# Laura McGuire

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# Psychological barriers to climate change.

## An exploration of implicit and explicit attitudes to sustainability and their behavioural implications.

‘Record-breaking climate change pushes world into *uncharted territory*.’

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2. Beattie, G. & McGuire, L. (2016). Consumption and climate change. Why we say one thing but do another in the face of our greatest threat. *Semiotica, 213,* 493-538.

3. McGuire, L. & Beattie, G. (2016). Consumers and climate change. Can the presence of others promote more sustainable consumer choice? *The International Journal of Environmental Sustainability, 12*, 33-56.

4. McGuire, L & Beattie, G. (2018). Talking green and acting green are two different things: An experimental investigation of low carbon choices. *Semiotica*.

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8. McGuire, L. & Beattie, G. (2015). Breaking Bad: How to change consumer habits in the fight against climate change. The 21st 'International Conference on the Environment', organised by the Interdisciplinary Environmental Association, Puerto Rico, June 2015.

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## Abstract

This thesis tackles an issue of global importance, namely why we, as consumers, are not doing more to change our behaviour in the face of the threat posed by climate change. The scientific evidence for climate change is clear and unambiguous, yet there is serious concern about the public's willingness to adapt their behaviour and lifestyles to ameliorate its effects. This is puzzling in the light of the existing literature on self-report attitudes to sustainability, conducted by a variety of governmental and other agencies, which suggests that the public are ready for behaviour change. This interdisciplinary thesis explores the relationship between self-report measures of attitude, and measures of *implicit* attitude (not based on self-reports), and a number of aspects of consumer behaviour. These include visual attention to carbon labels in an experimental setting, consumer choice between products with various labels, including carbon labels, in a simulated shopping task, and choice between different aspects of lifestyle varying in carbon footprint. The studies found that self-reported attitudes were good predictors of self-reported behaviour, but not actual behaviour. Implicit attitudes to carbon footprint were a better predictor of visual attention to carbon labels, and the choice of low carbon items in a simulated shopping task, especially under time pressure. The thesis also considered whether we could change explicit/implicit attitudes

to carbon footprint and generate more sustainable lifestyle choices, using film content with a primary focus on emotion, information or both. It showed that it is possible to influence both carbon attitudes and behaviour; however, these effects are short-lived. The thesis argues that in the future we will need to design interventions aimed at changing both the explicit *and implicit* attitudes of younger children to produce the type of behavioural change that we need to combat global warming in any sort of meaningful way.

# Chapter 1: Introduction

## 1.1. Climate change and its challenges

The scientific evidence that our climate is changing is now abundantly clear (Intergovernmental Panel on Climate change, IPCC, 2015). Indeed, it has been pointed out by many climate scientists (and a diverse range of social commentators) that it is rare to see this degree of scientific consensus on anything (see Stocker et al., 2013). There is also a growing consensus amongst climate scientists that human beings have played a significant role in this change in our climate through their patterns of behaviour (Cook et al., 2016). The contribution of human activity to climate change has been highlighted many times over the past decade, including in the influential Stern review (2006) led by Lord Stern and conducted at the bequest of the U.K. government. Stern's language was, in many ways, apocalyptic: 'Climate change threatens the basic elements of life for people around the world' (p.vi). He continued 'A rise in global temperature will have: severe and widespread impacts, major risks to global food production, *and* more extreme fluctuations in weather, including droughts, flooding and storms'. However, he also made a very significant point - 'Human activities are a major driver of this rapid change in our climate…particularly patterns of consumption and energy use, driven by consumer demand for higher standards of living'. In other words, we as consumers are playing a major role in the creation of this problem, and it really is a problem of our own making. Of course, once you accept this forceful and well-reasoned scientific argument, then if we are part of the problem, we must be part of the solution. This point has not been lost on agencies like the United Nations and selected governments around the world. This interdisciplinary thesis, spanning psychology, semiotics, media and, to some extent, sociology (with a detailed consideration of consumer habits) attempts to propose a way forward in dealing with this critical issue.

Greenhouse gas emissions are affected by transportation and energy use, deforestation, changes to the patterns of land-use and, of course, consumer behaviour (IPCC, 2014). As a consequence of climate change, weather conditions are becoming much more adverse. There has been an increase in global temperature (Karl et al., 2015), the frequency of heat waves has increased in large parts of Europe (Haines, Kovats, Campbell-Lendrum & Corvalan, 2006), which are expected to become even more intense and more frequent in the coming years (Tobias & Diaz, 2014). Fourteen out of the sixteen hottest years in the U.K. occurred between 2000 and 2015. Indeed, 2016 is reported as being *the* hottest year globally on record (The Guardian, 2017; World Meteorological Organisation, 2017). By 2040 it is expected that heat waves will become the norm in the U.K., which will have a detrimental effect on mortality rates - currently, 2000 people die per year in the U.K. alone due to heat-related illnesses (see the UK Climate Change Risk Assessment Synthesis Report, 2016). As well as increased temperatures, we are also experiencing heavier and prolonged periods of rainfall. Indeed, it is predicted that extreme wet winters and severe floods are more likely to occur in the coming years (Pal et al., 2013; Schaller et al., 2016). Natural disasters from these extreme weather condition are causing devastation worldwide (Fischer & Knuttie, 2014) and it is predicted that they are to become 'the new normal' (Bowen, 2015).

Climate change is also causing irreversible change to coastlines. According to the recent UK Climate Change Risk Assessment (2016), melting ice glaciers and the increase in flooding has already significantly changed coastlines globally, and this change is expected to continue as a result of the changing climate. Since the beginning of the 20th Century, the average sea level has risen by approximately 19cm, and since the 1990s the rise in sea level has accelerated to a yearly rate of more than 3mm (UK Climate Change Risk Assessment, 2016; IPCC, 2014).

The Intergovernmental Panel on Climate Change report (IPCC, 2014) concluded that human factors are, in fact, *the* major driver of this rapid change in our climate. These factors include the burning of fossil fuel for electricity and the running of cars, releasing carbon dioxide into the air which, in turn, traps heat, ‘Human activities have changed and continue to change the Earth’s surface and atmospheric composition. Some of these changes have a direct or indirect impact on the energy balance of the Earth and are thus drivers of climate change’ (IPCC, 2013, p.18).

It has, in reality, been clear for some time that human beings have played a major role in climate change, long before the Stern report, as documented by the various IPCC reports (IPCC 1990; 1996; 2001; 2007; 2013; 2014). But what has changed is that the level of scientific certainty has increased. On the basis of the evidence available prior to 2008, Walker and King concluded that it was already clear that human beings were responsible for these dramatic changes. They therefore argued that human beings needed to change their behaviour in order to ameliorate these effects ‘it’s as individuals that we live our lives and make our choices…. Now we will have to adapt our choices to new realities of the twenty-first century (2008, p.238). The World Bank’s Annual World Development Report also recommended in 2010 that, ‘We must act *now*, because what we do today determines both the climate of tomorrow and the choices that shape our future’ (p. xiii).

## 1.2. Climate change campaigns and their limitations

Despite these clear messages from influential organisations like the World Bank, the IPCC and world-leading academics, there seems to be very little by way of actual behaviour change on the part of the population as a whole. However, some obvious things have changed; for example, carrier bag usage in U.K. supermarkets has reduced by 85% since the government introduced the 5 pence charge (The Guardian, 2016). The amount of electricity used for home lighting fell by 22% between 2000 and 2012 as more people began to use energy efficient lightbulbs in their homes (Boardman, 2014). Nearly half of U.K. households use recycling bins provided by local councils to dispose of their waste, and the disposing of glass, plastic drinks cartons, aerosols and batteries in the general waste bin is significantly decreasing year on year (WRAP, 2016). Indeed, according to the European Environment Agency (2013), recycling rates in the U.K. increased by 26.5% between 2001 and 2010, which was faster than any other country in Europe. This is largely due to local councils making it easier for residents to recycle their waste by issuing households with leaflets informing occupants of the recycling arrangements in the area, providing easy to access recycling bins and even offering reward schemes for those who do recycle (Department for Communities and Local Government, 2015). But there are a lot of additional things that people could easily do that would take relatively small effort, for example, buying *local* produce, walking to school instead of driving, turning down or reducing their use of heating. Or, there are larger changes that people could make such as taking a holiday in the U.K. rather than flying abroad, installing solar panels on their houses or buying hybrid cars. But people do not seem to be willing to make these changes (see Capstick & Pidgeon, 2014) - even the small ones, which themselves could have a very significant impact, leading to changes of a much larger magnitude, an effect known as 'the spillover effect' (see Thøgersen & Ölander, 2003). For example, Thøgersen and Crompton (2009) explain that 'If governments and environmental organisations are to persist in campaigning for individuals to adopt behaviour with small environmental impacts, at a time when fundamental changes in behaviour are urgently needed, this must be because there are good grounds to expect that these simple behavioural changes will lead to more far-reaching and environmentally significant changes' (2009, p.143). But the difficulty seems to lie in getting the message across to the general public and persuading them that it is possible to make a difference of the right magnitude by adjusting their own personal behaviour even in small ways. Indeed, the Department for Energy Food and Rural Affairs (Defra) report that 'Some people think that climate change is confusing and is a problem for the future, not now. They find it difficult to see how it relates to them personally, or realise that such a big problem can be affected by individual action' (2007, p.16). Furthermore, although there is an increase in awareness of climate change (Capstick, Whitmarsh, Wouter Poortinga, Pidgeon & Upham, 2015) most people feel that climate change is not a direct threat to them personally (Lorenzonia, Nicholson-Coleb & Whitmarsh, 2007; Lorenzoni & Pidgeon, 2006). Lorenzonia et al. (2007) report that 'In the U.K., 52% of people believe that climate change will have 'little' or 'no effect' on them personally (BBC, 2004; see also Poortinga & Pidgeon, 2003; Hillman, 1998). The Energy Savings Trust (2004) found that 85% of U.K. residents believe the effects of climate change will not be seen for decades' (Lorenzonia et al., 2007, p.447).

The media, of course, plays a central role in getting such messages across to a general audience, and the way in which climate change is constructed and 'framed' in any media campaign can enhance the public's knowledge, attitude and understanding (e.g. Weingart, Engels & Pansegrau, 2000; Stamm, Clark & Eblacas, 2000; Sampei & Aoyagi-Usui, 2009; Sharples, 2010) with potential knock-on effects for behaviour. The concept of 'framing' in the mass media is basically the construction of a whole series of ideas represented in a coherent way so that the audience will be able to identify and form an integrated opinion and, in turn, act upon this in the most appropriate way. Framing is 'a way of organizing ideas and defining a phenomenon in order to resonate with people's core values and assumptions' (O'Neill, Hulme, Turnpenny & Screen, 2010, p.997).

There have been a whole series of government campaigns with the single intention of promoting pro-environmental behaviour by changing the public's perception of climate change (which, in turn, was anticipated to change their attitude and behaviour). These particular campaigns were based on the assumption that the public would simply need more information in order to act in a pro-environmental way. Campaigns have used leaflets, billboards, television commercials and newspapers. One important example of such a campaign was 'Act On $CO_2$', which was launched in 2007. The campaign introduced a series of magazine and television adverts to impact upon public awareness, these were designed to get people to reduce their carbon footprint through home energy use e.g. switching off appliances, installing low energy light bulbs, fitting the correct amount and type of insulation etc. These early adverts aimed to encourage individuals to do their bit by tying in pro-environmental behaviour with saving money. For example, one particular advert included the caption 'Simple actions reduce both fuel bills and $CO_2$ emissions. Making your home as energy efficient as possible could save you over three hundred pounds a year. Save money, save energy…' (Act On $CO_2$, 2007). Gatersleben and Vlek (1998) emphasise that in order to engage the public in pro-environmental behaviour and environmentally friendly lifestyles, products need to be readily available as well as financially desirable. Sir Terry Leahy, the former CEO of Tesco also regarded money saving and price as an important factor when it came to sustainable lifestyles. He vowed to make green choices affordable and maintained that 'we must empower everyone - not just the enlightened or the affluent' (Leahy, 2007).

However, in 2010, Act On $CO_2$ launched a 'Bedtime Story' advert, which came in for some staunch criticism from a variety of sources including the Climate Change Communication Advisory Group and the general public (see Corner & Randall, 2011). The advert portrays a father reading a bedtime story to his daughter about the seriousness of climate change, emphasising the implications and consequences of climate change for the next generation (see Figure 1.1). The daughter then asks if there is going to be a happy ending to the story. The advert ends with a voiceover telling the audience that 'it is up to us how the story ends' emphasising that the future of the planet is now down to the viewer. The message is essentially that *we* are responsible for what is going to happen both in the story and in real life. However, the viewers thought that this particular campaign was inappropriate and that children should not be allowed to watch the commercial. It was criticised for not communicating the message effectively, for being too negative and for not offering a support intervention to break down the barriers that allow people to adopt a new low carbon lifestyle. It had what psychologists call 'low response efficacy' (see the International Global Action Plan, 2010). Response efficacy refers to the belief that the behaviour advocated will actually make a difference to the proposed threat and a low response efficacy means that you do not think that the behaviour will make a difference to the proposed threat (a more detailed description is provided later in this section). The campaign was also heavily criticized for using fear to promote change that some claimed 'was not supported by the available empirical evidence' (Corner & Randall, 2011). The commercial was subsequently moved to after the 9 o'clock water shed.


Figure 1.1: Screen grab of the 'Bedtime Story' Act On $CO_2$ campaign.

Another magazine campaign, again commissioned by 'Act On $CO_2$', parodied certain nursery rhymes, illustrating them with doomed images to portray the negative effects of climate change. One particular advert showed three men in a bath tub floating in water surrounded by houses and cars which were partially submerged under the water with the words ‘Rub a dub dub, three men in a tub, a necessary course of action due to flash flooding caused by climate change’. The text then continued ‘Climate change is happening. Temperatures and sea levels are rising. Extreme weather events such as storms, floods and heat waves will become more frequent and intense. If we carry on at this rate, life in 25 years could be very different’ (see Figure 1.2). A second magazine advert showed a young boy and girl at the top of a hill looking down a water well searching for water, which was not there, with the words ‘Jack and Jill could not fetch a pail of water because extreme weather due to climate change had caused a drought’ (see Figure 1.3). Both adverts warned that ‘it’s our children who’ll really pay the price of climate change’. However, these adverts were banned by the Advertising Standards Agency because the wording was too strong for children and they were frightening them. They stated that the adverts ‘should have been phrased more tentatively’ and advised that they ‘should not appear again in their current form’ (Advertising Standards Agency, 2010). It is unclear whether these particular adverts would have been effective in any case (this will be discussed subsequently).

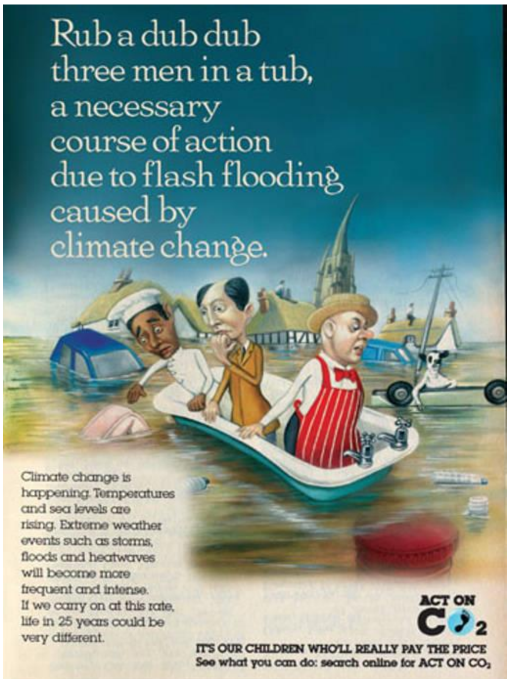



Figure 1.2: 'Three Men in a Tub' advert.

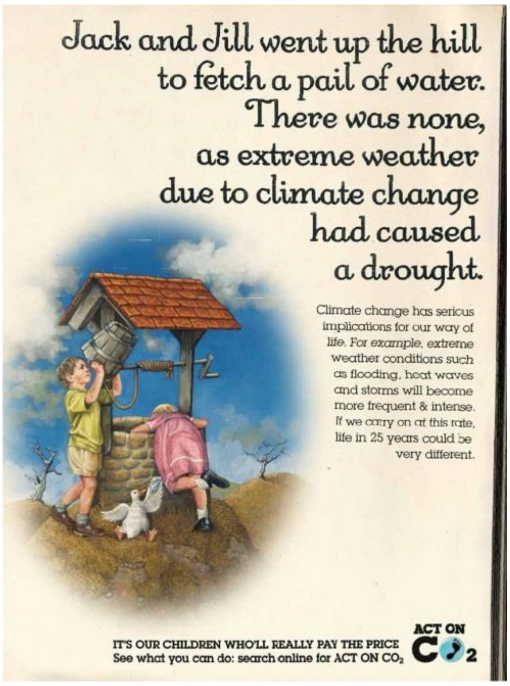



Figure 1.3: 'Jack and Jill' advert.

So what does it take for an advert to be effective without offending the public? Why are fear and shock tactics appropriate for some campaigns and not for others? They clearly have been used successfully in some campaigns in other domains, including smoking. For example, in 2004 a £4m anti-smoking campaign was launched across the U.K. using various advertising mediums. The campaign used strong imagery depicting fat oozing out of a smoker's artery. This was one of the British Heart Foundation's most successful campaigns to date. The adverts, showing a cigarette which is used to represent a smoker's artery with the words 'Give up before you clog up', appeared in magazines, newspapers, on television and on billboards across the country in a bid to make smokers aware of the danger of cigarettes. In the first month of the campaign a total of 10,000 people called the charity's smoking health line and a further 62,000 visited its website in search of tips to give up smoking and a total of 14,000 people gave up smoking as a result of this (very visual) campaign. The Department of Health brought out another hard-hitting anti-smoking shock campaign in 2012. This time the campaign used dramatic imagery of tumours growing on cigarettes as they were being smoked (see Figure 1.4). The message behind this campaign was that 'Every 15 cigarettes you smoke cause a mutation that can become cancer'. This campaign helped reduce smoking rates in the U.K. to their lowest level of 18.4% (Department of Health, 2014). So it would seem that it is acceptable (and effective) to scare people into changing smoking habits, and campaigns like these do actually have the desired end result in that they encourage people to stop smoking. But when it comes to climate change the advertising companies receive numerous complaints about their campaign forcing them to change it. Perhaps the reason for this is because people know how to change their behaviour when it comes to warnings about smoking and health (they 'simply' need to stop smoking), but when it comes to climate change it is significantly more complicated at the *individual* level. People do not know what they *personally* have to do to save the planet or to prevent climate change. It is not as obvious and people do not see the immediate benefits or the immediate threat of climate change. Sundblad, Biel and Gärling (2007) point out that if messages regarding climate change included the risk to personal health, people would be more motivated to seek out information and perhaps be more motivated to engage in pro-environmental behaviour. However, they also acknowledge that there is a very low understanding of health related risks connected to climate change amongst the public.


Figure 1.4: Tumour growing on a cigarette as part of the shock advert anti-smoking campaign.

So how can we create a successful campaign to engage the audience and bring about a positive change in behaviour? A successful campaign needs to have three major components if it is to effectively instil an appropriate response (Witte & Allen, 2000). The first major component is the depiction of a real life threat. For example, the portrayal of the devastating effects of climate change, or the example of the tumours caused by smoking. The campaign needs to convey successfully the severity of the threat to the *individual* and it needs to be apparent and obvious for the individual to understand why *they* personally will be affected (van der Linden, Maibach & Leiserowitz, 2015; Witte, 1992, 1998). Secondly, it needs to provoke an emotional response within the individual, and the danger posed to them needs to be evident because emotion often precedes and directs action (Damasio, 1994). The third component is that there needs to be a belief amongst the audience that something *can* be done about the problem and that they must be convinced that their responses will be effective in the resolution of the problem. In other words, there needs to be perceived 'response-efficacy' and 'self-efficacy' in order for a campaign to be successful (Witte, 1992; Rogers, 1983). 'Response efficacy' relates to a person's beliefs as to whether the recommended action steps will actually avoid or negate the threat. 'Self-efficacy' refers to beliefs about one's ability to carry out activities in question. In other words, the individual needs to believe that the proposed steps will successfully deal with the threat and they then need to believe that they are capable of carrying out that particular response. 'People need to be able to feel that they *can* do something about the problem and, that it is *worth* doing something' (Howell, 2011, p.3). It is also important to avoid maladaptive behaviour such as 'denial', 'withdrawal', 'avoidance' etc. (see Witte, 1992). In order to avoid such behaviours, threat and fear campaigns need to include high-efficacy messages including information and advice about ways in which the public should change their behaviour in order to avoid the actual threat posed - this component seemed to be missing from the Act On $CO_2$ campaign (Lewis, Watson & White, 2010; Moser & Dilling, 2004; Witte & Allen, 2000). The Protection Motivation Theory (Rogers, 1975) suggests that behaviour change on a *personal* level will only take place when people are confident that their actual specific behaviour will reduce the particular threat.

However, climate change campaigns to date may have gone wrong on a number of different levels. Shanahan (2007) argues that framing climate change in such a negative way could prove extremely disempowering. For example, the portrayal of Jack and Jill not able to find water due to the drought caused by climate change, and the example of three men in a tub floating in water surrounded by submerged houses and cars due to a flash flood, do not give us a positive image of what the future could hold for our planet. They are only reinforcing the negative effects of climate change and giving us a glimpse of what a negative future might be like. There is also no attempt to provide ideas of how to go about making positive changes. This is a depressing and de-motivating outlook. Spence and Pidgeon (2010) suggest that framing climate change in a positive way as opposed to focusing on the negative aspects encourages positive pro-environmental behaviour. In addition, presenting examples of the positive outcomes of engaging in pro-environmental behaviour, rather than presenting negative consequences of not engaging in pro-environmental behaviour, will encourage people to start making the small changes that are necessary. Morton, Rabinovich, Marshall and Bretschneider (2011) found that, compared to negative framing, positive framing evoked an increased intention to act in a more sustainable way even when there was a higher uncertainty about the outcome of climate change.

