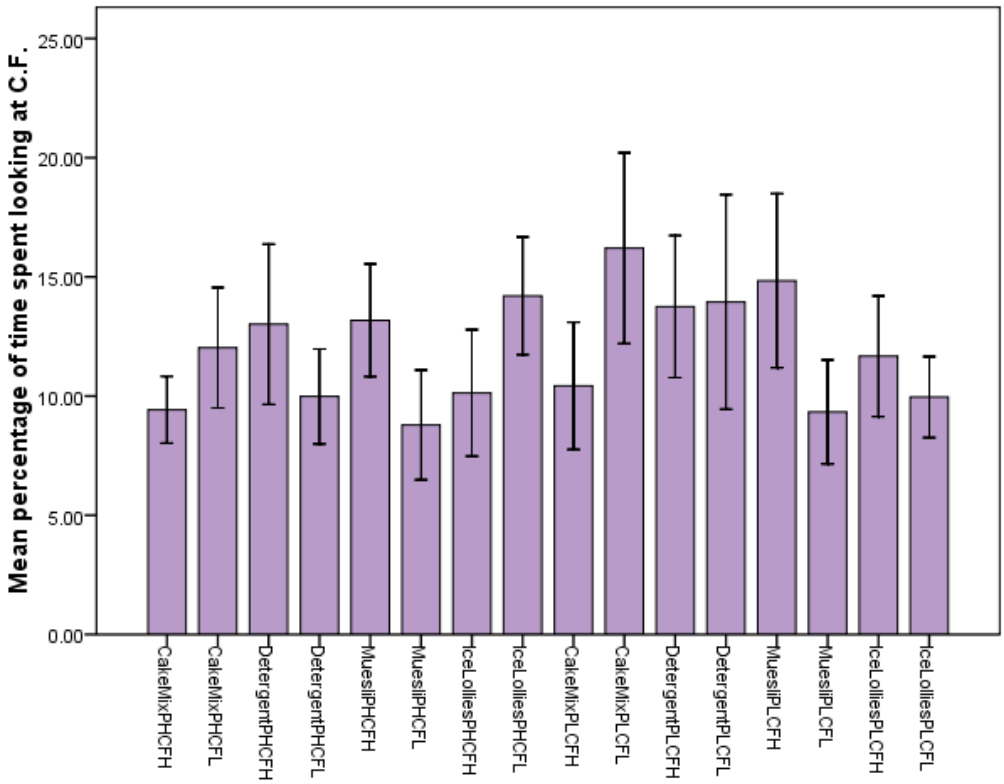


Figure 24: Mean percentage of time spent looking at carbon footprint with different products of different prices with error bars.

Analyses of the attitude measures revealed that the average Likert score was 3.7 (moderately pro-low carbon) with a standard error of 0.16, and a mean

of 1.7 for T.D. score (moderately pro-low carbon) with a standard error of 0.31. The IAT revealed that the average D score was 1.9 (strongly pro-low carbon) with a standard error of 0.4, suggesting that the *average* implicit attitude was more positive than the *average* explicit attitude in this particular sample. However, and importantly, 5 participants still showed implicit scores that were much less pro-low carbon than their self-reported attitudes would suggest (4 had negative D scores indicating a preference toward high carbon products, one was neutral, despite all 5 scoring 4 or 5 on the Likert scale). Similar results have been reported elsewhere (Beattie 2010).

Next, we considered the relationship between explicit attitudes and the proportion of time spent looking at carbon footprint information on each slide. The way the analyses was done was by comparing those with a strong positive explicit attitude, which we operationally defined as 4 or 5 on the Likert scale, compared with those with neutral or negative explicit attitude, operationally defined as 1,2 or 3 on the Likert scale. There were 14 in the first set (strong positive explicit attitude) and 8 in the second set (neutral or negative explicit attitude). Each stimulus array was considered separately. In each case $n_1 = 14$ and $n_2=8$ and in no case was there any significant statistical effect. See Table 1. In other words, those who express a strong positive attitude to carbon footprint do not spend significantly more time looking at the carbon label on products.

Table 1: The effects of explicit attitude to carbon footprint on possible selective attention to carbon footprint information.