So clearly there are important issues to consider when planning a campaign designed to change behaviour with respect to climate change. One such issue that we have not yet considered is the 'level' at which we should aim the campaign. Should the campaign be aimed at the country as a whole, specific socio-economic groups or 'communities' (either virtual - identified in terms of shared values, or real - local councils, villages) but more focussed than a national campaign, for example, in terms of the media they consume? Then there is the issue of the level (or granularity) of the recommended actions. Should this be aimed at countries (high carbon taxes, transport infrastructure, a levy for plastic bags), communities (car share, local public transport, local congestion taxes), families (meat free Fridays, green points for shopping) or individuals, with their specific everyday choices?

## 1.3. Some core psychological issues

### *1.3.1. Psychological salience*

So if we assume that behaviour change in this area is urgently required and that this will necessitate a concerted campaign, one of the first questions we have to ask is at which of these *levels* such campaigns should operate? For example, supermarkets have tried to promote more sustainable lifestyles through a variety of initiatives aimed at the behaviour of the individual consumer as well as family groups. Tesco was one of the earliest major retailers in the U.K. to embrace the 'green movement' and spent millions on labelling their products with carbon footprint information to guide individual consumer choice. In 2007, the former CEO of Tesco, Sir Terry Leahy, said that there had to be a 'revolution in green consumption'. He pledged that with the help of 'The Carbon Trust', Tesco would put carbon labels on 70,000 of their own brand products. So, aiming their new campaign at individual consumers, Tesco proceeded to mark many of their own brand products with a carbon footprint label. The label included a symbol of a black footprint in which the carbon value of the particular item was embedded, alongside it was a small box of information about what exactly had been calculated e.g. 'The carbon footprint of this product is the total carbon dioxide ($CO_2$) and other greenhouse gases emitted during its life, including production, use and disposal' and then another box saying 'We have committed to reduce this carbon footprint'. However, Tesco made *many* psychological assumptions when creating this campaign, which do need to be examined.

Firstly, they assumed that the campaign should target the individual (or the family unit). Secondly, they assumed that they could gain some insight into the individual consumer, based on traditional market research, to make the campaign effective. Indeed, the whole initiative was premised on the assumption that they could 'read' consumers well enough to make this campaign work. Thirdly, they assumed that they could use traditional self-report attitudinal measures, as a core element of this market research, to allow them to do this. Fourthly, they assumed that these self-report attitudinal measures could tell, with some level of accuracy, that consumers had the right underlying 'attitude' (or 'predisposition to act', Allport, 1935) to behave in a specific pro-environmental way and, therefore, that they were ready to change their behaviour in this regard. Fifthly, they assumed that consumers understood what the value of carbon footprint meant (e.g. if the value was particularly high or low and what the implications of that were). Sixthly, they assumed that in any icons used to communicate carbon footprint (in addition to the numerical values included), like black carbon footprints, would communicate effectively to consumers and, of course, that consumers would pay sufficient visual attention to these carbon labels in real time, so that they could impact on choice. Many of these assumptions, however, can be seriously questioned. For example, let us consider the assumption about carbon labels and visual attention. Tesco clearly assumed that these labels would have the same influence on consumer behaviour as calorie and fat content labels did, which they had previously introduced (Leahy, 2007). But consumers have a higher degree of knowledge about calories and fat content and these labels are much more emotionally salient to the consumer (see Beattie, 2012). Measures of calories and fat have an obvious effect on our bodies and people know that if they eat high calorie foods that they will gain weight and, in some cases, feel unhealthy in the days following. They also know that by eating fatty foods, they will be increasing their risk of serious health issues such as heart attacks, high cholesterol or obesity. We have also been given information about our required Guideline Daily Amount (GDA) and are advised to avoid exceeding this GDA if we want to stay healthy. But when it comes to carbon footprint labels, there are no readily available populist guidelines as to what should be considered 'high' or 'low' for the average consumer. There are no recommended daily or weekly amounts of carbon that we should not exceed and there are no *immediate* health risks that we are faced with if we do happen to exceed this amount. This makes carbon footprint a clearly more problematic concept to communicate effectively.

In the first study of its kind, in terms of visual attention to carbon footprint, Beattie, McGuire and Sale (2010) used eye-tracking to examine participants' eye gaze whilst viewing a variety of products (a light bulb, orange juice and detergent), each with a carbon label clearly displayed on the back of the product. Each product was photographed against a matt black background (see Figure 1.5, 1.6 ,1.7, 1.8, 1.9 and 1.10) with the front and back in a single shot, represented as one image. There were two images per product, for example, in the case of the light bulb, one image displayed the front of bulb to the right, back of bulb to the left - view 1; another image displayed the front of the bulb to the left, back of the bulb to the right - view 2, in order to control for natural biases in patterns of left-right looking. The study found that the carbon label was the focus of the first fixation (defined as the first 200 ms gaze fixation, in other words 5 consecutive 40 ms fixations), in only 7% of all cases. In other words, participants were not directing their attention to this label in the first instance. It was also found that participants were not looking at the label in the first 5 seconds, which is accepted as the critical time frame when it comes to attention and choice in supermarket shopping (see Louw & Kimber, 2007; Young, 2004). Participants spent more time fixating on the carbon footprint of the light bulb than any of the other products tested, and they spent longer focusing on the carbon footprint in this one isolated case than any other point of interest, e.g. the product image, the wattage, the product name etc. However, in the case of the orange juice, participants spent very little time fixating on the carbon footprint and more time fixating on price, product image and the fact that the oranges were 'picked and processed within 24 hours'. A similar pattern emerged in the case of the detergent, where participants spent least time looking at the carbon footprint, focusing instead on the product instructions, the fact that it was dermatologically tested and also that you could wash at 30 degrees with this product. In terms of the sequential order of where participants looked at the products - in only 4 out of the 60 cases (10 participants x 6 slides) did participants focus first on the carbon footprint. None of the participants focused on the accompanying carbon footprint information first. So probably, due to a lack of consumer awareness and knowledge, people were not paying attention to carbon footprint information on these labels. Tesco discontinued the practice of carbon labelling in 2012 (Bennett, 2015). They blamed market pressures and the fact that other retailers had not followed their example, however, lack of psychological salience of these labels might have been a significant consideration.

Figure 1.5: Light bulb - view 1.

Figure 1.6: Light bulb - view 2.

Figure1.7: Orange juice - view 1.

Figure 1.8: Orange juice - view 2.

Figure 1.9: Detergent - view 1.

Figure 1.10: Detergent - view 2.

(Figures 1.5 – 1.10: Images of products used in the eye-tracking study[1])

[1] Figures 1.5 – 1.10 are duplicated in Beattie (2010) and Beattie, McGuire and Sale (2010).

### *1.3.2. Attitudes*

When it comes to the issue of understanding the individual consumer, there is potentially an even more critical issue centring on the basic concept of attitudes, which formed the intellectual bedrock of the Tesco campaign. When Leahy (2007) announced that, 'The green movement must become a mass movement in green consumption' and that 'we must empower everyone - not just the enlightened or the affluent', he clearly believed that the market was ready for this green consumer 'revolution'. 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. His belief was shaped by numerous market research campaigns, leading him to the conclusion that 'Customers want to do more in the fight against climate change if only we can make it easier and more affordable'. These market research surveys had reported that '70% of people agree that if there is no change in the world, we will soon experience a major environmental crisis' and '78% of people say that they are prepared to change their behaviour to help limit climate change' (Downing & Ballantyne, 2007). These findings were being reported very consistently. Thus, the British Social Attitudes survey (2012) revealed that 76% of people ‘believe climate change is happening and that humans are, at least partly, responsible’. More recently, the Department of Energy and Climate Change (2015) in the U.K. said that 66% of people ‘reported feeling very or fairly concerned about climate change’ based on a survey using 1,981 face-to-face home interviews. The Department for Environment, Food and Rural Affairs (Defra) have argued, like Leahy, that ‘Policy action needs to be rooted in understanding and awareness of consumer behaviour’ (2008, p. 22). Like Leahy, they concluded that ‘Many people are willing to do more to limit their environmental impact, they have a much lower level of understanding about what they can do and what would make a difference’ (2008, p.28). In both cases with Leahy and with Defra this was based solely on self-reports of attitudes that had essentially not changed in terms of their measurement since the 1930s with Gordon Allport, when he borrowed the techniques of Rensis Likert (hence the ‘Likert’ Scale). Self-reported attitudes, of course, are based on the assumptions that we know what our attitude is (that is to say it is conscious), that we can report it when required, and we do this with little or no modification due to any possible constraints of social desirability (where most people know that ‘green is good’). Unfortunately, each of these assumptions can be seriously questioned, and it has been suggested that much of our attitudes are unconscious, not reportable and that self-reported attitudes are subject to major social desirability issues (see

Beattie, 2010; 2013). Psychologists often refer to these self-reported attitudes as ‘explicit’ attitudes, and refer to those attitudes held unconsciously as ‘implicit’ attitudes. How they relate, either together or separately, and how they influence behaviour is a major focus of the present PhD.

Tesco had, of course, felt that they were being psychologically sophisticated basing their approach to sustainability on the available empirical evidence about the ‘characteristics’ of individuals, in particular, their attitudes and values. They did not seem to realise that without a consideration of core psychological issues, like motivation, emotion, values and attitudes, campaigns like carbon labelling were designed to fail from the very beginning. In other words, such campaigns might fail because of a failure to consider important psychological variables within the individual. Of course, this does place considerable emphasis on the individual as the primary site for research in this domain and means that we will have to come to terms with some of these complex psychological issues. In the words of the World Development Report (2010) ‘Individuals, as citizens and consumers, will determine the planet’s future. Although an increasing number of people know about climate change and believe action is needed, too few make it a priority, and too many fail to act when they have the opportunity’ (World Development Report, 2010,

p. xxi). However, when there are so many ways in which people could help by modifying their behaviour, why are the vast majority of people not making it their main concern? Moreover, what does this tell us about our psychological appraisals of readiness to change? For example, in a survey conducted across 17 countries worldwide, Britain was ranked third from bottom when it came to the general public's concern about climate change. The survey, which questioned over 18,000 people revealed that Britain held a shared concern of just 10.8% closely followed by the USA (9.2%) and Saudi Arabia with just 5.7% of respondents listing it as their main concern (YouGovUK, 2016). In another U.K. survey completed by 3600 individuals, it was reported that 75% of respondents acknowledged that 'using a car less' and 'flying less' would have a 'medium or major impact' on the reduction of carbon emissions. Yet, in the same survey, it was reported that less than a quarter of the respondents believed that people are willing to take appropriate action to reduce their personal carbon footprint (Defra, 2007).

Market research surveys have suggested for years that people do have the right underlying attitudes to the environment, and that people are now ready to act in more sustainable ways, as we have seen (Downing & Ballantyne, 2007). Other surveys have reported that '84% say retailers should do more to reduce the impact of production and transportation of their products on climate change' (Ipsos MORI, 2008). Another reported that '69% of consumers in China are willing to change their lifestyle to help reduce climate change' (see also Beattie, 2010). However, the focus of this market research throughout is exclusively on *explicit* attitudes, which unfortunately may be biased ('green' consumer choices are after all generally perceived as 'considerate' and 'caring', see Beattie, 2010, p.36), and may not be reliable measures of our actual thoughts and values. None of these market research surveys have attempted to measure or gauge 'implicit' attitudes.

However, Beattie (2010) pointed out that there is nothing in Allport's formal definition of an attitude (namely, 'a learned predisposition to think, feel and behave towards a person, or object, in a particular way') that actually excludes an unconscious, implicit component**.** Attitudes influence and direct our beliefs and behaviour (Eiser & van der Pligt, 2015); they are formed as a result of experience and learning (Fazio & Zanna, 1981). There is no a priori reason (one could argue) as to why this should all be conscious and open to introspection. Some psychologists now argue that much of our behaviour is actually guided by these *implicit* rather than explicit attitudes (Friese, Hofmann & Wänke, 2008). They also argue that measuring implicit attitudes is likely to have greater predictive validity in terms of spontaneous behaviour, like much of everyday shopping behaviour, or behaviour that is subject to social desirability, than explicit attitudes (Beattie, 2010; 2012; Dovidio, Kawakami & Gaertner, 2002; Dovidio, Kawakami, Johnson, Johnson & Howard, 1997; Fazio, Jackson, Dunton & Williams, 1995). These implicit attitudes are thought to operate subconsciously and therefore are not reportable in the normal way and may well not relate closely to the component, which is available to conscious reflection (Greenwald & Banaji, 1995). It has also been posited that implicit attitudes develop slowly over a period of time (Rydell & McConnell, 2006) and need to be measured in different ways to explicit attitudes (Brunel, Tietje & Greenwald, 2004). However, these implicit attitudes may have a major impact on the everyday behaviour of consumers in a range of contexts. There is some evidence that implicit attitude are harder to change than explicit attitudes (Bohner & Dickel, 2011) because they are formed more gradually over time. Explicit attitudes, on the other hand, are actually formed through consciously available information (Vogel & Wänke, 2016) and may change relatively quickly according to many theorists (see Visser & Cooper, 2003, for a review of the literature on attitude change). Research has shown that there may well be a major 'dissociation' between implicit and explicit attitudes with little or no correlation between the two measures (Beattie, 2010; Beattie, 2013; Rudman, 2004).

In terms of measurement, Greenwald, McGhee and Schwartz (1998) introduced a computerised classification task known as the Implicit Association Test (IAT) to measure implicit attitudes. This test has now been widely acknowledged as a reliable and valid measure of implicit attitudes towards a given target concept. The basic premise behind the IAT is that when categorising items into two sets of paired concepts (for example, 'Flower' and 'Insect', 'Good' and 'Bad'), if the paired concepts are strongly associated in the mind (e.g. 'Flower' and 'Good' as opposed to 'Insect' and 'Good'), then participants should be able to categorise the stimuli (e.g. names of flowers) faster (and with fewer errors) into these combined sets ('Flower'/ 'Good') than if the paired concepts are not strongly associated (e.g. 'Flower'/ 'Bad'). In this classic research, Greenwald et al. (1998) tested 32 participants' implicit attitudes towards flowers and insects. They used words representing the names of 25 flowers including 'daisy', 'marigold', 'poppy' and 'tulip', 25 insect names such as 'cockroach', 'wasp', 'mosquito' and 'flee', 25 pleasant words including 'love', 'peace', 'cheer' and 'happy' and 25 unpleasant words such as 'filth', 'grief', 'death' and 'evil'. They found that participants performed faster when the target concept 'Flower' was paired with 'Pleasant' and the target concept 'Insect' was paired with 'Unpleasant'. In other words, participants held a stronger implicit preference to flowers over insects. In the second experiment of this set, Greenwald et al. tested participants' implicit attitudes to 'Musical Instruments' and 'Weapons'. As before, they used 25 words as stimuli to represent musical instrument names including 'cello', 'guitar', 'drum' and 'piano' and 25 words to represent the names of weapons including 'knife', 'sword', 'pistol' and 'gun'. The pleasant and unpleasant words were identical to the words used in the previous IAT mentioned in the study above. Their results revealed that participants found it easier to categorise the instrument words when the target concept 'Musical Instruments' was paired with 'Pleasant' and weapon words when the target concept 'Weapons' was paired with 'Unpleasant'. Thus indicating a stronger implicit preference towards musical instruments over weapons. These results were perhaps not surprising considering the expected universal associations to these particular target concepts.

Greenwald et al. then expanded this research to look at implicit attitudes towards Korean Americans and Japanese Americans. This was their third study of this particular set. Here they used both Korean American participants and Japanese American participants. In this IAT, as well as using 25 pleasant words ('love' etc.) and 25 unpleasant words ('filth' etc.) as in the previous IATs, they used Korean names and Japanese names (matched in length). They found that the Korean participants were quicker at sorting the Korean names into the correct category when the target concept ‘Korean’ was paired with ‘Pleasant’, the Japanese participants, on the other hand, were quicker at sorting the Japanese names into the correct category when the target concept ‘Japanese’ was paired with ‘Pleasant’. The final experiment of this set tested 26 White American students’ implicit attitudes towards White and Black Americans. They used 50 White American names, 25 male names including ‘Brandon’, ‘Ed’, and ‘Ged’ and 25 female names including ‘Betsy’, ‘Katy’ and ‘Nancy’. They also used 50 Black American names, 25 of which were male including ‘Darnell’, ‘Lamar’ and ‘Malik’ and 25 were female names ‘Ebony’, ‘Latisha’ and ‘Tawanda’. The results revealed that this set of White Americans responded quicker when ‘White’ was paired with ‘Pleasant’ than when ‘Black’ was paired with ‘Pleasant’ and therefore held more positive implicit attitudes to White sounding names than Black sounding names. This implicit bias can affect shortlisting decisions for jobs (Beattie, 2013) and may help explain racial and ethnic inequalities in the job market (Beattie, Cohen & McGuire, 2013; Dovidio & Gaertner, 2000; Segrest-Purkiss, Perrewé, Gillespie, Myers & Ferris, 2006; Son Hing, Chung-Yan, Hamilton & Zanna, 2008).

### *1.3.3. Implicit attitudes and attitude change*

One important study that used the IAT in the assessment of *implicit* attitude change was carried out by Rydell, McConnell, Mackie and Strain (2006). They had proposed that the implicit system and the explicit system are sensitive to different types of information, and predicted that ‘implicit attitudes would be affected more by subliminally presented primes and that explicit attitudes would be affected by consciously accessible information’ (2006, p. 955). In their experiment they told participants that they were going to be presented with information about a person named ‘Bob’ through a sequence of computerised learning trials. Participants were seated in front of a computer monitor and asked to focus on a cross in the centre of the screen. After 200 milliseconds the cross was replaced by either a positive or negative word (depending which condition that they were in). Each word appeared on the screen for 25 milliseconds and were subliminal primes e.g. love, party etc. (positive) or hate, death etc. (negative). Immediately after the word appeared on the screen, a picture of Bob would replace it for 250 milliseconds. This was classed as the priming phase. Once the priming phase was completed, an image of Bob remained on the screen, in addition to this, information about Bob’s behaviour was also displayed supraliminally. Participants were asked to press the appropriate response button dependent upon whether they believed that the behaviour was in keeping with Bob, or if they thought that it was uncharacteristic of Bob. Then for 5 seconds, participants received feedback reaffirming that this behaviour was indeed a characteristic of Bob. Half of the participants in the first trial (time 1) were presented with 10 negative subliminal primes but received positive supraliminal feedback about Bob's behaviour. Whilst the other half of the participants were presented with subliminal positive primes, however they received negative supraliminal feedback about Bob's behaviour. This was then switched for the second trial (time 2), so that participants who were presented with positive primes and negative feedback were now presented with negative primes and positive feedback and vice versa. Explicit measures were taken after time 1 and then again after time 2, where participants were asked to rate how likeable Bob was on a scale of 1 (very unlikeable) to 9 (very likeable). They were also asked to complete five 9-point differential scales describing Bob, a Feeling Thermometer and they were also asked to complete an IAT adapted to measure their implicit attitude towards Bob. They completed the IAT and the explicit measures after time 1 and after time 2 to assess any changes in explicit and implicit attitudes. The researchers found that when participants were subliminally primed with negative words about Bob but received positive supraliminal feedback at time 1, and then primed with positive words at time 2 but received negative supraliminal feedback about Bob, participants' implicit attitudes were more positive at time 2 compared to time 1 and their explicit attitudes were more negative at time 2 compared with time 1. Similarly, when participants were subliminally primed with positive words about Bob and received negative supraliminal feedback at time 1 and then subliminally primed with negative words at time 2 but received positive supraliminal feedback about Bob, participants' implicit attitudes were more negative at time 2 compared to time 1 and their explicit attitudes were more positive at time 2 compared with time 1. The results confirmed the hypothesis of Rydell et al. in that participants' explicit attitudes 'were formed and changed in response to consciously available information' (2006, p.957) and that 'implicit attitudes were sensitive to associative information presented below conscious awareness' (2006, p.957). They concluded that implicit attitudes can be changed if information is accessible but only if it is below the level of conscious awareness.

### *1.3.4. The possible origins of implicit attitudes*

The current theoretical understanding is that implicit attitudes have a different source and develop in different ways compared to explicit attitudes. Rudman (2004) argued that implicit attitudes 'stem from different sources and, therefore, should be conceptualized as distinct constructs' (2004, p.79). She maintains that implicit attitudes derive from past experiences which have been forgotten over time, whereas explicit attitudes are influenced by recent events and are therefore more accessible in terms of memory. One example, which Rudman uses to illustrate this is smokers' explicit and implicit attitudes towards smoking. Rudman suggests that for the vast majority of people, their very first experiences of smoking are actually quite unpleasant - the taste of the cigarette, the nausea, the cough and the bad breath (see Rudman & Heppen, 2001). However, as people become more used to smoking, they focus on, and therefore appreciate the more positive aspects of the whole experience - the relaxation, the bonding between smokers, the cool image instilled through years of advertising, the reduction in hunger pangs, (and its positive effects on weight control). With this in mind, she argues that smokers should have implicit attitudes to smoking that are much more negative than their explicit attitudes and this is consistent with what the research demonstrates (Rudman & Heppen, 2001).

Rudman also suggests that much of what happens in our early social environment, which is critical to the development of implicit attitudes, is pre-verbal and not acquired in the normal way using language and propositional reasoning. She writes that ‘These lessons form the foundation on which later learning is built and may also serve as a non-conscious source for related evaluations and actions’. This was consistent with Rudman and Goodwin’s findings (2004) who investigated the relationship between gender related attitudes and ‘pre-verbal attachment to caregivers’. They found that male and female participants who were brought up by their mothers held a more positive implicit attitude towards women than they did to men. They also found that those participants who held an implicit preference towards women, also implicitly preferred their mothers to their fathers.

Therefore, Rudman and others suggest that early experiences are crucial to the development of implicit attitudes. However, she also maintains that this is not the whole story - also critical is the role of emotion. Rudman writes that ‘implicit attitudes are more sensitive to affective experiences than are explicit attitudes’ (2004, p.80). One example of this is our implicit attitude to people from different racial or ethnic backgrounds. In this domain, our implicit attitudes seem to be associated with increased activation in the amygdala, which of course, is crucial to the control of emotion. Fiske (2005) for example demonstrated that the amygdala, which works as the vigilance system of the human brain, responds more when faces from a different racial group to our own are presented on a computer screen compared to when faces from our own racial group are presented (see also Hart, Whalen, Shin, McInerney, Fischer & Rauch, 2000). In the words of Fiske ‘the brain’s burglar alarm habituates faster to members of the in-group. This differential amygdala response correlates with implicit evaluation of racial groups’ (2005, p.48).

Rudman and her colleagues have also reviewed evidence which found that White people, who signed up for diversity training, displayed a reduced anti-Black bias and this was true for both explicit and implicit attitudes. However, the reduction in the negative implicit attitudes was connected to aspects of the emotional experience namely a reduction in fear, and an increased liking of the people from a different ethnic group. The reduction in negative explicit attitude, on the other hand, was related to knowledge-based phenomena, for example, an improved awareness of bias and a personal motivation to overcome possible prejudice. On the basis of this and related evidence, Rudman concludes that implicit attitudes are more connected to emotional responses and therefore the changes in implicit attitudes require a certain amount of what has been called 'emotional reconditioning'. Her research showed that changes in explicit attitude are more to do with changes in cognitive and motivational factors.

But Rudman says that if we are to really understand the development of implicit attitudes, it is not enough to just consider early experiences, even early pre-verbal experiences, but that we must consider the role of emotion in the development of implicit attitudes - we also need to look more broadly at the culture as a whole. Rudman suggests that aspects of our culture and our language, the media portrayals of Black and White, for example, our literature, our newspapers, our TV news, our educational system, all of the things that contribute to our culture, play a role in the development of implicit attitudes to race. In addition, what is interesting about culture is that all citizens, regardless of their own race or ethnicity, are exposed to some common elements. She says that this is the reason why both White and Black people show an anti-Black bias on implicit measures but do not do so on explicit measures. Moreover, she says that this all makes considerable sense because in American culture, there is a cultural representation of Blacks that is not as positive as Whites, and this cultural representation has been internalised by people of different racial and ethnic backgrounds.

This is a very contentious point, but she says it helps explain why Black people, regardless of how hard they try, cannot overcome this unconscious cultural bias against their own racial or ethnic groups. Beattie (2013) speculated about how specific aspects of the culture may contribute to this, even in the language that we use with some terms, which include the word 'black' (for example, 'black sheep', 'black magic', 'black mark', 'blackmail'). These terms are much more negative than those terms which include the word 'white', (for example 'white knight', 'white lie', 'white witch', etc. see Beattie, 2013, p. 186). Beattie's conclusion is that, although there does appear to be a slight tendency for 'black' to be found in more expressions with negative connotations than 'white', he queries how prevalent this is throughout the English language as a whole and says that this really does need to be empirically determined.

But in effect, what Rudman is saying is that the possible sources of influence on the development and trajectory of implicit attitudes are really quite diverse - from aspects of the most primitive parts of the human brain (the amygdala), through our very early experiences of which we have no memory, through to our broadest cultural understandings. Of course, it could be that all three types of factors play some role in the development of implicit attitudes here. Nevertheless, the most obvious implication of the Rudman review is that we need more research to detail how each of these factors can interact in the development of implicit attitudes in different domains. The reason this is so urgent is that if we are hoping to change implicit attitudes then we will need a better understanding of where they come from in the first place.

### *1.3.5. The Implicit Association Test and sustainability*

Few studies have attempted to measure implicit attitudes towards sustainability (but see Beattie & Sale, 2009; 2011; Vantomme, Geuens, De Houwer & De Pelsmacker, 2005; Richetin, Mattavelli & Perugini, 2016). Beattie and Sale (2009) used a sustainability IAT to measure implicit attitudes towards low and high carbon footprint products. They found that, although most of their participants showed a relatively positive implicit attitude to low carbon footprint items, when comparing these results to participants' explicit attitudes (using a Likert Scale and a Feeling Thermometer) they found that there was no significant correlation between the explicit and implicit attitudinal measures. In other words, the explicit and implicit attitudes appeared to be 'dissociated' and a significant proportion of individuals reported themselves as being much more green on the explicit measure than what resulted in their implicit scores. These results are consistent with previous research comparing the two attitudinal measures. Nosek and Hansen (2008) conducted a meta-analysis of 81 studies and found that implicit attitudes and explicit attitudes were only moderately correlated (Hofmann, Gawronski, Gschwender, Le & Schmitt, 2005). Another study by Nosek (2005) looked at the relationship between explicit and implicit attitudes in over 50 domains. He too found a low correlation between the two attitudinal measures varying from near to zero for some domains including attitudes to 'thin' and 'fat', to approximately 0.70 in other domains including 'pro-choice/pro-life' attitudes.

Of course, when we consider issues to do with sustainability, social desirability is likely to be a major factor (see Beattie, 2010, p. 37) and explicit measures may not be reliable predictors of behaviour. In these situations, the IAT could *potentially* be a much better predictor of behaviour, especially when people are making quick and non-reflective decisions. One study looked at explicit and implicit attitudes toward fictitious environmentally friendly cleaning products (Vantomme et al., 2005). Vantomme and colleagues introduced participants to two fictitious green and non-green brand names using a 'learning phase' pairing the individual brand names with brand characteristics 'green product: minimal packaging, recyclable, green label and a price premium; for the traditional product: attractive packaging, non-recyclable, extensive media-support and standard price' (2005, p. 223). Participants then completed an IAT, which enabled the researchers to test participants' implicit attitudes to these fictitious cleaning products. Participants were also asked to complete various explicit measures including explicit attitudes to the fictitious cleaning products, intention to purchase the green fictitious cleaning products and a behavioural intention measure towards real multi-purpose cleaning products including an eco-labelled brand, two popular brands, and a less popular brand. They found that participants' explicit attitudes towards the fictitious products were positive for both the green and the non-green products. Their implicit attitudes were more positive to the green cleaning brand than the non-green cleaning product. The IAT scores correlated with 'intention to buy' measures, in that those with a positive implicit attitude to the green products were more likely to express an intention to purchase the green products than the non-green products. However, the explicit attitude measures did not correlate with intention to purchase. In the case of the real multi-purpose products, it was only implicit attitudes that correlated with intention to purchase the eco-brand. Explicit attitudes did not predict intention to purchase in this regard. Furthermore, implicit attitudes did not correlate with explicit attitudes.

Beattie and Sale (2011) tested participants' implicit and explicit attitudes towards high and low carbon footprint products in order to investigate which measure best predicted the choice of a high or low carbon footprint goody bag under two conditions - time pressure and no time pressure. These goody bags were given to participants as a reward for taking part in the study. They found that implicit attitudes did actually predict the choice of the low carbon goody bags. However, this prediction was only true when it came to participants choosing the goody bag under time pressure. This was not the case when participants were told they had as much time as they liked to choose a goody bag. Explicit attitudes did not predict behaviour in either conditions.

Another study that attempted to investigate the relationship between implicit attitudes and actual shopping behaviour was by Panzone, Hilton, Sale & Cohen (2016). Panzone et al. conducted their study across 900 Tesco customers via the Dunhumby Shopper Thoughts Panel.

Participants were first asked to complete an online IAT that was designed to measure underlying attitudes to sustainable and unsustainable items. Participants were also asked to complete a 13-item explicit attitude questionnaire, which assessed reported attitudes towards sustainability on a Likert scale. Items included ‘I monitor my carbon footprint’, ‘I am willing to pay extra for environmentally friendly products’ and ‘I try to buy products that have minimal amount of packaging’. In order to obtain the data for *actual* shopping behaviour, Panzone et al. used the Tesco Club-Card data, which records all purchases at Tesco made by the individual cardholder. Their results found that implicit attitudes, measured using the sustainability IAT, did not predict the sustainable consumer behaviour of their participants, although the IAT did predict one important behavioural measure - the share of expenditure allocated to bottled water, in that those with a positive implicit attitude towards sustainability did actually buy less. This was an important finding because, there is, of course, a low carbon alternative, namely tap water. Bottled water is expensive, high in carbon footprint and unnecessary. Measures of explicit attitude, including measures of ‘Green Consumer Attitude’ and ‘Sustainable Food Preference’ ‘did not predict aggregate consumer behaviour’ (Panzone et al., 2016, p. 15). This study will be critiqued in more detail in Chapter 3.

## 1.4. Measures of Implicit Attitudes

So when it comes to climate change, if we are going to attempt to understand and change consumers' patterns of consumption, it would seem to be very important to understand (and analyse) both explicit *and* implicit attitudes towards environmental features of products. But should we restrict ourselves to measuring implicit attitudes just using the IAT?

Over the last twenty years, there has been an increase in the interest of understanding implicit processes, and the use of implicit measuring tools in research for predicting behavior has become much more popular. The attraction of utilising these implicit measures in research is that they access people's implicit social cognition without the need of self-report questionnaires and therefore they avoid (or lessen) any biases that could be subject to social desirability (Gawronski & De Houwer, 2014; Gawronski & Payne, 2010). Since the popularity of the measurement of implicit attitudes, there have been several tools introduced. The most commonly used methods are described below:

### *1.4.1. Affective Priming Task (APT)*

The Affective Priming Task (also known as the Evaluative Priming Task), was developed by Fazio, Sanbonmatsu, Powell and Kardes (1986). This was one of the first reaction time tasks designed to measure implicit attitudes and has influenced many reaction time tasks since its creation (see De Houwer, 2003; Musch & Klauer, 2003). In the Affective

Priming Task there are two target categories in the lower left and right-hand side of the computer screen (for example 'Good' and 'Bad'). Two stimuli are presented sequentially on a computer screen. The first stimulus is a prime (either a positive or a negative prime), for example, a 'flower' (positive prime) or 'insect' (negative prime) and the second stimulus is the attribute category, for example, the word 'happy'. Participants are required to sort the second stimulus (the attribute) into the correct category as quick as possible. The basic premise behind the Affective Priming Task is that the participants should find it easier to sort the attribute stimuli into the correct category when it has the same valence as the prime. So for example, if the prime was 'flower' and the attribute was 'happy' the participant should be able to categorise it more quickly in the 'Good' category than if the prime was a negative prime (for example, an image of an insect and the attribute was 'happy' (see De Houwer, 2003; Fazio et al., 1995).

### *1.4.2. Extrinsic Affective Simon Task (EAST)*

The Extrinsic Affective Simon Task was designed by De Houwer and largely influenced by the IAT (De Houwer, 2003). It was originally designed to measure implicit attitudes and self-esteem (Teige, Schnabel, Banse & Asendorpf, 2004), but it has since been used to measure a variety of attitudes in different domains including implicit prejudice (Degner & Wentura, 2008) and implicit attitudes to alcohol (De Jong, Wiers, van de

Braak & Huijding, 2007). In a standard EAST there are three blocks – two practice blocks and one critical block. In the first block, good and bad words (that are white in colour) appear on the screen. When the words are white, participants are asked to focus solely on the meaning of the words and to place them in the correct category – either 'Good' (for example on the right side) or 'Bad' (for example on the left side) using the assigned keys on the keyboard for left or right. As with all other implicit measures, participants are required to do this as quickly as possible making as few mistakes as possible. In the second block, coloured words appear on the screen and participants are required to place the words in the correct category in accordance with their colour rather than their meaning, for example left for green coloured words and right for blue coloured words. If the EAST was testing implicit attitudes to 'flowers' and 'insects', the words in this particular block would be names of flowers and insects. In the third block, words appear on the screen (either white or coloured), and participants have to categorize words by their meaning (white words) or by their colour, for example, right side for blue, left side for green and their meaning is irrelevant.

The basic premise behind the EAST is that once the participants have completed the first block, they will extrinsically associate 'good' with one side of the screen (in this example - right) and 'bad' with the left side (in the case of this particular example). Therefore, those with a positive implicit attitude towards flowers will find it easier to categorise the flower words when coloured in blue (on the right side of the screen) because the colour blue will be extrinsically associated with good as opposed to when the insect words are coloured in blue.

### *1.4.3. Implicit Association Test (IAT)*

The IAT, as has been noted, was originally developed by Greenwald, McGhee and Schwartz (1998). This is the most popular test used to measure implicit attitudes (see De Houwer & De Bruycker, 2007). The IAT usually consists of seven blocks, however there are shorter versions using just five blocks (see for example Egloff, Schwerdtfeger & Schmukle, 2005; and the Brief Implicit Association Test (BIAT), which is detailed below). Each block in the standard IAT consists of between 20 and 40 trials. In Block 1, there are two target concepts positioned in the top left and right-hand side of the screen, for example 'Flower' (top left) and 'Insect' (top right). Images of flowers and insects appear consecutively in the centre of the screen and the participant places them in the correct category by using the correct response key ('Z' if it belongs in the left category, or 'M' if it belongs in the right category). In Block 2, the target concepts then change to 'Good' and 'Bad'. Stimuli are presented in the centre of a computer screen (good words and bad words: 'happy', 'sad', 'angry' etc.). Again, participants are required to decide upon whether the word in the centre of the screen is good or bad by pressing a specified key on the left side of the keyboard (‘Z’) or right side of the keyboard (‘M’). In Block 3 the categories are then paired, so for example ‘Flower’ might be paired with ‘Good’ and ‘Insect’ might be paired with ‘Bad’. Participants are asked to categorise the good and bad words that appear in the centre of the screen, and categorise the images of insects and flowers that appear in the centre of the screen as quickly as possible without making any mistakes. Those participants who have a positive implicit attitude towards flowers and a negative implicit attitude towards insects would find this example block relatively easy because ‘Flower’ is paired with ‘Good’ and ‘Insect’ is paired with ‘Bad’. Blocks 4 and 5 mirror those of Blocks 1 and 2, however, the target concepts are on opposite sides to the previous blocks. For example, if ‘Good’ was on the left side of the screen and ‘Bad’ was on the right in Blocks 1 and 2, ‘Bad’ would now be on the left side and ‘Good’ would now be on the right. In Block 6 and Block 7 the paired categories are swapped and ‘Good’ would now be paired with ‘Insect’ and ‘Bad’ would now be paired with ‘Flower’. Those with a positive implicit attitude towards flowers and a negative implicit attitude towards insects would find this block more difficult than the previous pairings in Block 3 and Block 4. The basic premise behind the IAT is that it measures speed of associations between the different paired concepts and provides researchers with a difference or

'D' score in accordance with Greenwald et al.'s (2003) improved scoring algorithm (see page 131-133 for a summary of the improved algorithm and an interpretation of the D scores resulting from the IAT).

### *1.4.4. Brief Implicit Association Test (BIAT)*

The Brief Implicit Association Test is a shorter version of the Implicit Association Test and generally consists of just four blocks as opposed to seven blocks in the traditional IAT (Sriram & Greenwald, 2009). In each block there are just two categories displayed at the top middle of the computer screen (as opposed to 4 in the IAT). So for example, in a BIAT that is testing for implicit preferences towards flowers and insects, the target categories shown on the computer screen at any one time might be 'Good' or 'Bad' and 'Flower' or 'Insect'. As before, stimuli are presented in the center of the screen and participants are asked to press the correct response key on the keyboard in order to categorize the stimuli correctly. The participant is asked to press 'I' if the stimuli belongs to either of the targets categories displayed at the top of the screen (for example 'Good' or 'Flower'), or 'E' if the stimuli belongs in either of the other categories not displayed on the screen (for example 'Bad' or 'Insect'). Like in the standard IAT, the category pairs are swapped in each block and participants with a positive implicit attitude towards flowers would find it easier to categorize the images of flowers if the word 'Flower' was paired with 'Good' than if the word 'Flower was paired with

‘Bad’ and vice versa. The participants are required to complete this task as quickly as possible making as few errors as possible.

### *1.4.5. Single Target IAT (ST-IAT)*

The single target IAT is similar to the standard IAT and the BIAT, however, the ST-IAT only measures implicit attitudes to one category, for example, implicit attitudes towards flowers (Sriram & Greenwald, 2009). A typical trial in the ST-IAT would have the word ‘Good’ on one side of the screen and ‘Bad’ on the other. If the test was measuring implicit attitudes towards flowers then the word ‘Flower’ (in Block 1) might be paired with ‘Good’, and the word ‘Bad’ would not be paired with anything. In Block 2, the word ‘Flower’ might be paired with ‘Bad’, and the word ‘Good’ would not be paired with anything. Good and bad words would be displayed consecutively in the centre of the screen and images of flowers would also be displayed in the centre of the screen. The participant would have to put the word or image in the correct category as quickly as they can, making as fewer mistakes as possible (see Bluemke & Friese, 2008).

### *1.4.6. Go-No-Go (GNAT)*

The Go-No-Go Association Task was developed by Nosek and Banaji (2001) and measures implicit associations towards a single target category rather than a comparison of implicit preference between two categories. The basic design of the Go-No-Go Association Task is that category items in the form of images or words (depending upon the design of the particular test) are displayed consecutively on the screen for a limited duration. Participants are asked to press the allocated key (e.g. the space bar) if words (or images) are displayed that represent the category displayed on the computer screen (for example ‘Flowers’) and the participant must press the allocated key on the key board within a short space of time before the time runs out. If the stimulus does not belong in the category, the participant does not press a key and waits for the next stimulus. In another block, participants may be asked to press the space bar when words (or images) appear on the screen that are associated with the word ‘good’. The Go-No-Go Association Task measures the strength of association between the categories, for example ‘Flowers and Good’ versus ‘Flowers and Bad’.

### *1.4.7. The Affect Misattribution Procedure (AMP)*

In a typical AMP there are two target categories (on the top left and right side of the screen) e.g. ‘Pleasant’ on the top right and ‘Unpleasant’ on the top left. Participants are instructed that images are going to appear in the centre of the computer screen followed by a Chinese character. If the AMP were testing implicit attitudes towards flowers and insects, the images would be images of flowers and insects. Participants are told that these images are put in place just to alert them that the Chinese character is about to appear in the centre of the screen. Once the participant has seen the Chinese character they must judge the character on whether they think that it is ‘Pleasant’ or ‘Unpleasant’ by pressing the allocated key for ‘Pleasant’ (in this particular example on the right side, e.g. ‘M’) or ‘Unpleasant’ (in this example on the left side, e.g. ‘Z’). The basic premise of the AMP is that if the participant holds a positive implicit attitude towards flowers, they will rate the Chinese character that follows the images of flowers as more attractive than if the Chinese character follows an image of an insect.

### *1.4.8. The Sorting Paired Features Task (SPFT)*

The Sorting Paired Features Task differs from other implicit measures as it measures associations to four different paired concepts in one response block. There are four category pairs placed in the top left, top right, bottom left and bottom right of the computer screen. For example, if the SPFT was measuring associations to flowers and insects the category pairs would be ‘Flower/Good’, ‘Flower/Bad’, ‘Insect/Good’ and ‘Insect/Bad’ all placed in a different corner of the computer screen. As with other implicit measures, participants are told that the response keys on the keyboards are associated with the positioning of each pairing located on the computer screen, for example ‘Q’ = top left, ‘P’ = top right, ‘Z’ = bottom left and ‘M’ = bottom right. For each trial an image and a word appear in the centre of the screen - for example an image of a flower along with the word ‘Pleasant’ (this example would belong in the

‘Flower/Good’ category) or an image of an insect with the word ‘Lovely’ (this example would belong in the ‘Insect/Good’ category). If the participant finds that both stimuli presented (i.e. the word and the image) are strongly associated, they will find the categorization process easier and therefore, they will respond quicker than if the pairs are not strongly associated.

## 1.5. Comparison of different implicit measures

De Houwer and De Bruyker (2007) used both the IAT and the EAST in three separate studies to compare participants’ attitudes to political parties, food items and homosexuality. In the first experiment, they tested 48 participants on both explicit and implicit measures. Participants had to rate on a 7-point scale how much they liked the Liberal and Democratic Flemish party (VLD) and how much they liked the coalition government party, which included the Socialists and the Green Party (CD&V). They were then asked to complete an IAT and an EAST to measure their implicit attitudes to both of these parties. In order to calculate a difference score for the explicit measures, the researchers subtracted the self-report liking of the VLD from the self-report liking of the CD&V. They found that the D score (calculated using the IAT) significantly correlated with the difference score of the explicit measure. However, the VLD D Score (calculated from the EAST) did not correlate significantly with the difference score from the self-reported liking of the VLD, nor did it correlate with the self-report liking of CD&V. The researchers also found that there was no significant correlation between both implicit measures.

The next analysis in this particular set of experiments focused on the comparison of the EAST and the IAT measuring participants' implicit attitudes to sprouts and beer. In this study, the researchers were testing the correlation between D scores resulting from the IAT, D scores resulting from the EAST and self-reported attitudes. Again, participants were asked to rate on a 7-point scale how much they liked sprouts and how much they liked beer. They were also asked how frequently they consumed both products on a 6-point scale from 'never' to 'more than once a week'. The researchers found that there was a strong correlation with the D Score from the IAT and the difference score from the self-reported measure. There was also a strong correlation between the D Score from the IAT and the frequency of consumption. However, the D score resulting from the EAST did not significantly correlate with self-reported measures of liking, nor did it correlate with the frequency of consumption of either of the products.