Proportion of time spent looking at carbon footprint information			Statistical comparisons Mann-Whitney U test U values (n_1=14, n_2=8)
Stimulus array	Strong positive explicit attitude (4/5 on Likert scale)	Neutral or negative explicit attitude (1/2/3 on Likert scale)	
Muesli CF –High Price -High	12.2	14.9	53
Muesli CF –High Price -Low	13.9	16.5	48
Muesli CF –Low Price -High	8.7	9.0	50½
Muesli CF –Low Price -Low	10.8	6.9	52½
Ice Lollies CF-High Price - High	10.4	9.7	52
Ice Lollies CF-High Price - Low	11.6	11.9	55½
Ice Lollies CF-Low Price - High	11.5	18.7	38½
Ice Lollies CF-Low Price - Low	10.2	9.5	53
Detergent CF – High	13.8	11.6	49½

Price - High			
Detergent CF – High Price – Low	14.1	13.1	50
Detergent CF – Low Price - High	8.9	11.8	47
Detergent CF – Low Price - Low	18.9	6.6	47
Cake mix CF – High Price - High	8.0	11.9	39
Cake mix CF – High Price - Low	10.9	9.5	43
Cake mix CF – Low Price - High	11.9	12.2	52
Cake mix CF – Low Price - Low	16.5	15.6	55

The next analysis considered whether implicit attitude had any effect on the proportion of time spent looking at carbon footprint information. We operationally defined strong positive implicit attitude as anything above the median D score (D = 1.69) and a more negative implicit attitude as anything below the median. In this case, of course, there were 11 in the first set (with a mean D score of 3.24) and 11 in the second set (with a mean D score of 0.46; 5

of the 11 had a negative D score). The fixation level on carbon footprint was 1.01% *lower* for those with high D scores compared to lower D score, with means of 11.27% and 12.28% respectively, and there was no significant relationship between D score and level of fixation on carbon footprint information (T= 49, n=16, n.s.) when the statistical comparison was made across the 16 stimulus arrays. See Table 2.

Table 2: The effects of implicit attitude to carbon footprint on possible selective attention to carbon footprint information.

Proportion of time spent looking at carbon footprint information			Statistical comparisons Mann-Whitney U test U values (n_1=11, n_2=11)
Stimulus array	Strong positive implicit attitude	Less positive implicit attitude	
Muesli CF –High Price -High	11.3	15.0	49
Muesli CF –High Price -Low	19.8	9.9	46
Muesli CF –Low Price -High	14.6	3.0	22
Muesli CF –Low Price -Low	6.6	12.1	41½
Ice Lollies CF-High Price - High	7.6	12.7	52½
Ice Lollies CF-High Price - Low	11.2	12.2	50½
Ice Lollies CF-Low Price - High	15.4	13.0	51½

Ice Lollies CF-Low Price - Low	9.7	10.2	60½
Detergent CF – High Price - High	8.4	17.7	37½
Detergent CF – High Price – Low	16.6	11.0	51
Detergent CF – Low Price - High	9.6	10.3	55
Detergent CF – Low Price - Low	11.0	17.8	49
Cake mix CF – High Price - High	9.0	8.3	53
Cake mix CF – High Price - Low	9.2	11.7	49
Cake mix CF – Low Price -High	8.3	15.8	46
Cake mix CF – Low Price - Low	13.2	19.3	50

We also found no significant correlation between D score (as a measure of strength of implicit attitude) and the proportion of time spent looking at the carbon footprint information when each stimulus slide was considered separately (with 16 correlations computed, the various Spearman Rank Order

Correlation Coefficients ranged from 0.02 to -0.31). See Table 3. In other words, there seemed to be no systematic relationship between the measure of implicit attitude and the overall level of fixation on the carbon label, in direct contrast to what had been found with iconic images of climate change reported in Beattie and McGuire (2012).

Table 3: Mean percentage of time spent looking at CF information for each of the 4 products (and the 4 combinations of each product).