The final experiment from this set tested the implicit attitudes of 91 participants towards homosexuality. Explicit attitudes were also measured (a cognitive attitude scale and an affective attitude scale), along with a sexual orientation questionnaire where participants indicated their sexual identity and sexual behaviour on a 5-point scale ranging from 'exclusively heterosexual' to 'exclusively homosexual'. In this experiment, the researchers found a significant positive correlation between the cognitive attitude scale and the affective attitude scale. They found that there was a stronger correlation between the affective attitude scale and the D scores yielded from the IAT than the cognitive attitude scale and the D scores from the IAT. They also found that there was a significant correlation with IAT D scores and self-reported behaviour. The homosexual participants reacted faster when 'Homosexual' was paired with 'Positive' than when 'Heterosexual' was paired with 'Positive', thus showing a more positive implicit attitude towards homosexuality than heterosexual, this yielded a positive D score. Heterosexual participants responded quicker when 'Heterosexual' was paired with 'Positive' than when 'Homosexual' was paired with 'Positive' and thus yielded a negative D score. When it came to the EAST, there was no significant correlation between D score and explicit measures. There was no interaction effect between the category items and the groups taking the test. There was also no correlation between the IAT D scores and the EAST D scores. The authors concluded that 'the IAT consistently outperformed the EAST as a measure of inter-individual differences'

(2007, p.415). The researchers found that the split-half reliability scores from the IAT were high, but for the EAST they were low. When previous comparisons of implicit measures have been made in terms of reliability, the EAST was always lower in terms of reliability than the IAT (Teige, Schnabel, Banse & Asendorpf, 2004; Schmukle & Egloff, 2006).

In a more recent study, Bar-Anan and Nosek (2014) tested seven implicit measures: the IAT, the BIAT, the Go-No-Go association task, the ST-IAT, the Affective Misattribution Procedure, the Sorting Paired Features Task and the Evaluative Priming Task. They also used eleven direct attitude measures including self-reported preferences (towards 'Black' people and 'White' people, towards 'Democrats' and 'Republicans' and towards 'Myself' and 'Others') and Feeling Thermometers (towards 'Black' people and 'White' people, towards 'Democrats' and 'Republicans' and towards 'Myself' and 'Others'). They used item ratings whereby participants rated how 'warm' or 'cold' they felt towards the stimuli presented in the implicit measures; the 'speeded self-report' where participants had to report their attitudes towards specific objects very quickly. The Modern Racism Scale, which is a widely used self-report measure of explicit attitudes towards ethnicity was also used. Finally, the Rosenberg self-esteem test, which is a 10-item Likert scale designed to measure people's 'global self-worth' was used.

For each implicit measure, the same stimuli were used, so for example, when the researchers were measuring implicit attitudes towards ethnicity, the stimuli they used in each implicit test were the same six images of White people's faces and the same six images of Black people's faces. The stimuli used to test people's implicit attitudes towards politics across all implicit tests were always 'Barack Obama', 'Hillary Clinton', 'Bill Clinton', 'Al Gore' and 'John Kerry' (Democrats); and 'George W Bush', 'George H W Bush', 'Ronald Reagan', 'Condoleezza Rice' and 'Rudy Giuliani' (Republicans). Finally, for the self-esteem implicit measures, the words used in both categories were 'I', 'me', 'mine', 'myself', and and 'my health ('Self' category) and 'they', 'them', 'their', 'theirs' and 'others' ('Other' category). The results deriving from all of the implicit measures (apart from the AMP) indicated that the participants (of mixed reported racial origins including American Indian, Asian, Black, Hispanic, White and multiracial) all shared an implicit preference for White people rather than Black people. This result correlated with the explicit measures where participants had to indicate their preference for White people over Black people, and the Feeling Thermometer where participants had to rate how warm or cold they felt towards White and Black people. However, when it came to rating their preference towards the individual stimuli used in the implicit measures, participants were more likely to report that they preferred the images of Black people rather than the images of White people. The results from the indirect measures also indicated that participants held an implicit preference towards Democrats rather than Republicans, which correlated with their explicit measures. There was also a shared implicit preference for 'Self' over 'Others' across all implicit measures and explicit measures. The researchers concluded that the IAT and the BIAT were better at detecting participants' social identity. The IAT was also most reliable in terms of internal consistency followed by the BIAT, and the BIAT proved to be the strongest in terms of test-retest reliability followed very closely by all other measures (apart from the EPT which had a low test-retest reliability). The BIAT, GNAT and the IAT related more closely to all other measures and the AMP and EPT related to other indirect measures least. The BIAT and IAT also correlated with explicit measures more so than the other indirect measures with the EPT correlating least. Their conclusion was that 'Of the seven indirect measures, the IAT and the BIAT showed the best psychometric qualities across topics' and that the 'IAT has earned its status as the most popular tool because of its comparatively strong internal consistency, validity, and adaptability for a variety of research applications' (2014, p.46).

## 1.6. Measuring implicit attitudes in children

The IAT has also been adapted in various forms to measure the implicit attitudes of children as young as 6 (Baron & Banaji, 2006; Cvencek, Meltzoff & Greenwald, 2011; Dunham, Baron & Banaji, 2006; Rutland, Cameron, Milne & McGeorge, 2005; Steffens, Jelenec & Noack, 2010). One particular child friendly version of the IAT is known as 'FlexiTwins' (a game version of the IAT). The original FlexiTwins was designed to measure participants' connectedness with nature associating 'self' with 'Nature' or 'Built'. This adaptation was designed to avoid children being bored throughout the traditional IAT and served as an alternative to the Go-No-Go Association Test (GNAT) (Bruni & Schultz, 2010). FlexiTwins is a colourful, animated game designed to be fun and easily used across a wide range of ages. Two frogs are located on either side of the screen, one on the bottom left side and one on the bottom right side with the target categories labelled below either frog, so for example 'Me' on the left side 'Other' on the right. As in the traditional IAT, stimuli are presented in the centre of the screen. However, in order to make the game visually stimulating to children, the stimuli in FlexiTwins drops from the top of the screen (in this case words are used rather than images). Each word has to be caught by either the frog on the right-hand-side, or the frog on the left-hand-side (depending upon which side of the screen the child thinks the word belongs). Before the game begins, participants are asked to type their own name in a space provided on the computer screen. In the first block, the categories are 'Me' versus 'Other'. In this block, random names of people drop down from the top of the screen. These are a combination of male and female names and include the participant's own name. When the participant's name drops down they assign it to the 'Me' category and when somebody else's name drops down they need to assign it to the 'Other' category. In the second block the categories change to 'Nature' and 'Built'. In this block words representing built items such as 'chair', 'car' and 'truck' and also words representing nature including 'tree', 'flower' and 'butterfly' drop down from the top of the screen. Here the children have to assign the items to the category of 'Nature' or 'Built'. In the third and fourth block, the categories are then paired. So for example, on the left side of the screen, the word 'Me' would be paired with 'Nature' and on the right side of the screen the word 'Other' would be paired with 'Built'. The participant is required to assign the words representing nature and their own name to the left side of the screen and other people's names and words representing built items in the right side of the screen. In the fifth block, the categories swap sides, so for example if 'Built' was on the right side and 'Nature' was on the left side in the previous blocks, then 'Built' would now be on the left side and 'Nature' would now be on the right side. In the final two blocks the pairings then swap - here, ‘Built’ would now be paired with ‘Me’ and ‘Nature’ would now be paired with ‘Other’.

The basic premise behind FlexiTwins is that if the participant shares an implicit connectedness to nature, they would find it easier to put the words representing nature in the ‘Nature’ category when ‘Nature’ is paired with ‘Me’ rather than when ‘Nature’ is paired with ‘Other’. If the participant holds a stronger implicit connectedness to built environments, then they would find it easier to categorise the words representing built in the ‘Built’ category when ‘Built’ is paired with ‘Me’ than when ‘Built’ is paired with ‘Other’. Each word has to be caught before it reaches the bottom of the screen. If the word is not caught in time, it will remain at the bottom of the screen until the participant places it in the correct category. Sound effects are used giving feedback for correct and incorrect responses making it appear more like a game. Reminders are also built into the design of the game reminding participants they have to categorize the items as quickly and as accurately as possible. Participants receive points for their correct responses and the quicker the classification the more points they receive.

Bruni and Schultz (2010) conducted a study designed to test the reliability and validity of FlexiTwins. Participants were asked to complete a series of explicit measures online including a questionnaire measuring their personal explicit environmental concerns - a single item Likert scale taken from Dunlap, Gallup and Gallup (1992; 1993) asking participants to rate how concerned they personally feel about environmental issues on a scale of 0 (not at all concerned) to 10 (extremely concerned). There was also an 'Environmental Motives Scale' where participants had to rate 12 items on a scale of 0 (not important) to 10 (supreme importance). The 12 items are divided into three categories - 'Egoistic' concern which included items such as 'me', 'my future', 'my lifestyle' and 'my health', 'Altruistic' concern which included items such as 'future generations', 'my community', 'all people' and 'all children' and 'Biospheric' concern which included items such as 'plants', 'animals', 'marine life' and 'birds'. Participants 'Environmental Intent' was also tested by questioning how frequently they considered the environment in their daily routine. Participants had to respond on a scale of 0 (never) to 10 (always). An 'Inclusion of Nature in Self' scale was also used to test how connected the individual feels towards nature. After completing the explicit measures, participants were asked to complete the FlexiTwins game. Results showed that there was a significant correlation between the FlexiTwins D Score and the Personal Environmental Concern scale. There was also a significant correlation between the FlexiTwins D score and 'Inclusion of Self in Nature' scale. FlexiTwins D score also significantly correlated to the responses on the Environmental Intent question and when comparing the D score to the participants priorities of environmental protection versus economic growth. However, there was no correlation between the D score and egoistic concern, altruistic concern or biospheric concern.

Baron and Banaji (2006) also developed a child friendly version of the IAT to measure implicit ethnic bias in children from as young as the age of six. They wanted to investigate the social-cognitive mechanisms that are present universally, and the 'cultural processes that mark the development of these attitudes and preferences' (2006, p.53). In order to do this, they measured implicit racial biases in White North American middle-class children. They chose this particular issue as there is 'evidence that North American children achieve an adult like concept of this category by age 5' (2006, p.53). They report that children express out-group biases towards other children from the age of three; however, these reported biases start weakening by the age of seven, and gradually disappear by the time they reach 12.

In order to validate this particular version of the IAT, they also measured children's implicit attitudes to insects and flowers. The idea behind this was that flowers and insects elicit distinctive implicit responses in that people tend to have a more positive response to flowers than they do towards insects. They used 79 participants (39 males and 40 females) with the age ranging from 6 years and 1 month to 19 years. They adapted the standard IAT so that it could be used by young children and used images of faces of Black and White children as stimuli. In order to account for reading ability, they substituted the attribute words (‘pleasant’, ‘love’, ‘hate’ etc.) with a recording of a female voice saying the words through speakers inbuilt in the computer. They used eight images in each test (four images of insects and four images of flowers in the flower/insect IAT, and four images of European American faces and four images of African American faces in the ethnic IAT). Rather than using the keys ‘I’ and ‘E’ for left and right, they used two large ‘Jellybean’ buttons to counteract any issues regarding motor responses. Surprisingly, the detection of implicit preferences were present in children as young as six. Girls showed a preference for flowers as did the boys, however boys showed the preference to a lesser extent. When it came to the ethnic IAT, 6 year olds showed a pro-White implicit bias and their explicit attitudes correlated with their implicit attitude. The same pattern emerged with the flower/insect IAT and the ethnic IAT in 10 year olds as it did with 6 year olds, which suggests that implicit biases remain relatively stable across time. However, the explicit measure indicated a somewhat reduced ethnic bias but the bias was still prominent. Adults showed a pro-White bias on the IAT; however, their explicit measure indicated an equal preference for

White and Black faces. These results indicate that children aged six have already formed implicit biases when it comes to other social groups.

## 1.7. Attentional focus and climate change

The ability to access and measure implicit attitudes gives us possible new insights into the motivations which guide, and in some cases predict, human behaviour. These new insights could prove to be critical when it comes to combating climate change. However, the concept of implicit attitudes needs to be understood more fully in relation to other aspects of behaviour that these implicit attitudes might affect, such as the *processing* of information relating to climate change and how this may affect other pro-environmental behaviour (for example, the choice of low carbon products).

As mentioned earlier, there have been many attempts at creating successful advertisement campaigns, newspaper campaigns, and films persuading people about the dangers of climate change, all aimed at promoting awareness with the intention to change people's perceptions about climate change in the hope that people will change their behaviour. Beattie, Sale and McGuire (2011) played sections of Al Gore's 'An Inconvenient Truth' to participants and found that the different clips produced a significant impact (to varying degrees) on how people felt about environmental issues (see also Beattie, 2010). However, as individuals, we are not all drawn to the same information. We may not focus on the same images as other people, which could have major implications for the design of such campaigns and on the impact of these campaigns on individual behaviour (Xing & Isaacowitz, 2006). For some people, the evidence of climate change may not be 'obvious' and this could potentially be a result of a different underlying implicit attitudes and its specific effects on attention.

The link between implicit attitudes and attentional focus could be of immense theoretical importance when it comes to climate change. This issue formed the basis for an eye-tracking study by Beattie and McGuire (2012). By using eye-tracking technology, they were able to measure visual attention to different sets of images by tracking the movement of the eyes and measuring each period of fixation. Eye movements provide, 'an unobtrusive, sensitive, real-time behavioural index of ongoing visual and cognitive processing' (Henderson & Ferreira 2004, p.18), and gives us clear and reliable data on the allocation of attention (see also Holsanova, Holmberg & Holmqvist, 2008). The basic operation of the eyes in processing information is as follows: 'when we read, look at a scene, or search for an object, we continually make eye movements called *saccades*. Between the saccades, our eyes remain relatively still during *fixations* for about 200-300 ms. There are differences in these two measures as a function of the particular task…Saccades are rapid movements of the eyes with velocities as high as 500º per second. Sensitivity to visual input is reduced during eye movements; this phenomenon is called *saccadic suppression* (Matin, 1974) …We do not obtain new information during a saccade, because the eyes are moving so quickly across the stable visual stimulus that only a blur would be perceived (Uttal & Smith, 1968) …As we look straight ahead, the visual field can be divided into three regions: *foveal, parafoveal* and *peripheral*. Although acuity is very good in the fovea (the central 2ºof vision), it is not nearly so good in the parafovea (which extends out to 5º either side of fixation), and it is even poorer in the periphery (the region beyond the parafovea). Hence, we move our eyes so as to place the fovea on that part of the stimulus we want to see clearly' (Rayner, 1998, p. 373-374).

Beattie and McGuire (2012) examined how measures of both implicit and explicit attitudes to the environment related to unconscious patterns of eye movements towards or away from iconic images of environmental damage and climate change. Participants' implicit attitudes were measured using a carbon footprint IAT and their explicit attitudes using a Likert scale and a Feeling Thermometer'sign. Nine negative iconic representations of climate change/environmental damage were selected (based loosely on Al Gore's film 'An Inconvenient Truth'), nine positive iconic images of nature were also selected and nine neutral images of everyday household objects. Nine different stimulus slides were assembled; each contained three images from the three different sets, that is to say, one negative image, one positive image and one neutral image. The images were always the same size. The slides were shown for 10 seconds and then replaced by the next slide in the sequence. Participants were told simply that they were going to be shown a series of images, which were not specified in advance. Each 40 ms frame was coded by a human observer in terms of where each of the participants were looking (positive image/negative image/neutral image/background).

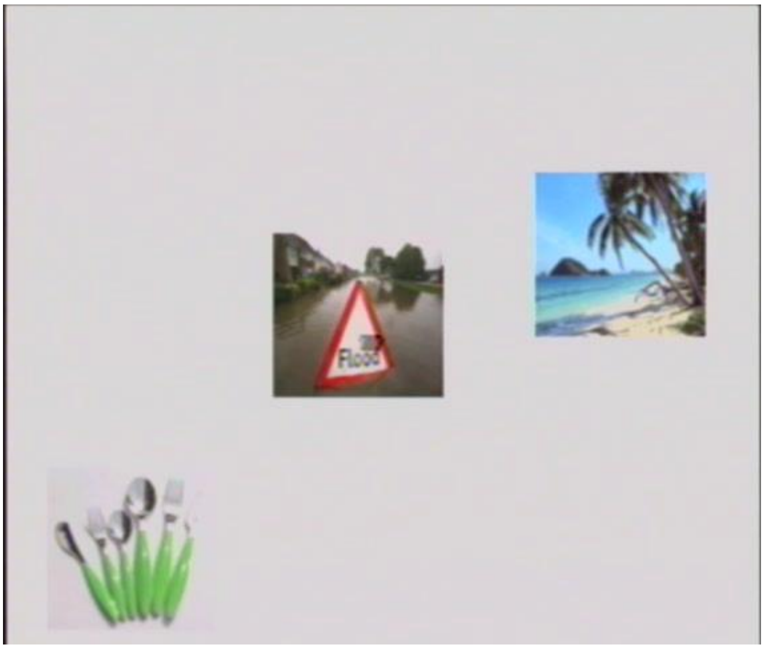


Figure 1.11: The eye gaze of one participant with one stimulus array. The gaze here is directed at the negative image in the middle of the screen *(from Beattie & McGuire, 2012, p.248).*

Participants were separated into a high/low explicit group and high/low implicit group using a median split. The study found that participants with a strong positive implicit attitude to low carbon products looked significantly more at the negative images of climate change than the positive images of nature. However, when it came to the low implicit group, there was no significant difference in terms of gaze fixation on the negative images versus the positive images. When it came to the high and low explicit groups, again, there were no significant differences in where participants looked. Gaze fixation within the first 200 ms of looking was then analysed, in order to see if there was any difference in the groups in terms of where they looked first. The high implicit group spent a significantly higher proportion of time within the first 200 ms looking at the negative images of climate change than positive images of nature. Indeed, they looked at the negative images twice as much as the positive images. However, there was no significant difference between the high and low explicit groups in terms of where they looked in the first 200 ms. This study clearly raises the possibility that an understanding of the operation of implicit attitudes and their effects on non-conscious behaviours like eye movements could be critical. The research also suggested that explicit attitudes did not have a good predictive value in this regard.

## 1.8. Education, knowledge and personality factors

So how might we embed these new insights from research on implicit attitudes into a broader cultural context? From other research, we know that there are many potential factors at the social psychological, cultural and experiential level that can influence pro-environmental concern and behaviour. These range from childhood experience, political worldviews, felt responsibility, age, religion and gender. Hines, Hungerford and Tomera (1987) conducted a meta-analysis of 315 studies of responsible pro-environmental behaviour. Their aim was to identify psychological variables that were linked to pro-environmental behaviour. They analysed the associations between four major psycho-social variables. One psycho-social variable was the attitude-behaviour relationship (the individual's feelings for, or against, particular aspects of the environment). Another psycho-social variable was locus of control (the individual's perception of whether they could bring about change through their own behaviour). If the individual attributes change to others i.e. God, parents, government, as opposed to their own behaviour, this is deemed as an external locus of control. However, if on the other hand, the individual believes that their actions will have an impact, this is deemed as an internal locus of control (Peyton & Miller, 1980). Hines et al. (1987) also considered moral responsibility in their analysis of psycho-social variables (the individual's feelings that they are responsible to act and bring about change) and pro-environmental behaviour (the individual's intentions to act). They found that 'intention to act is merely an artefact of a number of other variables acting in combination (e.g., cognitive knowledge, cognitive skills, and personality factors)' Hines et al., 1987 p.6.

However, one major barrier to preventing pro-environmental behaviour is education and people knowing what they can do to help combat the effects of climate change. If people do not know about the potential problems, or indeed know how to act in a positive way, then little can be done on a personal level to act in a pro-environmental way (Gifford & Nilson, 2014). Hines et al. surmise that before an individual can take an environmentally friendly approach, they must have knowledge and awareness of the problem. They must also possess knowledge of action strategies that will bring about change. Hines et al. found a relationship between age and pro-environmental behaviour, 'younger individuals were slightly more likely to have reported engaging in responsible environmental behaviours than were older individuals' (1987, p.5). However, these are self-reported measures of behaviour rather than measures of actual behaviour and therefore may not be entirely reliable. Lyons and Breakwell (1994) also found that teenagers, who had more environmental knowledge, were more concerned about the environment.

Gifford, Hay and Boros (1983) found that in a Canadian university, students who were enrolled on an Environmental Education Program had ‘significantly greater knowledge, verbal commitment and actual commitment’ than students who were not enrolled on the Environmental Education Program. Levine and Strube (2012) conducted a study looking at the relationship between implicit and explicit attitudes to the environment, reported pro-environmental behaviour as well as their knowledge about environmental issues amongst 90 college students. They measured participants’ explicit attitudes to the environment using the New Ecological Paradigm Scale (NEP). The NEP consists of 15 items where the participant has to state on a 5-point scale how strongly they agree with each statement. Statements on the NEP included ‘Humans are severely abusing the environment’, ‘If things continue on their present course, we will soon experience a major ecological catastrophe’ and ‘When humans interfere with nature it often produces disastrous consequences’. Participants then had to complete a 12-item questionnaire taken from the National Environmental Education and Training Foundation (NEETF)/Roper Survey (2000) - a multiple-choice test containing items designed to test basic environmental knowledge, for example, how electricity is generated, common causes of air pollution and what renewable resources are etc. They then measured environmental intentions asking participants to complete a 9-item Intended Pro-

Environment Behaviour measure stating how likely it was that they would perform different pro-environmental behaviours on a 5-point scale (adapted from Cordano, Welcomer & Scherer, 2003). For example, one item asked how likely it was that the participant would 'sign a petition to support stricter environmental law'. Another item asked how likely it was that the participant would 'participate in a protest against a company that is harming the environment' and another asked how likely it was that the participant would 'participate in events organized by environmental groups' (see Corando et al., 2003, p. 28). In order to measure environmentally friendly behaviour, participants were given a list of 'environmentally relevant actions' and were asked to rate the frequency of engagement in such behaviours on a 5-point scale, for example, 'recycling, using public transportation, and turning off lights and electrical appliances when not in use' (2012, p.316). Levine and Strube (2012) then used an IAT to measure participants' implicit attitudes to pro-environmental behaviour. Participants had to categorise target words such as 'recycling', 'conservation', 'nature', 'ecology' and 'organic', or industry words such as 'pollution', 'deforestation', 'emissions' and 'landfills' into the category 'environment' or the category 'industry'. They also used attribute words such as 'love', 'wonderful', 'happy' and 'joy' for the category 'Good' and 'agony', 'horrible', 'awful' and 'evil' for the category 'Bad'. They found that participants had positive implicit associations with ‘environmental’ words and negative associations with ‘industry’ words. There was no significant correlation with implicit attitudes and behaviour or intention. Knowledge was significantly correlated with behaviour but not significantly correlated with intention. They found that when it came to environmental issues, men were more knowledgeable, but there was no significant difference in men and women’s explicit measures, implicit measures, intention or behaviour.