Product	High D score (above the median)	Low D score (below the median)
Cake mix	9.0	9.8
	9.2	14.9
	9.2	11.7
	11.2	21.2
Muesli	11.3	15.0
	14.5	3.1
	19.8	9.9
	10.2	8.4
Detergent	8.4	17.7
	9.9	10.1
	16.6	11.0
	11.0	17.9
Ice lollies	11.2	12.2
	10.9	9.1
	9.0	9.8
	9.2	14.9

Thus, there seems to be no relationship between either measure of explicit or implicit attitude and the *overall* proportion of time spent looking at the carbon footprint information. But this does not mean that there might not be some more subtle differences in patterns of attention between the two groups. This was highlighted in the study by Beattie and McGuire (2012). In that study there was an overall difference in level of gaze as a function of implicit attitude, but in addition there were also distinct gaze biases operating within the first 200 milliseconds. The group with a high positive implicit attitude towards carbon footprint spent a significantly higher proportion of the time within the first 200 milliseconds looking at negative images of climate change than positive images. So the question for the present study is – what is the relationship between attitudinal measures and early attentional focus on carbon footprint information? Before attempting to answer this, we must consider one important difference between the two studies. Iconic images of climate change/environmental damage are both instantly recognizable and emotionally laden and the question of whether they draw gaze immediately was clearly an interesting and pertinent one for the former study. Carbon footprint is different in that the images (and accompanying text) are less immediately recognizable and less emotionally laden (see again Beattie 2012) and certainly need more time to process. So in this study what we concentrated on was where the first *fixation* occurred, operationally defined as 200 milliseconds of gaze at the same target area (in other words, 5 successive gaze points at the same target). The

target areas we were interested in were the three main attributes of the product, namely carbon footprint, price and energy value. The prediction was that implicit attitude should influence first fixation; and more specifically that those with a positive implicit attitude should be more likely to fixate first on carbon footprint information. An additional, and entirely open, question was how many individual 40msec gaze points occurred before this first fixation was achieved. Table 4 shows how this was scored for one participant looking at the different stimulus arrays. It documents the number of gaze points before a fixation was achieved and what the focus of that first fixation was. You can see that this participant had a high D score of 5.62, in other words, this was someone with a very high positive implicit attitude. Their first fixation was on 'carbon footprint' in the case of 11 out of 16 stimulus arrays, and it took a mean of 23.5 individual gaze points (40 milliseconds each) to arrive at this fixation. The next most frequent fixation target was 'energy' with 4 cases (and 16.7 gaze points to arrive at this), and 'price' in just one case. This type of analysis was carried out with respect to all 22 participants.

Table 4: The first fixation of one individual with a strong positive implicit attitude.

Participant mp2477 D score 5.62		
Slide	**Number of 40 msec. intervals before first fixation achieved**	**First fixation**
Cake mix CF-high Price-low	10	Carbon Footprint
Cake mix CF-high Price-high	30	Carbon Footprint
Ice lollies CF-high Price-low	41	Carbon Footprint
Muesli CF-high Price-low	27	Carbon Footprint
Ice lollies CF-low Price-high	50	Carbon Footprint
Cake mix CF-low Price-high	15	Energy
Washing powder CF-low Price-low	30	Energy
Muesli CF-low Price-high	5	Energy
Muesli CF-high Price-high	30	Carbon Footprint
Ice lollies CF-low Price-low	14	Carbon Footprint
Washing powder CF-low Price-high	10	Carbon Footprint
Washing powder CF-high Price-low	10	Carbon Footprint
Muesli CF-low Price-low	7	Carbon Footprint
Ice lollies CF-high Price-high	12	Energy
Cake mix CF-low Price-low	40	Price
Washing powder CF-low Price-low	30	Carbon Footprint

Table 5 shows the fixation pattern of one individual who had a negative implicit attitude towards carbon footprint. Note that here the first fixation was on 'carbon footprint' in just 4 out of the 16 cases (with a mean of 15.3 gaze points to arrive at this fixation). 'Energy' value of the product was the most frequent point of first fixation for this participant (7 cases), with 'price' in second place with 5 cases. See Table 5.

Table 5: The first fixation of one individual with a negative implicit attitude towards carbon footprint.

Participant mp2446 D score -0.47		
Slide	Number of intervals before first fixation achieved	First fixation
Cake mix CF-low Price-low	39	Price
Cake mix CF-high Price-high	9	Price
Ice lollies CF-low Price-low	19	Energy
Washing powder CF-high Price-low	10	Price
Muesli CF-high Price-high	20	Energy
Ice lollies CF-high Price-high	14	Energy
Ice lollies CF-low Price-high	7	Carbon Footprint
Cake mix CF-high Price-low	5	Energy
Washing powder CF-low Price-high	9	Price
Cake mix CF-low Price-high	32	Carbon Footprint
Muesli CF-low Price-low	12	Carbon Footprint
Muesli CF-low Price-high	10	Carbon Footprint
Muesli CF-high Price-low	5	Energy
Washing powder CF-low Price-high	14	Energy
Washing powder CF-high Price-high	17	Price
Ice lollies CF-high Price-low	12	Energy