However, when we consider these findings in the context of the literature on implicit processing and implicit attitudes, it may not be that surprising that participants held strong positive associations with ‘environmental’ concepts and held a more negative association with the ‘industry’ concepts due to the fact that the words ‘recycling’, ‘conservation’, ‘nature’, ‘ecology’ and ‘organic’ all have obvious positive connotations. Yet, the words used for the ‘industry’ concept have clear negative connotations e.g. ‘pollution’, ‘deforestation’, ‘emissions’ and ‘landfills’ (rather than concepts like ‘cheaper products’, ‘convenience’, ‘capitalist wealth’ which might have produced different results).

Scannel and Grouzet (2010) point out that actual knowledge about climate change is the strongest predictor of *intention* to engage in pro-environmental behaviour. Similarly, Bord, O’Connor and Fisher (2000) conducted a large-scale survey looking at Americans’ knowledge of climate change and intention to engage in pro-environmental behaviour. They too found that actual knowledge predicted intention to engage in behaviours that would lead to the possible mitigation of climate change. Similarly, Lazo, Kinnell and Fisher (2000) and O'Conner, Bord and Fisher (1999) found that the more knowledge people possess with regards to climate change, the more likely they are to accept mitigation policies. Knowledge is clearly not the sole predictor of behaviour change, there are other factors that need to be addressed such as habit (and other forms of 'mindless' behaviour), but knowledge does play a major role when it comes to (conscious) intention to act. People do not always associate certain events, for example, adverse weather conditions to the more abstract concept of climate change, so we may need to make people more aware of the connections in this domain. This is clearly something that needs to be addressed.

## 1.9. The media and mental representations of climate change in films

The portrayal of climate change in films and television programmes also plays an important role in the mental representation of this concept. Even though people are witnessing more extreme weather conditions such as floods, droughts, heat waves etc., it is the media who make the connection between these conditions and global warming (Corbett & Durfee, 2004). There have been many popular films depicting climate change in an attempt to make it more real, for example, 'The Day after Tomorrow', 'The Age of Stupid' and 'An Inconvenient Truth'. These films were aimed at raising awareness about climate change and emphasising its devastating effects. However, communicating climate change is a complex issue and unless depicted with a sense of 'realism' and 'legitimacy' it will not have the desired response (Lowe, Brown, Dessai, de França Doria, Haynes & Vincent, 2006). Of course, we still have to consider the issues of perceived 'response-efficacy' and 'self-efficacy'. There is always the danger that an audience will have difficulty in separating fact from fiction, which, in turn, will result in the viewer believing that the devastating effects of climate change are something of a fantasy and they will not happen in the real world and certainly will not happen to them personally. The audience also needs to identify with the characters as well as the scenario in order for them to be persuaded and to be cognitively and emotionally affected (Kelman, 1961). Cohen (2001) describes the process of identification with the characters as 'a mechanism through which audience members experience reception and interpretation of the text from the inside, as if the events were happening to them' (2001, p.245). Oatley (2002) proposes that, in order to successfully identify with a character, one needs to 'make a leap into another mind' (2002 p.62).

Fictional narratives used in feature films and television programmes employ various effects to engage the audience on an emotional level rather than to merely entertain them. They successfully affect people's beliefs and attitudes concerning the subject approached in the narrative, especially when developed for education-entertainment (Wilkin, Valente, Murphy, Cody, Huang & Beck, 2007). It has been suggested that viewers who feel psychologically involved and engaged by a narrative are persuaded more effectively by the message within that particular narrative (see Green & Brock, 2000). Slater and Rouner (2002) suggest that, in order to understand the effects of narrative persuasion, identification with the characters is a necessary factor. This is based on the assumption that the viewer understands arguments in relation to the message that is being conveyed.

Some of these films mentioned have been criticised for being too extreme and unrealistic, which, in turn, has led to denial and reduced self-efficacy, for example, 'The Day After Tomorrow', and they do not seem to evoke a long-term emotional response (see for example Lowe et al., 2006). This is a problem, because until we can provoke an emotional response towards climate change with a lasting effect, then we may not be able to get the audience to understand the perceived threat that is upon us. In the words of Weber (2006) 'we should find ways to evoke visceral reactions towards the risk of global warming, perhaps by simulation of its concrete future consequences for people's home or other regions they visit or value' (2006, p.1).

One of the major problems here is that, to many people, global warming is very abstract. Its scientific and statistical content inhibits people's understanding and emotional responses (Beattie, Sale & McGuire, 2011). The effects of climate change are not immediate, they take a relatively long time to become visible and require people to understand and believe the arguments of climate scientists. People do not seem to understand or know enough about what they have to do to make a lasting effect. As Kellstedt, Zahran and Veslitz (2008) commented 'the lack of public outcry about global warming, then, is not because the public does not care enough about global warming; it is because they don't know enough about it' (p.114). However, climate change is such a huge and complex topic that there is the danger that the more people know about something as catastrophic as global warming, the less personally responsible people may feel about it. As a result, the feeling of responsibility and lowering perceived self-efficacy and response efficacy will be shifted on to others rather than themselves, having the opposite affect than intended (see Ross 1977; Lee & Beattie, 1998; 2000 for an analysis of defensive attributions). A study by Kellsedt et al. (2008)

looked at exactly this effect. They conducted a telephone survey asking people about their perceptions of the risks posed by climate change, their perceived efficacy to have an influence on climate change and their knowledge about climate change. Their results revealed that those who knew more about global warming showed less concern. However, Beattie et al. (2011) found that after showing participants short extracts from the film Al Gore's award winning film 'An Inconvenient Truth', participants felt exactly the opposite to Kellstedt et al.'s findings. Indeed, participants felt more motivated to do something about climate change and were less likely to feel that they had no control over climate change. In Beattie et al.'s (2011) study, participants were shown seven clips that had previously been identified as being powerful and emotional. The first clip was intended to highlight the fact that global warming is a serious issue and that all countries must unite if we are going to come up with a solution. The second clip was a slightly more positive clip, emphasising the fact that every small bit that people do in terms of pro-environmental behaviour can help, and that we can all do something about it. The third clip was an image of our 'small planet' taken from space. Al Gore was informing the audience that this is our only home and the entire history of our human race is contained on this small blue planet. Clip 4 was describing the paradoxes caused by global warming, that not only has there has been an increase in floods, but also an increase in droughts. Clip

5 was an animated clip of a polar bear stranded on a melting ice floe. Clip 6 was about the effects of population growth. Finally, clip 7 was highlighting the effects of global warming on the rise in sea levels. In this clip, Al Gore demonstrated what our coastlines would look like in the future showing land submerged by water. Participants were then each given a shortened version of the UWIST Mood Adjective Checklist consisting of 21 items grouped into seven mood categories – ‘happiness’, ‘sadness’, ‘anger’, ‘tension’, ‘calmness’, ‘energy’ and ‘tiredness’. Participants were also given a questionnaire designed to measure participants’ explicit attitudes and social cognitions towards climate change. There were 30 statements grouped into five categories where participants had to rate on a 5-point scale the strength to which they agreed with each statement (1= strongly disagree; 3= neither agree nor disagree; 5 = strongly agree. The five categories were as follows: ‘Message acceptance’ (for example ‘I believe most of what was said in the message’) ‘Motivation’ (for example ‘I am prepared to do more to help reduce climate change’), ‘Empowerment’ (for example ‘I feel empowered in the fight against climate change’), ‘Shifting responsibility’ (for example ‘Climate change is a problem to be solved by future generations’) and ‘Fatalism’ (for example ‘I feel helpless in the fight against climate change’). After watching each of the clips participants’ levels of happiness significantly dropped from their baseline happiness levels,

which were taken before watching the clips. Levels of calmness also dropped after watching each of the clips. However, participants' level of anger and tension were not significantly affected. When it came to the climate change attitude questionnaire, participants' motivation increased after watching each of the clips. Levels of empowerment increased significantly after watching each of the clips. There was an increase in levels of fatalism after watching some of the clips. Yet levels of 'shifting responsibility' were not significantly affected, nor were the scores for 'message acceptance'. The results of this study showed that these clips had a significant effect on participants' mood state as well as on participants' explicit attitudes/social cognitions.

It is important to emphasise that this experiment only measured participants' explicit measures (something that will be corrected in this PhD thesis). There was no attempt to measure implicit attitudes to the environment before or after watching any of these clips. Furthermore, the explicit measurements were only taken immediately after watching each of the seven clips, there was no follow-up questionnaire months after to measure any long-term effects (like most studies in this domain). There was also no attempt to measure *actual* behaviour change amongst participants.

If people are aware of the threat posed by climate change and are aware of the small things that they can do in terms of pro-environmental behaviour, they will feel empowered and are more likely to bring about change. However, if they are subjected to footage of climate change on a catastrophic level, with no advice on how to go about change on a personal level, of course they will feel disempowered and feel it is somebody else's problem. Another suggestion pointed out by Scannel and Grouzet (2010) is that messages should portray the impact of climate change on a 'local' level rather than a 'global' level as individuals do not usually associate climate change as a local issue, they believe that it is a problem affecting other countries far reached from their own. In doing so, this may be more effective in engaging people and perhaps then, they will have a more emotional response. They will see examples of the effects of climate change and its impact on their local environment and will feel emotionally driven to do something about it. If people see the effects on a global level, they will feel that firstly, the effects are too catastrophic for anything to be done, and secondly, that they will not be *personally* affected by it.

Howell (2011) investigated the effects of 'The Age of Stupid', a 92-minute futuristic feature film set in 2055 in a world that has suffered devastating effects resulting from climate change. It is a low budget documentary film starring Pete Postlethwaite. Postlethwaite plays the last man alive after the shattering effects of climate change have destroyed the earth. In the opening scene, we are confronted with images of London under water, Las Vegas covered over with sand, the Taj Mahal destroyed and Sydney on fire. The archivist, played by Postlethwaite, gathers archived footage and news clips and plays them to us (the audience) and we are able to follow six real life journeys of individual's personal experiences of climate change, which are interwoven and broken up by actual news clips. Postlethwaite plays the footage and watches it carefully asking the question 'Why didn't we stop climate change when we had the chance?' It is an informative, yet emotional film, which uses fear as a primary motivator. But the main issue with this film is that does not seem to give the audience advice on how to go about making personal changes and after watching the film, we are actually no wiser as to how we should go about changing our behaviour. Howell (2011) gave 213 filmgoers a questionnaire before seeing this particular film. They were then given a questionnaire immediately after seeing the film and then again 10-14 weeks after to see if the effects were lasting. The questionnaires consisted of multiple-choice questions about participants' level of concern about climate change, participants' beliefs about climate change and participants' motivation to do something about climate change. They were also asked specific behavioural questions about raising awareness of climate change, home energy use, travel and food. Participants showed concern before watching the film and then had a slight increase in concern immediately after. Levels of motivation increased after watching the film; however, these higher levels of motivation were not evident in the follow-up 10-14 weeks after seeing the film. There was evidence of behavioural changes amongst participants in this study, in that participants *reported* that they were 'buying more local produce' or that they had decided to take a holiday that did not involve flying.

So how can we get people to remain motivated and do more? Watching a film is unlikely to have long-term lasting effects unless different types of attitudes are affected (something that will be investigated in chapter 6), and unless other initiatives are put in place, such as education programmes, if we are going to impact and attempt to change people's behaviour by increasing self-efficacy and response efficacy. According to Brant (2009), this particular film has been heavily criticized for presenting a very negative outlook and showing things that we should avoid, rather than creating a positive outlook and portraying a future that we could strive to achieve. It also fails to show how we could go about changing our patterns of behaviour.

Interestingly, Howell found that '21.9% of respondents stated that they 'decided to reduce/cut out holiday flying long-term as a result of seeing the film'. However, the questionnaires were self-report measures so may not be a reliable or valid measure of actual behaviour, and may well be subject to social desirability. So how can we get a better measure of behaviour? It may be better to observe, wherever possible, actual behaviour (Steg & Vlek, 2009). For example, Chao and Lam (2011) trained students to observe particular aspects of their roommates' 'responsible environmental behaviour' and compared these observations of actual behaviour with reports of 'behavioural intention' and 'self-reported behaviour'. They found that 'behaviour intention' and 'self-reported behaviour' (all subject to social desirability, of course) were significantly higher than the frequency of observed responsible environmental behaviour. However, even the observation method itself can promote socially desirable behaviour when people know that they are being observed (the so-called Hawthorne effect - see Landsberger, 1958). Corral-Verdugo, Zaragoza and Guillen (1999) found a way around this problem by asking participants to provide quantifiable measures such as gas/meter readings, not subject to either social desirability or the Hawthorne effect. However, it is quite difficult to ask people to provide energy bills etc. because it could be perceived as both personal and intrusive.

No study thus far (to the best of the author's knowledge) has set out to measure the effects of a film on implicit attitudes concerning climate change. However, changing people's implicit attitudes and persuading people to change their behaviour through film has been successful in other domains such as smoking. Dal Cin, Gibson, Zanna, Shumate and Fong (2007) investigated whether identification with a character in a film increased implicit associations of 'self with smoking' amongst 26 smokers and 26 non-smokers. Participants completed a series of questionnaires, which included explicit measures of smoking, beliefs about smoking and personal intention to smoke. They also completed a transportability scale assessing individual's disposition to engage with a narrative (Dal Cin et al., 2004). Participants were then asked to watch 36 minute segments from the film 'Die Hard'. They were assigned to either of two conditions, a smoking condition where participants saw the main character smoking, or the non-smoking condition where participants did not see the main character smoking. After watching the clips, the participants had to report how much they identified with the character. They were also asked how likely it was that they would smoke in the next few months, if they thought they might smoke more cigarettes in the future and if they would be less likely to be friends with somebody who smoked. Participants also had to estimate how popular smoking was amongst the population. Participants completed a smoking IAT measuring associations between 'self' and 'smoking' by categorising pictures (some with smoking related items and some without) as 'Smoking' or 'No

Smoking’ and words e.g. ‘me’, ‘mine’, ‘they’, ‘them’ as ‘Self-relevant’ or ‘Not Self-relevant’. Those participants who held a stronger association with the main character (both smokers and non-smokers) in the smoking condition had an enhanced implicit association between ‘Smoking’ and ‘Self’. Identification with the character in the smoking condition also predicted a greater intention to smoke.

Smoking in films also predicts a greater likelihood of smoking based on self-report measures (see Hines, Saris & Throckmorton-Belzer, 2000; Pechmann & Shih, 1999). Gibson and Maurer (2000) found that after participants had viewed a film where certain characters were smoking, they had a more favourable explicit attitude towards smokers. Similarly, teenagers who liked specific actors who smoked had stronger intentions to smoke even though they had never smoked themselves (Tickle, Hull, Sargent, Dalton & Heatherton, 2006).

So although there are experiments that suggest that implicit attitudes can be changed using appropriate techniques in a relatively short time frame, we need to ask whether this is applicable to implicit attitudes to the environment, and if this can impact upon pro-environmental behaviour?

## 1.10. Children's perception of climate change

As discussed earlier, education is critical in the fight against climate change. Therefore, if we are to tackle climate change, we need to educate the next generation because they, of course, are the future. Environmental education is intended to change the attitudes and behaviour of the learners and make them more aware of the consequences of their current behaviour (Zsóka, Szerényi, Széchy & Kocsis, 2013). Yet attitudes towards the environment (both implicit and explicit) develop at an early age (Bryant & Hungerford, 1977) and once these attitudes are formed, they are much more difficult to change (Asunta, 2003) so it is important to target children at an early age. Indeed, younger children are less likely to have developed harmful habits concerning environmental behaviour, they are more susceptible to learning new information, and can then effectively promote pro-environmental behaviour in others if they are educated in the correct way (Leeming & Porter, 1997). If children are more aware of the behaviours they need to employ in order to tackle the problems of climate change and are willing to adapt their behaviour, they can potentially motivate siblings and those they live with (Damerell, Howe & Milner-Gulland, 2013). Wilcox, Gillies, Wilcox and Reid (1981) found that children actually influenced their parents to give up smoking after they completed a project at school about lung health. There is also supporting evidence that children who are educated about environmental issues have influenced the behaviour of family members at home (Sutherland & Ham, 1992; Uzzell & Prtugal, 1994).

However, in the past, environmental education has focused on scientific knowledge and not enough on the encouragement of pro-environmental behaviour (Tsevreni, 2011) and there is little correlation between abstract environmental knowledge, scientific knowledge and actual pro-environmental behaviour (Kollmuss & Agyeman, 2002; Finger, 1994). A possible mechanism to encourage such behaviour is to focus on the empowerment of children by informing them of what alternative actions they should take rather than focusing on scientific knowledge and ecological issues. Tsevreni (2011) took an alternative approach to educating children in Athens about the environment, putting emphasis on children's willingness to engage and participate in a pro-environmental community. The participants consisted of 60 children aged between 9 and 12. Tsevreni used methods such as storytelling, photography and drama as a way to explore pro-environmental behaviour in order for children to communicate their own experiences and perceptions with regard to the environment. In doing this, children were encouraged to address issues through the expression of emotion. The first task was to address issues through storytelling. Children were asked to participate in a storytelling contest. They were told to 'Imagine that you are an extra-terrestrial landing with your spacecraft on Athens: Describe what you like and what you do not like in the city; How do you imagine the city after 20 years? Which changes would you like to be made in the city?' (2011, p.56). The children were able to read each other's stories and share ideas and thoughts about the future of the planet. In the second task, children were provided with easy to use cameras and were asked to take photographs of their neighbourhood, paying attention to their favourite areas, areas they disliked and areas where they liked to play. Children were then asked to describe, in writing, why they took the pictures of the specific areas and what they would like to express through the images depicted in the photographs. In the final stage, the children formed groups and expressed through drama, the positive and negative issues regarding the city. After each activity, the children were asked to write about their feelings towards the environment and their experiences. At the start of the study, the children showed a lack of confidence in their ability to express their own thoughts and opinions and they did not display a 'willingness to act'. However, after engaging in such activities and having the freedom to express and analyse their ideas, a number of issues arose - many of the children felt that nobody would listen to them with regards to future plans of their own environment and the lack of power felt by the children proved that the children had a low sense of self-efficacy. Many of the children had negative thoughts about their environment and were pessimistic about the future. They brought up the issue of pollution caused by cars saying that they would like to see ‘less cars and more flowers and trees’. But the main observation from this study was the increase in self-confidence that the children felt in their ability to express their own thought and opinions. Indeed, this feeling of empowerment may well impact on actual behaviour (in terms of self-efficacy).

So, if children feel a sense of empowerment and are more confident in expressing their opinions regarding their environment, they can then influence the people around them and encourage changes at home ‘As children learn about sustainability at school, they sometimes bring new ideas and actions to live more sustainably at home’ (Desjardins & Wakkary, 2011). Damerell, Howe and Milner-Gulland (2013) found that children who were educated about the environment, transferred knowledge between peers which successfully encouraged positive changes in behaviour in the home. They collected data from seven schools, all of which had all undertaken learning activities on wetlands. They compared data to eight other schools who had undertaken work on alternative projects. Both sets of pupils completed questionnaires, as did the parents of pupils from both groups. The children completed their questionnaires, addressing issues regarding ‘wetland’ whilst they were in school and then took a slightly different version of the questionnaire home to their parents. Not surprisingly, children who had undertaken the work on wetland scored higher on the questionnaire than those children who had studied alternative subjects. Parents whose children had undertaken the wetland work also scored higher than the parents of the children who studied alternative subjects. However, the most surprising result was that the children who had undertaken the wetland course had a positive influence on water use behaviour at home.

## 1.11. Summary

If we are to combat climate change then it could be argued that a better understanding of some of the psychological issues surrounding environmental attitudes and behaviour, and climate change, will be the key to its success. We need to identify the psychological barriers. This review of the literature on government and commercial initiatives to change our behaviour to climate change has highlighted the assumptions on which these campaigns were based. In this introduction, the emergence of the concept of implicit, as well as explicit attitudes has been detailed, and how these implicit attitudes can be measured has been discussed. The possible link between implicit attitudes and actual behaviour (as opposed to self-reported behaviour) in a number of domains has been outlined. Also discussed in the introduction is how these implicit attitudes develop in childhood and how they can be changed. The review, as a whole, has identified a range of critical issues where current psychological knowledge is in need of systematic and urgent development. There have been many, very well publicised and meaningful campaigns, that have failed to deliver because they lacked an adequate understanding of some of the key psychological factors that underpin human action and consumer behaviour. The goal of this PhD is to address some of these key issues.

Empirical research is reported in four chapters (chapters 2-6). In each case, the study has either been published, submitted for publication or a publication is in preparation. Each chapter is, therefore, organised around a published piece of work or a piece of work currently in press or being prepared for publication. The chapters in the thesis are modified versions of each of these papers. This was necessary for a number of reasons - for reasons of redundancy and overlap (especially in aspects of the method sections) and for theoretical refinement and cohesion. Each chapter begins with a scene setting introduction, indicative of the original introduction.