We then did a statistical analysis comparing the 6 participants with the most positive implicit attitude and the 6 with the least positive implicit attitude, as the most extreme members of our set of participants in terms of their underlying implicit attitude. The mean D score for the 6 highest was 4.02 and the mean D score for the 6 lowest was -0.24. Those with the most positive attitude had a mean of 7.0 first fixations on carbon footprint (out of a possible maximum of 16). Those with the least positive attitude had a mean of 4.5 first fixations on carbon footprint.

Table 6: First fixation on CF across the 16 stimulus arrays

	Most positive implicit attitude (n=6)	Least positive implicit attitude to (n=6)
	11	6
	7	4
	5	5
	8	5
	7	2
	4	5
Mean	7.0	4.5

A Mann-Whitney U test revealed that those with the highest positive implicit attitudes were more likely to fixate first on carbon footprint information

than those with more negative implicit attitudes ($U=7$, $n_1=6$, $n_2=6$, $p<0.05$: one-tailed test).

This did not occur with explicit attitude. Those with the most positive explicit scores (defined on the basis of 4/5 on the Likert scale and a positive Thermometer Difference score) had a mean of 5.3 first fixations on carbon footprint. Those with more negative explicit attitudes had a mean of 6.5 first fixations on carbon footprint. This difference was both in the wrong direction and non-significant.

These results could turn out to be very important because they suggest that implicit attitude has an impact on unconscious gaze behaviour such that individuals with a positive implicit attitude to certain environmental features are more likely to fixate first on carbon footprint information when they view certain products. One possible implication of this is that it suggests that carbon footprint information might just work with those individuals who have got the right underlying attitude to the environment in the first place. It also suggests that carbon labelling is not entirely doomed as an approach to inducing behavioural change in the case of promoting more sustainable consumption.

Discussion

Many influential figures in the worlds of politics and business have argued that one important weapon in the fight against climate change is the provision of carbon footprint information on products so that consumers can

make informed decisions in the light of the products' environmental consequences. The argument underpinning this has been that 'the green movement must become a mass movement in green consumption' but in order to achieve this some argued that 'we must empower everyone - not just the enlightened or the affluent.' Both politicians and business leaders have suggested that the solution here is to break down the barriers of price and information, to make green choices affordable and to give the consumer the right information to make informed decisions. At considerable expense (because of the difficulties in actually computing accurate carbon footprint information) carbon labels have appeared on certain products in various countries across the globe. But could this kind of approach ever work in psychological terms?

One can, after all, see the obvious attractions of the approach. It empowers consumers to act in a positive way for the environment and, in addition, it allows them to do what they say they really want to do, i.e. behave in accordance with their (reported) positive attitude towards the environment. It also removes the need for more drastic action like government legislation or prohibitive pricing of high carbon alternatives. But unfortunately it does make several large assumptions both about underlying attitudes (and their predictive value for consumer choice) and the salience of carbon labels, which this experimental study set out to test.

The study found firstly in terms of consumer attitude that measure of implicit attitude, which seem to predict much of everyday *automatic* consumer choice, do not relate closely to the usual self-report measures of attitude in line with previous findings (see Beattie, 2010). Secondly, in terms of visual attention it found that participants do direct their attention at carbon labels for a significant proportion of the time, but this overall viewing figure is not affected by whether this information is high or low (and does not, therefore, reflect any 'optimism bias' where people might avoid looking at high carbon products). The level of attention to carbon footprint is comparable to the level directed at other sorts of information on products, including price, energy value and even the product image itself. This is an important result because without minimal visual attention to carbon footprint information this information could not possibly influence consumer choice. But one must bear in mind here how the information was presented in the current study. The carbon footprint was represented on the front of the package (it is normally represented on the back or the sides with a clear implicit message about its relative importance) and, in addition, the size of the carbon footprint label was carefully matched with the other labels, which tends not to be the case with real commercial products.

However, the study also found that there was no significant relationship between how positive the explicit attitude to carbon footprint was and the overall amount of attention devoted to the carbon label. No effect was found either with our measure of implicit attitude. But very importantly there was a

significant statistical association between our measure of *implicit* attitude and the target of the first fixation. Those individuals with the most positive implicit attitude were more likely to fixate first on the carbon footprint information (rather than 'energy' or 'price') compared with those with a more negative implicit attitude. Those with the most positive implicit attitude had a mean of 7.0 first fixations on carbon footprint whereas those with the least positive implicit attitude had a mean of 4.5 first fixations on carbon footprint. This association did not, however, occur with explicit attitude. Those with the most positive explicit scores (defined on the basis of 4/5 Likert scores and a positive Thermometer Difference score) had a mean of 5.3 first fixations on carbon footprint whereas those with more negative explicit attitudes had a mean of 6.5 first fixations on carbon footprint. As has already been pointed out this difference was both in the wrong direction and non-significant. So again we find evidence that measures of implicit attitude, but not measures of explicit attitude, predict patterns of unconscious eye movements (see also Beattie and McGuire 2012).

This result could potentially have important practical implications in our efforts to do something about climate change. We already know that consumers could be crucial in this fight. According to the 2005 Millennium Ecosystem Assessment: 'over the past 50 years, humans have changed ecosystems more rapidly and extensively than in any comparable period of time in human history.' In the words of Stoddard and Cruickshank (2012) 'The

Intergovernmental Panel on Climate Change (IPCC) has found that global CO_2 emissions grew by 70 per cent between 1970 and 2004. This is despite the overwhelming scientific consensus that increasing levels of CO_2 in the atmosphere caused by human activity pose a serious threat to human well-being. This time frame also corresponds to the period during which the global community has come to understand human impacts on the environment better than ever before, and has developed an ever-expanding system of global governance to address these problems' (2012: 9). The authors add a coda that 'It is important to recognise that coincidence does not imply causality. The continued degradation of the global environment has not been caused solely by government weaknesses, but rather by a multitude of drivers, including prevailing economic models and patterns of consumption and production' (ibid: 9). Clearly, patterns of consumption are crucial to this change in CO_2 emissions (along with prevailing economic models and patterns of production, as well as, quite probably, the *absence* of effective global governance) because, in many ways these everyday behaviours are at the centre of everything. Change the patterns of consumption, and therefore the demand for certain products (and, of course, the needs, habits and aspirations of the consumer) and many other things will fall into place. Many politicians and international companies have recognised this very point. Hence the focus on providing the consumer with clearer information about the environmental consequences of the products they buy (in the form of carbon footprint labels). An earlier study which examined

patterns of gaze fixation on products (Beattie, McGuire and Sale 2010) showed little visual attention to carbon footprint labels except on specific environmentally friendly products. The present study, however, might hint at a slightly more optimistic conclusion. It seems to offer the intriguing possibility that carbon footprint information might well work with the right set of individuals i.e. those with the right implicit attitude to the environment in the first place, in that they seem to fixate *first* on carbon footprint at least in an experimental situation.

Of course, this study was both relatively small scale and an experimental analogue (although it did generate 88,000 individual gaze points that were individually scored and coded), and therefore does clearly need to be replicated on a much larger sample in a more ecologically valid setting for consumer choice. But given the global significance of this topic and the potential importance of the conclusion we suspect that many people would agree that this genuinely does need to be done, and with some urgency.

Of course, one other very important consideration also emerges from this study. And that is, if we have a mechanism of influence (carbon labels) that might work with the right individuals (at least in terms of grabbing early pre-conscious visual attention), how can we produce more of the right individuals within a reasonable time frame? The answer will have to be a campaign, or a set of campaigns, to change not just what people *say* about the environment (see Beattie 2011) but their underlying implicit attitudes. We know, of course, that

this will not be easy but there are clearly precedents for orchestrated change in implicit attitudes in a number of other domains (see Beattie 2013 for a discussion of studies that have changed implicit attitudes to race) and there are other examples to guide us in the case of consumer psychology (Gibson 2008)

The over-arching question posed in the title of this paper was whether we can indeed harness the unconscious mind of the consumer in the fight against climate change. This study offers the briefest glimmer of hope in that direction, our implicit (and unconsciously held) attitude to an environmental feature does seem to predict first fixation on carbon labels on products. But what this study does more than anything else is remind us of all the untested assumptions underlying this whole consumer-based approach to tackling climate change. Clearly much new empirical work needs to be done in this area before we place all our trust in consumers and their spending habits, and their desire, either conscious or unconscious, to change these habits.

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