Chapter 2 explores the implications of implicit attitudes for unconscious, low level and habitual behaviours like visual attention, which is the bedrock of human action. Earlier research (Beattie & McGuire, 2012) had identified how implicit attitudes predicted attention to iconic climate change images. It reported that those with a strong positive implicit attitude towards low carbon products spent significantly more time attending to negative images of climate change than positive images of nature in a ten second interval and this was observed even in the case of the first 200 milliseconds of looking. But how does this apply to other stimuli including carbon footprint on products? Is there a relationship between implicit attitudes and visual attention here? Do explicit attitudes predict visual attention in this context? Again, earlier research had suggested that there is minimal visual attention to carbon footprint on products, given the competition with all of the other salient stimuli (price, energy, brand etc.). Is this the case when we restrict our focus to those with positive implicit attitudes to low carbon?

Chapter 3 explores the issue of the relationship between explicit and implicit attitudes and self-reported environmental behaviour, as well as actual consumer choice (including carbon choices) in a simulated shopping task. The concept of time pressure is introduced as a variable to see how this affects consumer choice, when behaviour is more automatic.

Chapter 4 introduces other core aspects of products including brand – well-known, value, luxury and organic/eco that clearly influence choice, and again considers the effects of time pressure on selection decisions. The effects of implicit and explicit attitude on aspects of these choices are considered in a very fine-grained analysis.

Chapter 5 considers the effects of the presence of other on consumer choices when products are labelled in terms of their environmental impact. This chapter introduces ‘costly signalling theory’ as a possible explanatory device for the choice of certain products. Chapter 6 investigates whether we can modify implicit attitude through film, by targeting informational or emotional routes (or whether in fact we need to do both). It poses the critical (and often neglected questions) of how persistent any such change is, and what are the implications of any change in attitude for behaviour. The final chapter, Chapter 7, is the general discussion which reflects on the implications of the work presented in this thesis and present a vision for future research, including the introduction of a proposed educational programme on climate change aimed at school-children.

# Chapter 2: How implicit attitudes predict pre-conscious visual attention to carbon footprint information on products

## 2.1. 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 & 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, as already discussed, 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 & 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 & 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.

So in order to promote more sustainable lifestyles amongst their customers, Tesco, went on to embrace the 'green movement', spending millions on labelling their products with carbon footprint information. He pledged that with the help of 'The Carbon Trust', Tesco would put carbon labels on 70,000 of their own brand products. So, aiming their new campaign at individual consumers, Tesco proceeded to mark many of their own brand products with a carbon footprint label. The particular label included a symbol of a black footprint in which the carbon value of the particular item was embedded, and alongside it was a small box of information about what exactly had been calculated e.g. ‘The carbon footprint of this product is the total carbon dioxide ($CO_2$) and other greenhouse gases emitted during its life, including production, use and disposal’ and then another box saying ‘We have committed to reduce this carbon footprint’. But Tesco made many psychological assumptions when creating this campaign. Firstly, they assumed that consumers had the right underlying attitude to act in a pro-environmental way and, therefore, that they were ready to change their behaviour. They also presumed that consumers understood what the value of carbon footprint meant (e.g. if the value was high or low) and that consumers would pay sufficient visual attention to these labels in real time which, in turn, would affect their supermarket shopping behaviour. Perhaps Tesco thought that these labels would have the same influence on consumer behaviour as calorie and fat content labels did.

However, some academics were more cautious and 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 & 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 underlying attitude towards the environment.

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, as discussed in Chapter 1, and 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 & Williams, 1995), but they are less good at predicting spontaneous behaviour under time pressure (Friese, Wänke & Plessner, 2006; Beattie, 2010; Beattie & Sale, 2011), or when consumers are under any sort of cognitive or emotional load (Gibson 2008; Hofman, Rauch & Gawronski, 2007). Unfortunately, time pressure, cognitive load (see Block & Morwitz, 1999), and the absence of any opportunity to deliberate, characterises much of everyday supermarket shopping (Beattie & 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 & Banaji, 1995, p.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, p.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 measure implicit attitudes to the environment, or to more specific phenomena such as low carbon products, using measurement techniques like the implicit association test (IAT). The IAT is now widely used in some domains in psychology, as discussed in the introduction. 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 1/5$^{th}$ second in supermarkets (Gelperowic & 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 & 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 frequently mentioned by the CEO of Tesco himself when Tesco launched its own carbon labelling scheme. Tesco had found, by analysing its own club-card data that sales of low fat meals increased when GDA was introduced whilst sales of high fat meals decreased. This all occurred in a short time frame. Beattie (2012) pointed out that 'sales of their [Tesco's] 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%' (p. 214). 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' (Henderson & Ferreira, 2004, p.18), which provides accurate data on the allocation of attention (see Beattie et al., 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.

Beattie reviewed the evidence on this and concluded in the following terms: '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"' (Beattie, 2012, p. 215).

Nevertheless, the plan then was for Tesco to include carbon footprint labels on each of its 70,000 own brand products. Other major multinationals were to follow suit.

However, in a controlled eye-tracking experiment (Beattie et al., 2010), as outlined in the introduction, 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. The first analyses focused on 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). It was found 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 2.1.

Figure 2.1: An example of one participant’s gaze at the carbon footprint label on the low energy light bulb *(from Beattie, 2010).*

In the case of the orange juice they looked at the carbon footprint for 10.0% of the total time. In the case of the detergent they spent 3.3%

of the total time focusing on the carbon footprint. 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 information 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 focussing 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 have represented, as Beattie (2012) pointed out 'an over-estimation of attention in situ because the images presented on the computer screen for participants to view 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)' (p. 215).

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 & 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). However, this preliminary eye-tracking experiment, 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 et al., 2010) clearly requires careful consideration. Perhaps, the most striking result in this study was the 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). However, 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 and buying them regardless). Alternatively, 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? On the other hand, did the physical features of the product labels, including simple things like the relative size of the different categories of information represented affect the results? Moreover, 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 experiment detailed in this chapter was an attempt to test experimentally some of these basic alternate hypotheses. The salience of carbon footprint information was investigated by controlling the physical size of information labels for all 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), 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. As previously outlined, research by 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 results revealed that those with a strong positive implicit attitudes to carbon footprint were 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. It was 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 200 ms 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 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 and one that offers some hope to the lobby that says we could change consumer behaviour by providing carbon footprint information to consumers.

But should it really be expected that this attentional focus occurs with carbon labels? This is not necessarily an easy question to answer at the present time. One could argue 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. However, one could also argue that we are now very familiar with iconic images of climate change, indeed one such iconic image, depicting the stranded polar bear on the melting ice floe, is an immediate and recognizable signifier of climate change. 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 2.2. They changed the colour of their cans from red to white, added an image of polar bears, and then launched 1.4 billion of these special edition cans onto the market.


Figure 2.2: 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 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. In addition, consumers believed that 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 & 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 unlikeliness 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.

The hypotheses for this study are detailed below:

H1: Implicit attitudes will predict visual attention to carbon footprint labels, in that those participants with a strong positive implicit attitude to carbon footprint will attend to carbon labels with greater immediacy and for longer periods of time than those with a weaker implicit attitude.

H2: Those participants with a strong positive implicit attitude will be more likely to fixate first on the carbon footprint label than those with weaker implicit attitudes.

H3: Given the current lack of detailed knowledge about specific carbon footprint values amongst the public, different values of the individual carbon footprint labels (without any colour coding to distinguish 'high' and 'low' values) are unlikely to influence overall gaze fixation on carbon labels, or first fixation on carbon labels, of the participants.

H4: Explicit attitude will not predict visual attention to carbon labels, including both overall gaze fixation or first fixation to carbon footprint labels.

## 2.2. Method

This was part of a larger market research project (sponsored by Tesco) into visual attention to product labels. It was also originally conceived of as potentially part of a broader ethnographic consideration of visual attention to product labels in actual supermarket shopping.

Four different non-branded packages were created for muesli, cake mix, ice lollies and detergent (see Figures 2.3 – 2.6). On each slide – there were 6 features: product name, product image, carbon footprint (icon plus text ‘working with the carbon trust’, and carbon value e.g. 0.6g $CO_2$), price, energy value (calories, number of washes) and bar code. The product image and the product name were in colour, the product information labels were in black and white.


Figure 2.3: The stimulus used for the muesli product.


Figure 2.4: The stimulus used for the washing powder product.

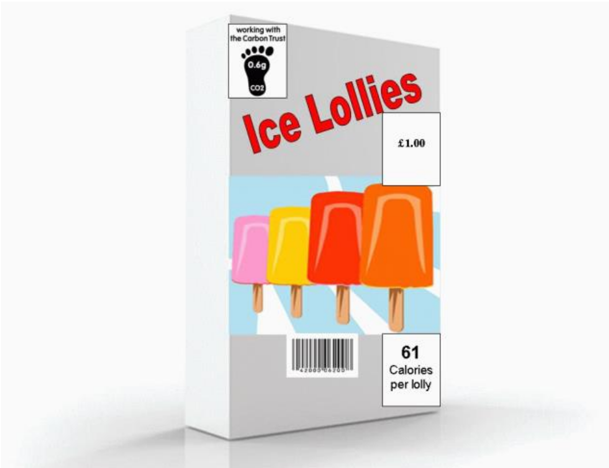



Figure 2.5: The stimulus used for the ice lollies product.


Figure 2.6: 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 2.7). 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.

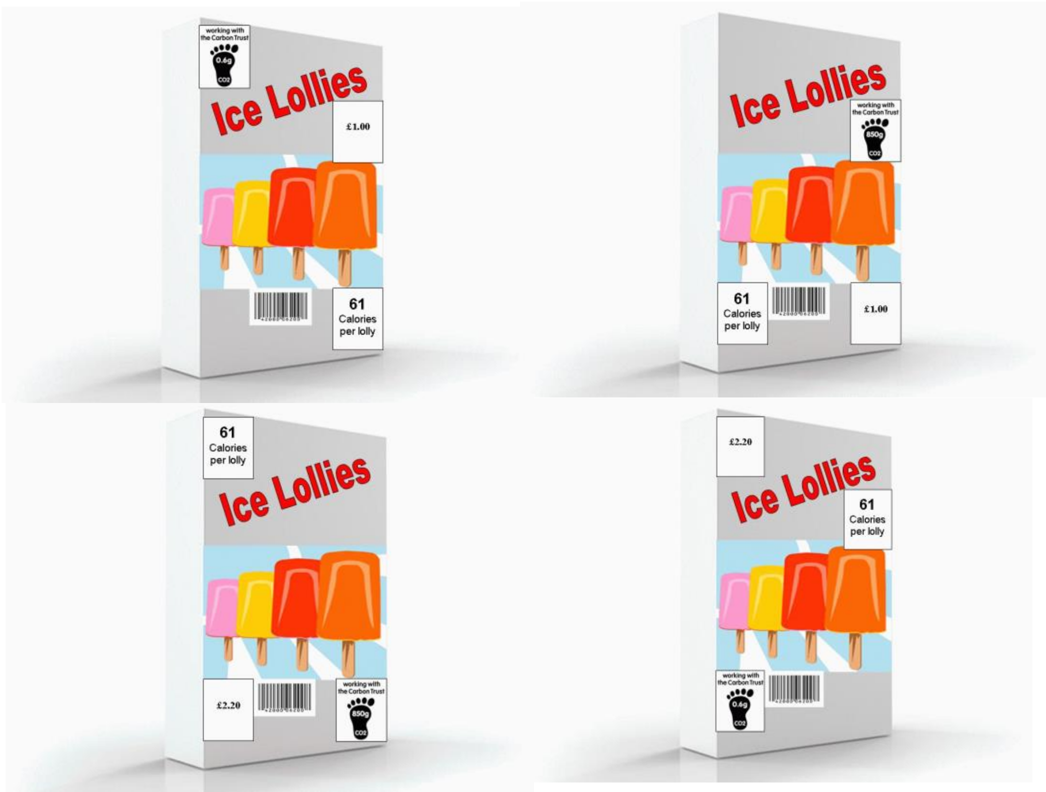
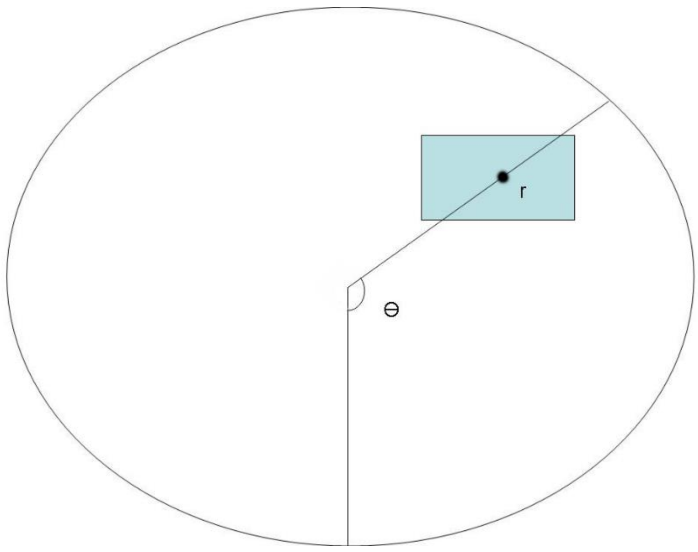



Figure 2.7: How CF, energy and price labels were rotated on one product.

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:




Ɵ = 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 2.8: 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 Kahneman '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' (1973, p.52). There were 22 participants in total; all were university undergraduates paid £5 for their participation.

### *2.2.1. 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 in order to enable observation of the positioning of camera observing the eye. From a separate computer, the illumination of the infra-red camera and the 'pan/tilt' of the camera in the eye tracker was adjusted 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 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 during the calibration process 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.

### *2.2.2. 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 participant was looking. There were 22 participants (16 slides x 10 seconds x 25 frames per second) generating 88,000 individual data points individually coded and analysed. Each frame was scored as having gaze focus on carbon footprint/price/energy/product image/other. See Figure 2.9.

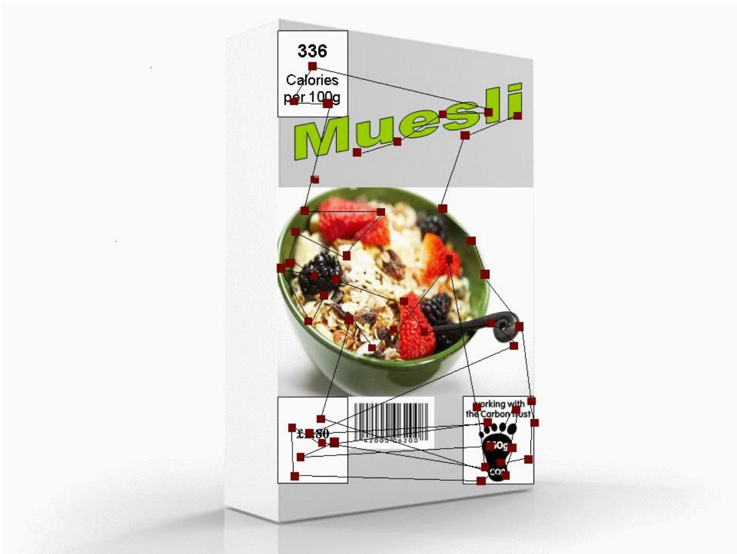



Figure 2.9: The pattern of gaze at one stimulus slide (every 10th frame is represented here).

### *2.2.3. Attitudinal measurements*

Participants completed two computerised self-report attitudinal measures (a Likert scale and a Feeling Thermometer) after the eye-tracking was complete (see Figures 2.10 and 2.11). 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 2.10: A computerised version of the Likert scale for measuring attitudes to carbon footprint.


Figure 2.11: A computerised version of the Feeling Thermometer scale for measuring attitudes towards high and low carbon footprint products.

### *2.2.4. 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-hand and right-hand corners of the screen. In this version of the IAT images were used to represent the high carbon and low carbon exemplars as research has suggested that images can be evaluated quicker than words (De Houwer & Hermans, 1994; Giner-Sorolla, García & Bargh, 1999; Hermans, De Houwer & Ellen, 1994). 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 blocks where Blocks 1, 2 and 5 were practice blocks and Blocks 3, 4, 6 and 7 were the critical blocks 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 and making fewer errors) and harder to sort exemplars if the paired target categories are not associated (therefore responding slower and making 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 2.12 – 2.18. This is an example of what the participants actually saw on the computer screen in the IAT:

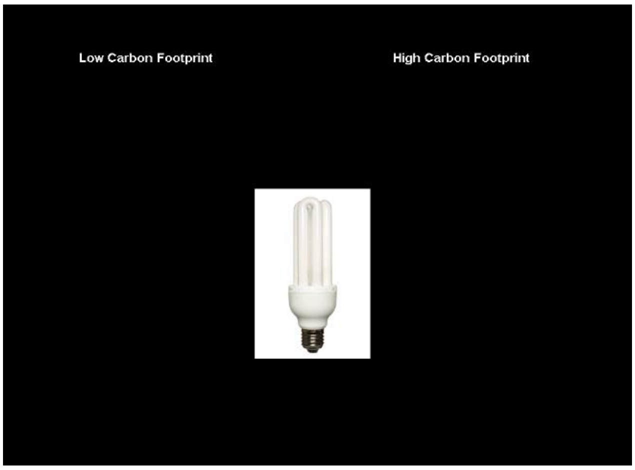



Figure 2.12: 1st block: Low vs. High Carbon Footprint.

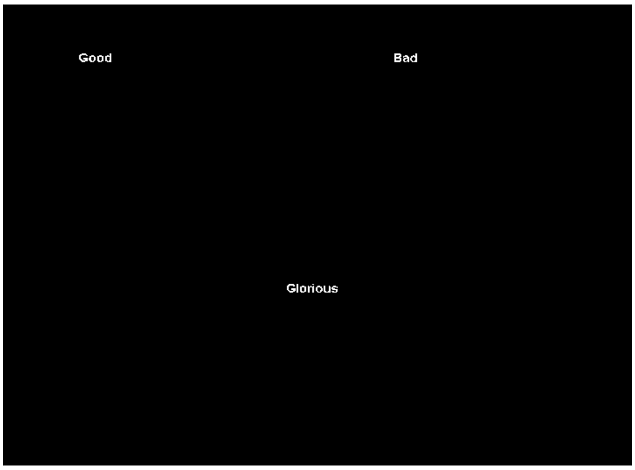
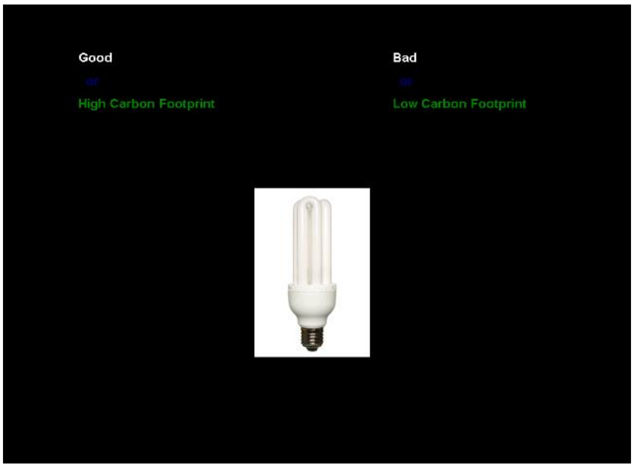



Figure 2.13: 2nd block: Good vs. Bad.



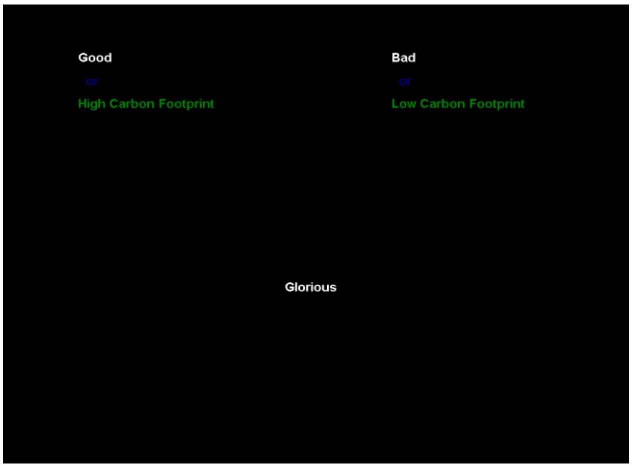




Figure 2.14 and 2.15: 3rd and 4th block: Good or High Carbon Footprint vs. Bad or Low Carbon Footprint.

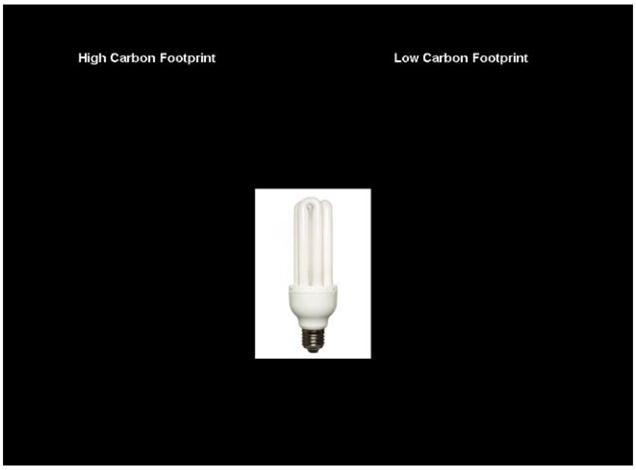
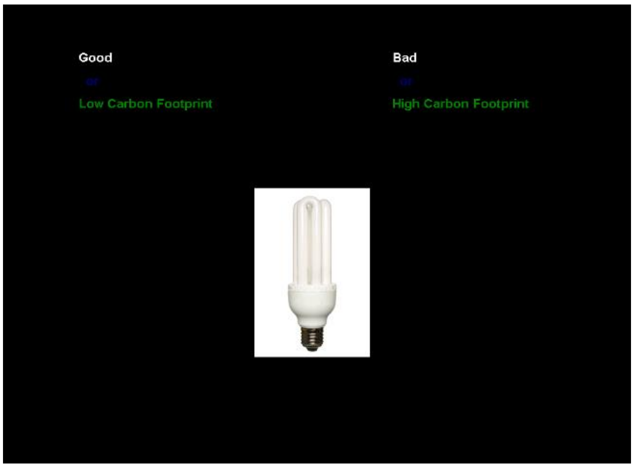



Figure 2.16: 5th block: High vs. Low Carbon Footprint.



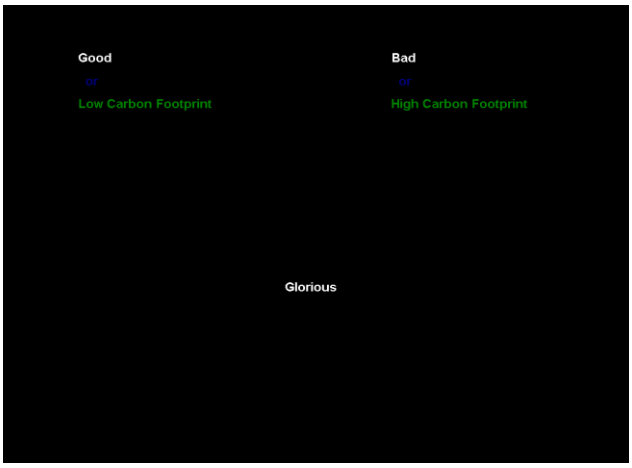



Figure 2.17 and 2.18: 6th and 7th block: Good or Low Carbon Footprint vs. Bad or High Carbon Footprint.

IAT D scores were computed by following the following scoring algorithm (see Greenwald, Nosek & Banaji, 2003):

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 Block 3, Block 4, Block 6 and Block 7.
4. Calculate the standard deviation for Blocks 3 and 6 (combined) and Blocks 4 and 7 (combined).
5. Calculate the difference score for Blocks 3 and 6 and the difference scores for Blocks 4 and 7.

6. Divide the two difference means by the associated pooled standard deviations.

6. Average the two resulting 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) see Figure 2.19 below for an interpretation of the D scores from the carbon footprint IAT.

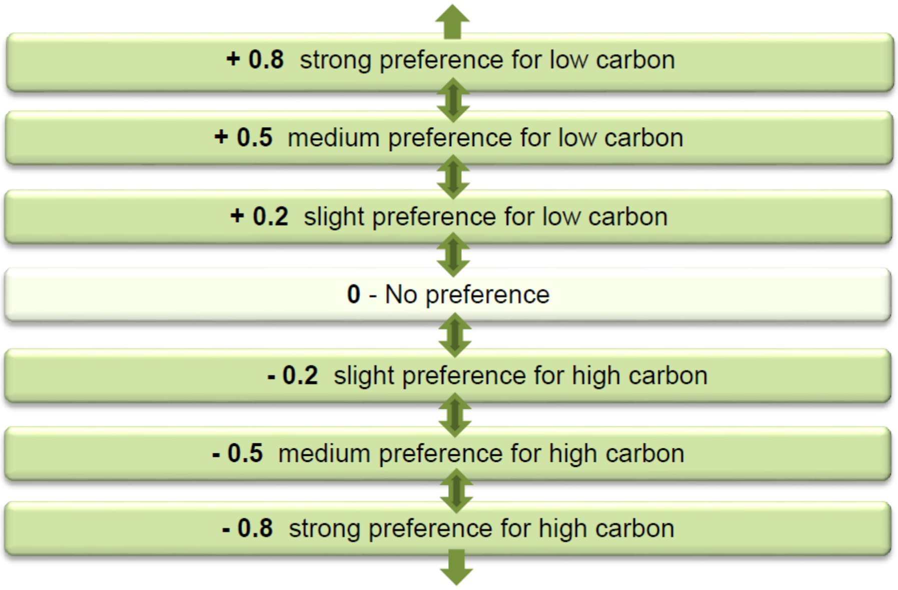



Figure 2.19: Interpretation of D scores from the carbon footprint IAT.

## 2.3. Results[2]

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 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 Figure. 2.20.

[2] The small number of participants in this study (22), intensively studied, meant that the distribution of data failed to reach conditions of normality, hence nonparametric statistics were employed.

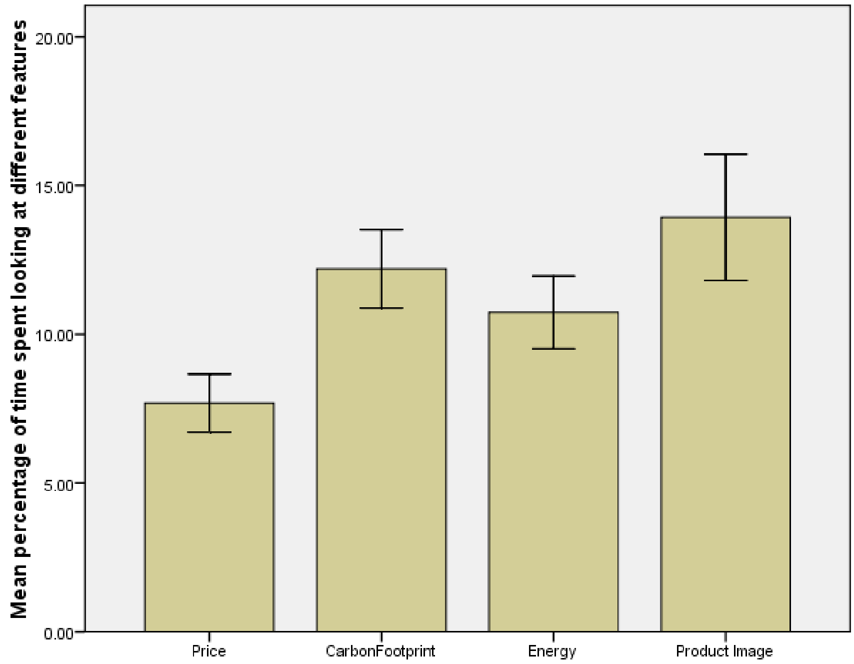



Figure 2.20: Mean percentage of time spent looking at different features of products.

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 2.21.

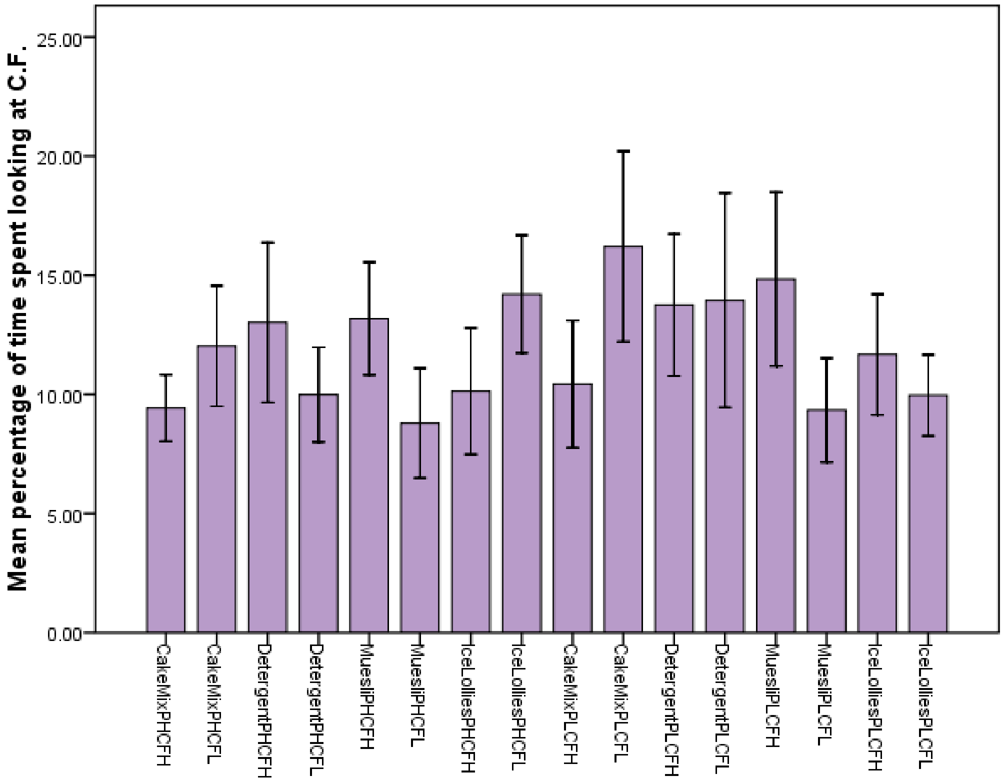



Figure 2.21: Mean percentage of time spent looking at carbon footprint with different products of different prices with error bars.

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 Thermometer Difference 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).

The next analysis considered the relationship between explicit attitudes and the proportion of time spent looking at carbon footprint information on each slide. The analyses was carried out by comparing those with a strong positive explicit attitude (operationally defined as 4 or 5 on the Likert scale) with those with a 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 2.1. 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 2.1: 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 Price – High | 13.8 | 11.6 | 49½ |
| Detergent CF – High Price – Low | 14.1 | 13.1 | 50 |
| Detergent | 8.9 | 11.8 | 47 |

| | | | |
|---|---|---|---|
| CF – Low<br>Price – High | | | |
| Detergent<br>CF – Low<br>Price - Low | 18.9 | 6.6 | 47 |
| Cake mix<br>CF – High<br>Price - High | 8.0 | 11.9 | 39 |
| Cake mix<br>CF – High<br>Price - Low | 10.9 | 9.5 | 43 |
| Cake mix<br>CF – Low<br>Price - High | 11.9 | 12.2 | 52 |
| Cake mix<br>CF – Low<br>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. A strong positive implicit attitude was operationally defined 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 2.2).

Table 2.2: 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 |

It was also found that there was no significant correlation between 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 2.3. 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 2.3: Mean percentage of time spent looking at CF information for each of the 4 products (and the 4 combinations of each product).

| Product | Price and Carbon Footprint information combination | High D score (above the median) | Low D score (below the median) |
|---|---|---|---|
| Cake mix | Price-High/CF-High | 9.0 | 9.8 |
| | Price-High/CF-Low | 9.2 | 14.9 |
| | Price-Low/CF-High | 9.2 | 11.7 |
| | Price-Low/CF-Low | 11.2 | 21.2 |
| Muesli | Price-High/CF-High | 11.3 | 15.0 |
| | Price-High/CF-Low | 14.5 | 3.1 |
| | Price-Low/CF-High | 19.8 | 9.9 |
| | Price-Low/CF-Low | 10.2 | 8.4 |
| Detergent | Price-High/CF-High | 8.4 | 17.7 |
| | Price-High/CF-Low | 9.9 | 10.1 |
| | Price-Low/CF-High | 16.6 | 11.0 |
| | Price-Low/CF-Low | 11.0 | 17.9 |
| Ice lollies | Price-High/CF-High | 11.2 | 12.2 |
| | Price-High/CF-Low | 10.9 | 9.1 |
| | Price-Low/CF-High | 9.0 | 9.8 |
| | Price-Low/CF-Low | 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. However, this does not mean that there might not be some more subtle differences in patterns of attention between the two groups. For example, in the Beattie and McGuire (2012) 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 experiment is - what is the relationship between attitudinal measures and early attentional focus on carbon footprint information? Before attempting to answer this, it is important to 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 the main focus of the analysis was on 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 of interest 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 question was - how many individual 40 ms gaze points occurred before this first fixation was achieved? Table 2.4 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 15.5 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 2.4: The first fixation of one individual with a strong positive implicit attitude.

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

Table 2.5 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). The '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 2.5.

Table 2.5: 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<br>CF-low Price-low | 39 | Price |
| Cake mix<br>CF-high Price-high | 9 | Price |
| Ice lollies<br>CF-low Price-low | 19 | Energy |
| Washing powder<br>CF-high Price-low | 10 | Price |
| Muesli<br>CF-high Price-high | 20 | Energy |
| Ice lollies<br>CF-high Price-high | 14 | Energy |
| Ice lollies<br>CF-low Price-high | 7 | Carbon Footprint |
| Cake mix<br>CF-high Price-low | 5 | Energy |
| Washing powder<br>CF-low Price-high | 9 | Price |
| Cake mix<br>CF-low Price-high | 32 | Carbon Footprint |
| Muesli<br>CF-low Price-low | 12 | Carbon Footprint |
| Muesli<br>CF-low Price-high | 10 | Carbon Footprint |
| Muesli<br>CF-high Price-low | 5 | Energy |
| Washing powder<br>CF-low Price-high | 14 | Energy |
| Washing powder<br>CF-high Price-high | 17 | Price |
| Ice lollies<br>CF-high Price-low | 12 | Energy |

Following on, a statistical analysis was carried out 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 the 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 2.6: 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.

## 2.4. 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. However, 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 the measure of implicit attitude. But very importantly there was a significant statistical association between the 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 to 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, as mentioned in Chapter 1 of this thesis, there is evidence that measures of implicit attitude, but not measures of explicit attitude, predict patterns of unconscious eye movements (see also Beattie & 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, p.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’ (2012, p.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 et al., 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. Nevertheless, given the global significance of this topic and the potential importance of the conclusion, 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. 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 this chapter was whether implicit attitudes predict unconscious visual attention to carbon footprint information on products. This study offers the briefest glimmer of hope in that our implicit attitude to an environmental feature does seem to predict first fixation on carbon labels on products. However, 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 of our trust in consumers and their spending habits, and their desire, either conscious or unconscious, to change these habits[3].

[3] This study was begun at the interdisciplinary Sustainable Consumption Institute (SCI) at the University of Manchester as part of the Flagship Programme ‘Sustainable Consumer Behaviour and Lifestyles’.  The SCI was funded by Tesco and this research was part of a project into visual attention to product labels. It was considered as market research and did not go through separate psychology departmental ethics committee scrutiny.

# Chapter 3: An experimental investigation of the relationship between self-reported attitudes to carbon and actual low carbon behaviour

## 3.1. Introduction

As already discussed, the evidence is now extremely clear that our climate is changing. According to the Intergovernmental Panel on Climate Change (IPCC), global warming is 'unequivocal' and 'unprecedented' (IPCC, 2014). More people globally are witnessing the devastating effects of climate change first-hand, with increased adverse weather conditions such as more frequent flooding, stronger hurricanes, longer heat waves, more tsunamis and periods of drought (IPCC, 2015; UK Climate Change Risk Assessment, 2016). The World Health Organisation (WHO, 2017) warns that with temperatures rising and the increase in rainfall we need to be prepared for more illnesses resulting from climate change, including mosquito borne infections like malaria, dengue and the Zika virus. The WHO report that 'Climate change already claims tens of thousands of lives a year from diseases, heat and extreme weather', and they say that it is 'the greatest threat to global health in the 21st century'. Indeed, the Global Risk Perception Survey (from the World Economic Forum) identified climate change as *the* top global risk facing humanity, a greater risk than weapons of mass destruction and severe water shortages (Global Risk Report, 2016).

Psychology has a major role to play here because people are the most significant contributor to climate change through energy use, population growth, land use and patterns of consumption (IPCC, 2014; 2015). Currently, $CO_2$ emissions from human activity are at their highest ever level and continue to rise. Global $CO_2$ emissions in 2011 were reported as being '150 times higher than they were in 1850' (World Resource Institute, 2014; see also IPCC, 2014; 2015). Although we cannot undo the damage already done with regards to climate change (Clark et al., 2016; Sadler-Smith, 2015; Sunstein, 2015) we do have the power to adapt our behaviour to ameliorate any future effects (Hayles & Dean, 2015).

There have been a number of government policies to encourage the reduction of $CO_2$ emissions in both domestic households and in the workplace with a target of an 80% reduction by 2050 (see GOV.co.uk, 2015; Department of Energy and Climate Change, 2016; Defra, 2016). There have also been campaigns (reviewed in the introduction) from a variety of organisations aimed at promoting awareness, and encouraging a more sustainable lifestyle, amongst the general public. These campaigns have used a variety of media, including television commercials (Act On $CO_2$), magazine advertisements (sponsored by the WWF) and social media (The Climate Coalition). But with groceries accounting for, on average, one third of household $CO_2$ emissions (Sharp & Wheeler, 2013; Moser, 2015; Fisher et al., 2013) it would seem important to persuade consumers to opt for low carbon alternatives in everyday purchases. Carbon labelling, which is the practice of communicating the greenhouse gas emissions associated with the life cycle of a product or service, was one major initiative designed to help in this regard. The idea behind the initiative was to inform consumers of the environmental impact of the products that they purchase through a simple labelling scheme, thus enabling them to reduce the $CO_2$ emissions of their household by making simple and relatively small changes to their lifestyle.

In 2006, the Carbon Trust introduced the 'Carbon Reduction' label scheme to show that the carbon emissions of a particular product had been measured and that the manufacturers using these labels were committed to reducing carbon emissions. These labels were used on many food items in the U.K. including Kingsmill bread, Walkers crisps and Quaker Oats and also on domestic appliances such as Dyson cleaners. The Carbon Trust explicitly stated that 'It is consumption activity and consumer behaviour that drives carbon emissions on a wider scale. In order to meet the long-term emission reduction targets it will be necessary to change cultural patterns of consumption and the way in which products and services are produced for the final consumer' (see Vision 21, 2008).

These labels are assessed every two years and if the manufacturers of these particular products do not successfully reduce the carbon footprint of the item, then they no longer have the right to use the label. The carbon reduction label has also been used internationally. Aldi was the first retailer in Australia to introduce a carbon footprint reduction label on their 'Everyday Olive Oil' range. The Carbon footprint reduction labels also became popular in Japan, Korea and France and are now used in over 26 countries worldwide (Carbon Trust, 2011).

Subsequently, in 2007, the Carbon Trust teamed up with the multinational retailer Tesco and developed the 'Carbon Measured' label. The Carbon Measured label provided consumers with an accurate measure of $CO_2$ emissions of the lifecycle of selected products, thus enabling consumers to make more informed choices in terms of exact environmental impact. The carbon footprint label included a symbol of a black footprint in which the carbon value of the particular item was embedded. For example, in the case of the Tesco lightbulb there was an image of a black footprint with '30kg $CO_2$' embedded in white lettering on the footprint, below the footprint were the words 'per 1000hrs per bulb', and above the footprint the text read 'Working with the Carbon Trust' in bold lettering. Alongside the footprint was an information box detailing what had actually been calculated. So in this case, the information box read 'The carbon footprint of this product is 30kg per bulb per 1000 hours of use and we have committed to reduce the footprint of future equivalent lightbulbs'. The label also informed the customer that 'The electricity used to power the lightbulb makes up 98% of the footprint. You can reduce your carbon footprint by switching off the lightbulb when you don't require lighting'.

Tesco began measuring the carbon footprint of a number of its other own store-branded products, including orange juice, detergent, toilet roll and energy saving lightbulbs with the intention to include carbon labels on all of its 70,000 own brand products within a few years. The then CEO of Tesco, Sir Terry Leahy, stated that we needed a mass movement in green consumption and pledged that Tesco would be 'a leader in helping to create a low-carbon economy'. Leahy was optimistic about the possible impact of carbon labelling, saying that this could be the start of 'a green revolution'. On the basis of existing market research, which had measured consumer attitudes to consumption and climate change, he was confident that the public were ready for this green revolution and willing to adapt their behaviour accordingly 'with the right information'.

The background market research on consumer attitudes seemed unambiguous, as we have seen in the Downing and Ballantyne report (2007). Forum for the Future reported that 85% of people *reported* that they wanted more information about the associated environmental impacts of their purchases (Berry, Crossley & Jewell, 2008). Leahy concluded from this that ‘Customers want to do more in the fight against climate change if only we can make it easier and more affordable’. This view was shared with the Department for Environment, Food and Rural Affairs (Defra) in the U.K. who asserted that ‘Many people are willing to do more to limit their environmental impact, they have a much lower level of understanding about what they can do and what would make a difference’ (2008, p.28).

However, not all researchers were so optimistic. Upham, Dendla and Bleda (2011) used focus groups to gain more insight into consumers’ understanding of carbon labels. They found that that there was little understanding of the values on the carbon labels. Some consumers wanted a recommended daily allowance for carbon (Upham et al., 2011, p.5; see also Beattie, 2012). Gadema and Oglethorpe (2011) asked 428 participants if they thought that it would be an advantage to have carbon footprint information labels on products. Whilst 72% of respondents reported that the labels would be useful, 81% of respondents found that such labels were difficult to understand and that the comparison of carbon footprint values across the various products was confusing. Significantly, participants in this particular study ranked carbon footprint information

13th on the list of important attributes of a product (out of a total of 14). Hartikainen et al. (2014) also found that although 90% of their respondents reported that a carbon label would influence their purchasing decisions, they would prioritize price and taste before they even considered the actual carbon footprint information.

But it was not just that consumers did not understand carbon labels or prioritise the information, it was also found that consumers paid little visual attention to them. As already discussed, Beattie et al. (2010) found that in an experimental setting where participants viewed images of products, the carbon label was the focus of the first visual fixation of participants in only 7% of cases suggesting that the carbon label was not of immediate concern to most participants (see also Beattie, 2012). It was also found that participants showed little visual attention overall to the carbon label in the first five seconds which is a critical finding considering that this is close to the average time taken to make a selection in a supermarket (See Louw & Kimber, 2007; Young, 2004).

However, there is another potentially even more serious issue here, as discussed in the introduction. The assumption guiding government agencies (including Defra in the U.K.) and multi-nationals like Tesco are that self-report measures of attitudes are good predictors of actual consumer *behaviour*. But is this really the case? At first sight, there does appear to be a significant relationship between attitudes and behaviour in the environmentally-relevant consumption domain. For example, Schlegelmilch, Bohlen and Diamantopoulos (1996) report that 'attitudes are the most consistent predictor of pro-environmental purchasing behaviour' (p. 51). Honkanen, Verplanken and Olsen (2006) report 'a significant relation between attitude and intention to consume organic food' (p. 426). Dahm, Samonte and Shows (2009) report that 'attitudes were significant predictors of consumption behaviors and practices…Positive attitudes toward organic foods and other environmentally friendly practices significantly predicted similar behaviors' (p. 195). Barber, Taylor and Strick (2009) reported 'a strong and significant relationship between attitude and willingness to purchase environmentally friendly wine' (p. 69). But in none of these studies was *actual* behaviour examined, rather the focus was on self-reports of behaviour, or reported intentions, or willingness to consume environmentally friendly products. Baumeister, Vohs and Funder (2007) have commented that although psychology may call itself the science of *behaviour* 'some psychological sub-disciplines have never directly studied behaviour' (2007, p.396). They also noted that 'a remarkable amount of the 'behaviour' studies turn out to be really just responses on a self-report questionnaire. Sometimes these questionnaires ask people to report what they have done, will do, or would do. More often, they ask people to report what they think, how they feel, or why they do what they do' (2007, p.397). When it comes to issues regarding the environment and climate change, any such responses may well be overshadowed by social desirability and reporting biases.

When actual consumer behaviour is studied, the relationship with self-reports of behaviour is often much less clear. For example, Tsakiridou, Boutsouki, Zotos and Mattas (2008) explored the relationship between attitudes and behaviours towards organic products. The researchers developed a 23-item questionnaire where respondents were required to report their personal consumption of organic products using a Likert scale. They found that 50% of participants reported that they preferred to buy organic products as opposed to conventional products. However, this was contradicted by actual consumption data, in that only a small proportion of those who expressed a positive attitude towards organic products actually purchased organic products. Corral-Verdugo (1997) randomly selected 100 families in Mexico who completed a series of self-report questionnaires to report their attitudes to 're-use and recycling' and to report their recycling behaviour. Participants were required to report the amount of glass, aluminium, newspapers, etc. they reused and recycled. These reports of behaviour were then compared with direct observations of reuse or recycled items of the household. The researchers found that 'beliefs (assessed verbally) only predicted the self-reported conservation, while competencies (assessed nonverbally) were only related to observed behavior' (1997, p. 135). Similarly Fielding et al. (2016) measured self-reported household recycling, self-reported water conservation behaviour as well as *actual* recycling and *actual* water use. Their results showed a 'weak relationship between self-reported household recycling and objective measure of recycling'. They also found a 'weak relationship between self-reported water conservation behaviour and objective household water use' (2016, p.90).

Kormos and Gifford (2014) performed a meta-analysis of the validity of self-report measures of pro-environmental behaviour and concluded that 'self-reports are only weakly associated with actual behaviour' (2014, p. 360). They identify some of the factors responsible for this weak relationship including the fact that 'self-report measures may be prone to exaggeration' and that because self-report measures are 'subjective by nature; descriptors such as "*Often,*" may mean different things to different participants' (2014, p. 360). In addition to this, self-reports of behaviour may 'reflect individuals' perceptions of their behaviour (Olsen, 1981), behavioural intentions (Lee, 1993), or other – sometimes false – beliefs and attitudes (Rathje, 1989), rather than objective behaviour' (2014, p. 360). They also say that 'limited memory or knowledge may also reduce the accuracy of self-reports (e.g. see Warriner, Gordon, McDougal & Claxon, 1984)' (2014, p. 360).

One alternative approach to this issue of the potentially weak relationship between self-report measures of attitudes and actual behaviour is to measure 'implicit' attitudes, where reporting biases may not be so prevalent. These implicit attitudes are underlying evaluations, which appear to be fast and automatic (Kahneman, 2011), often operating below the level of conscious awareness and therefore less amenable to change (Beattie, 2010; Greenwald & Banaji, 1995; Wilson, Lindsey & Schooler, 2000). Greenwald, McGhee and Schwartz (1998) have defined implicit attitudes as 'actions or judgments that are under the control of automatically activated evaluation, without the performer's awareness of that causation' (p. 1464). Research has shown that in *some* domains implicit attitudes (measured using associative tasks like the IAT) and explicit attitudes, measured using self-reports show little or no correlation. This is especially the case in the environmental domain (Beattie, 2010; Beattie & Sale, 2009; 2011; Brunel, Tietje & Greenwald, 2004; Friese, Wänke & Plessner, 2006; Hofmann, Gschwender, Nosek & Schmitt, 2005) and other 'sensitive' domains like race (Beattie, 2013; Beattie, Cohen & McGuire, 2013). The IAT has been acknowledged as a reliable and valid measure of implicit attitudes towards given target concepts with a test-retest reliability of 0.60 (Greenwald et al., 2002) and a consistency measure with a Cronbach's alpha > 0.08 (see Friese et al., 2006; but see Blanton et al., 2009). The basic premise behind the IAT is that when categorising items into two sets of paired concepts, if the paired concepts are strongly associated, then participants should be able to categorise the items faster into these sets (and with fewer errors) than if they are not strongly associated.

A number of studies have examined whether implicit attitudes predict behaviour in the environmental domain (often in direct comparison to explicit attitudes). But again, there has been a bias to use self-reports of behaviour rather than actual behaviour with potentially misleading conclusions (see, for example, Friese, Wänke & Plessner, 2006; Levine & Strube, 2012). Perhaps typical is Vantomme, Guens, DeHouwer and DePelsmacker (2006) who reported that 'the IAT effects for buyers and non-buyers of fair trade products were significantly different' and also that 'the logistic regression analysis demonstrated that IAT effects partially predicted ethical consumer behaviour even when the influence of the explicit measure was controlled for' (p. 702). But the experimenters did not analyse actual consumer choice, they based their conclusions on people reporting their behaviour.

However, some studies have measured implicit attitudes and actual behaviour, although the behaviour in questions is often somewhat incidental like the choice of a goody bag at the end of the study (Beattie & Sale, 2011) or the choice of a plastic carrier bag (Geng et al., 2015).

Geng et al. (2015), for example, measured students' connectedness to nature using a 14-item 'Connectedness to Nature' Scale (CNS) – an explicit measure designed to measure participants' emotional and cognitive connectedness to nature. They also used an IAT to measure implicit attitudes to natural and built environments. As well as this, participants completed a 'College Students' Environmental Behaviours Questionnaire' which required students to *report* their behaviours to seven different domains including energy conservation, waste avoidance, recycling and purchasing behaviour. Participants also completed a simulation task whereby they chose four packs of wafers at the end of the task. Each participant was then asked if they needed a free plastic bag. Geng et al. (2015) found that reported CNS measures correlated with reported environmental behaviours and implicit measures correlated with spontaneous environmental behaviours. However, 'spontaneous environmental behaviours' were solely based on those who chose or did not choose a carrier bag at the end of the study. Similarly, Beattie and Sale (2011) reported that only implicit attitude, under time pressure, predicted behavioural choice, namely the selection of a low carbon goody bag.

Given the importance of consumer behaviour to climate change, we clearly need to understand more fully the relationship between both self-reported and implicit attitudes of consumers to environmental features of products such as carbon footprint, and self-reports of behaviour versus actual behavioural choices. Given the emphasis in both governmental and commercial circles on carbon labelling, it is important to evaluate its potential effectiveness in guiding behavioural choice.

The aim of the present study is thus to investigate experimentally the relationships between explicit and implicit attitudes to carbon footprint, reported environmental and carbon behaviour, and actual product choice in an experimental setting. By studying consumer choice in an experimental situation, we are able to carefully control for a range of variables that could affect the selection of certain everyday products, including brand, price and carbon footprint in a simulated 'shopping' task. We can also consider the impact of variables such as time pressure on product selection. Following Kahneman (2011), one prediction is that implicit attitudes should be more closely associated with behaviour under time pressured as responses become more automatic. The specific hypotheses are detailed below:

H1: Self-reported attitudes to the environment and to carbon footprint will be associated with self-reported environmental and carbon behaviour respectively.

H2: Self-reported attitudes to carbon footprint are unlikely to be associated with actual carbon behaviour.

H3: Implicit attitudes to carbon footprint are unlikely to be associated with self-reported carbon behaviour.

H4: Implicit attitudes to carbon footprint will be associated with actual carbon behaviour.

## 3.2 Method

### *3.2.1. Participants*

Fifty participants were recruited to take part in this experiment (19 male, 31 female). The mean age of participants was 27.7 ranging from 18 to 67. Participants included staff and students from Edge Hill University (n=34), and members of the public (n=16). Each participant received £5.00 for taking part in the experiment. Ethical approval was obtained from the Edge Hill University Research Ethics Committee (UREC). Participants were informed about the test procedure and told that they could withdraw at any point during the experiment and that their data could be removed from the study and destroyed at any point up to three weeks after they had taken part in the experiment (no participant asked for their data to be removed and destroyed). They were fully debriefed at the end of the study.

### *3.2.2. Self-reported environmental behaviour questionnaire*

Participants were asked to complete a self-report sustainability behaviour questionnaire. There were 30 items on this particular questionnaire - 10 items were designed to measure participants' reported pro-environmental behaviour with items such as 'I avoid using toxic detergents', 'I avoid using aerosols' and 'I buy organic products'. A further 20 questions were designed to measure participants' carbon efficient behaviour with items such as 'I buy high efficiency lightbulbs', 'I buy locally produced foods', and 'I turn the heat off in unused rooms'. Participants reported their behaviour on a scale of 'always' (5), 'often' (4), 'sometimes' (3), 'rarely' (2) or 'never' (1).

### *3.2.3. Attitudinal measures*

#### *Likert scale*

As in the previous chapter, a Likert scale was used to assess explicit preference towards high/low carbon footprint products. Participants were asked: 'Which statement best describes you?' They reported their answer on a 5-point scale (1 = 'I strongly prefer products with a high carbon footprint to a low carbon footprint'; 2 = 'I moderately prefer products with a high carbon footprint to a low carbon footprint'; 3 = 'I like products with a high carbon footprint and a low carbon footprint equally'; 4 = 'I moderately prefer products with a low carbon footprint to a high carbon footprint'; 5 = 'I strongly prefer products with a low carbon footprint to a high carbon footprint').

***Implicit measure***

The carbon Implicit Association Test (described in the previous chapter) was used to measure participants' implicit attitudes to carbon footprint (see section 2.2.4. for a detailed description of the carbon IAT and the algorithm used to calculate the D score).

## 3.3 Simulated shopping task

### *3.3.1. Stimuli*

Participants were asked to select products from a series of items displayed on flash cards. There were 10 items in total and each item was central to any regular weekly shop. The products were: breakfast cereal (bran flakes), bread, cheese, coffee, fabric conditioner, ice cream, orange juice, soup, toilet roll, and washing up liquid. The product images were modified photographs of actual products. The amount of information provided on each item varied from product to product but generally the most expensive products had more information and the value products had less information. Each product had 4 variations – luxury brand (the most expensive), well-known brand (e.g. Heinz, Hovis, Kellogg's), organic/Eco brand and value brand (the cheapest variety and usually the supermarket's own brand). So for example, in the case of ice cream the luxury brand was 'Carte D'Or', the well-known brand was 'Walls', the organic/Eco brand was 'Breyer's Organic', and the value brand was 'Sainsbury's Basic'. Although the original packaging was not altered in any way, the price of the item and the carbon footprint of the item were superimposed onto the front of the item. The price of the product was always the actual price, which was sourced from various supermarket websites. Prices were represented in white numbers on a black circular sticker and always placed in the same position on the four individual items within the set, but this varied from set to set. So for example, when it came to soup, the price sticker was always placed on the top left-hand hand corner, with cereal the price was always placed on the top right-hand corner. In terms of price across the brands, the luxury items were always the most expensive, followed by the organic/Eco, followed by popular-brand, followed by value.

In this study the carbon footprint was colour coded in green for low carbon and black for high carbon. The carbon footprint value was represented numerically and was clearly visible on the representative footprint. In order to assign a carbon footprint value to the products, the actual carbon footprint value of the particular product was sought (e.g. Branflakes = 80g). For scoring purposes this was regarded as 'H' and placed on a black footprint to represent a high carbon footprint value. This figure was then halved to generate a lower carbon footprint (in this case 40g and this was arbitrarily assigned, in the case of cereal, to the popular brand). For scoring purposes this was regarded as ‘L’ and the carbon value was placed on a green footprint to represent low carbon footprint. 10% was then subtracted from this value and arbitrarily assigned it to the value cereal brand. This was then regarded as ‘LL’ (representing the lowest carbon footprint value and placed it on a green footprint, again, representing low carbon footprint). Finally, 10% was added to the starting carbon footprint value and was arbitrarily assigned to the luxury cereal brand. This value was regarded as ‘HH’ and placed it on a black footprint to represent the highest carbon footprint value of this particular product set. The carbon footprint was assigned to products using the following criteria: each product had two high and two low carbon footprint labels, and each brand had five high and five low carbon labels. Once the price and carbon footprint was attached to each product image, they were then placed on a white background and laminated thus creating a series of flash cards.

## 3.4. Procedure

Participants entered the lab and were asked to complete a variety of tasks (the order of these tasks was randomised). They completed a self-report questionnaire about their carbon and environmental behaviours. They were also asked to complete a computerised Likert scale reporting their preference towards high and low carbon footprint items. In addition to the self-report measures, participants completed the carbon IAT. In order to assess participants' carbon choices, they also participated in a simulated shopping task. Forty laminated flash cards were laid out in ten rows, with each row having 4 alternatives. Each participant was asked to choose ten items (one from each row) under one of two conditions – time pressure and no time pressure. After each condition was complete, there was a two-minute break whilst the cards were reset. There were thus a total of 20 choices per participant. The order of the time pressure/no time pressure conditions was randomised across each participant to counteract any possible order effects. When participants were in the time pressure condition they were told to imagine that they were in a 'real hurry' and were told to choose an item as quickly as they could, whereas under no time pressure they were told that they had as much time as they needed to make the selection of an item. The average time spent choosing a product under time pressure was 2.7 seconds (with a range from 1.2 to 5.5 seconds) as opposed to 7.3 seconds (range from 2.0 to 27.8 seconds) under no time pressure. The time spent choosing under time pressure was significantly shorter (Wilcoxon Matched-Pairs Signed-Ranks Test, $T$=0, n=49, $p < 0.001$, 2-tailed test).

## 3.5. Results[4]

### *3.5.1. The relationship between self-reported attitudes and self-reported behaviours*

There were three categories of self-reported behaviour: reported carbon behaviour (with 20 items), reported environmental behaviour (with 10 items), and all reported sustainable behaviours (both categories together) with 30 items. A scale was produced for each of these categories by multiplying frequency of response by 'value' (where 'always'=5, 'often'=4, 'sometimes'=3, 'rarely'=2 and 'never' =1). For each participant, the score in each of these 3 categories could range between 20 and 100 for reported carbon behaviour, 10 and 50 for reported environmental behaviour and 30 and 150 for all reported sustainable behaviour. The actual ranges for each of these 3 categories were: 40 to 94 (carbon), 10 to 45 (environmental) and 50 to 136 (all sustainable behaviours). The overall mean for the Likert score was 3.6, which represents a slight explicit preference for low carbon. The data was dichotomised as follows: 4 = ('moderately prefer low carbon') or 5 ('strongly prefer low carbon') were categorised as having a positive explicit attitude towards low carbon (PEA), n=30. 1, 2, 3 on the Likert

[4] In this study there were 50 participants who self-reported their environmental behaviour (10 items) and carbon behaviour (20 items) as well as engaging in choice behaviour in a simulated shopping task with each participant making 20 choices (10 under time pressure and another 10 under no time pressure). There were 1,500 responses on the self-reported questionnaires and 1000 behavioural choices, yielding data with an essentially normal distribution, which meant that parametric statistics could be employed - including ANOVAs and t-tests.

were categorised as non-positive towards low carbon, in effect either neutral or preferring high carbon (NPEA), n=20. Reported behaviour was compared in each of the 3 categories with participants falling with the PEA or NPEA groups using a series of t tests. The analyses revealed that in each case the results were significant at the two-tailed level. For reported carbon behaviour: t=2.16 ($n_1$=30, $n_2$=20), $p < 0.05$. For reported environmental behaviour: t=2.53 ($n_1$=30, $n_2$=20), $p < 0.02$. For all reported sustainable behaviours: t=2.49 ($n_1$=30, $n_2$=20), $p < 0.02$). The means are displayed in Table 3.1. In other words, there does appear to be a significant relationship between self-reported attitudes and self-reported behaviours, and this is found not just with respect to the category of carbon behaviours, but seems to apply to other environmental behaviours and therefore sustainable behaviours more generally.

Table 3.1: Relationship between self-reported attitude to carbon footprint and self-reported carbon/environmental/sustainable behaviour (mean scores reported; high scores indicate more reported low carbon choices).

| | Carbon behaviour | Environmental behaviour | Sustainable behaviour |
|---|---|---|---|
| Positive explicit attitude towards low carbon | 70.37 | 30.27 | 100.64 |
| Non-positive explicit attitude towards low carbon | 62.10 | 24.95 | 87.05 |

### *3.5.2. The relationship between self-reported attitudes and actual choice behaviour*

In terms of behavioural choice, the number and nature of the carbon choices they actually made was tabulated for each participant. Then the frequency of choice was multiplied by value, as before, but here the 'value' is not reported frequency, but the carbon value of the particular product with one choice of an LL product scoring 4, one choice of an L product scoring 3, one choice of an H product scoring 2, one choice of an HH product scoring 1. This generated a score between 10 and 40 for each participant (as there were 10 choices) for each of the 2 conditions (time pressure and no time pressure). The next comparison focused on the actual choice behaviour of the PEA and NPEA groups using a two factor ANOVA (with factor 1: explicit attitude: high or low and factor 2: time pressure). The ANOVA revealed that there was no significant main effect for explicit attitude to low carbon on behaviour ($F$=3.31, d.f.=1, n.s.), no significant effect for time pressure ($F$=0.67, d.f.=1, n.s.) and no significant interaction effect between explicit attitude and time pressure ($F$=0.96, d.f.=1, n.s.). The means are displayed in Table 3.2 below.

Table 3.2: Relationship between self-reported attitude to carbon footprint and actual carbon behaviour, with or without time pressure (mean scores; high scores indicate more low carbon choices).

| | No time pressure | Time pressure | Overall mean |
|---|---|---|---|
| Positive explicit attitude towards low carbon | 27.33 | 26.17 | 26.70 |
| Non-positive explicit attitude towards low carbon | 25.35 | 25.60 | 25.48 |
| Overall mean | 26.48 | 25.94 | 26.21 |

Of course, there could be an argument that because carbon footprint was colour coded with green (covering both L and LL), and black (H and HH), that this may have minimised the effects of the variation within each of the two categories (H versus HH, for example). Therefore, it was imperative to analyse the data in terms of frequency of low (L or LL) versus high (H or HH) carbon choices in both conditions (TP versus no TP). The data is displayed in Table 3.3. It is worth noting that there were more low carbon choices overall than high carbon choices. There was also a tendency for people with a positive explicit attitude towards low carbon to select more low carbon items when not under time pressure. However, this fails to reach significance ($X^2 = 3.71$, d.f.=1, n.s.).

Table 3.3: Relationship between self-reported attitude to carbon footprint and number of low carbon and high carbon choices (no time pressure; high scores indicate more low carbon choices).

| | Number of low carbon choices | Number of high carbon choices |
|---|---|---|
| Positive explicit attitude towards low carbon | 185 | 115 |
| Non-positive explicit attitude towards low carbon | 106 | 94 |

The next analysis (Table 3.4) focused on behavioural choice under time pressure. Here it was found that those with a positive explicit attitude to low carbon were again more likely to choose low carbon products under time pressure, but this result was not significant ($X^2 = 0.05$, d.f.=1, n.s.).

Table 3.4: Relationship between self-reported attitude to carbon footprint and number of low carbon and high carbon choices (time pressure).

| | Number of low carbon choices | Number of high carbon choices |
|---|---|---|
| Positive explicit attitude towards low carbon | 168 | 132 |
| Non-positive explicit attitude towards low carbon | 110 | 90 |

In summary, self-reported attitudes to low carbon might be significantly associated with self-reported carbon/environmental/sustainable behaviour but it was not significantly associated with low carbon choices in the experimental paradigm.

### *3.5.3. The relationship between implicit attitudes and self-reported behaviours*

The analysis here mirrors that carried out for explicit attitudes. As before, attitudes (in this case implicit attitudes) were dichotomised with a positive implicit attitude towards low carbon operationalised as a D score of 0.8 and above (PIA), n=26; and a non-positive implicit attitude as anything less than 0.8 (NPIA), n=24. The behavioural self-report measures were dichotomised as before. The mean D score in this sample was 0.99, which represents a strong pro-low carbon preference (for the particular set of high and low carbon items represented in the IAT). The next comparison focused on the reported frequency of behaviour in each of the 3 categories with participants falling within the PIA or NPIA groups using a series of t tests. The analyses revealed that in each case the results were not significant at the two-tailed level. For reported carbon behaviour: $t=1.21$ ($n_1=26$, $n_2=24$), n.s. For reported environmental behaviour: $t=0.31$ ($n_1=26$, $n_2=24$), n.s. For all reported sustainable behaviours: $t=0.95$ ($n_1=26$, $n_2=24$), n.s. The means are displayed in Table 3.5. In other words, there does not appear to be a significant relationship between implicit attitudes and self-reported carbon/environmental/sustainable behaviours.

Table 3.5: Relationship between self-reported carbon/environmental/sustainable behaviours and implicit attitude to carbon footprint (mean scores).

| | Carbon behaviour | Environmental behaviour | Sustainable behaviour |
|---|---|---|---|
| Positive implicit attitude towards low carbon | 69.31 | 28.46 | 97.77 |
| Non-positive implicit attitude towards low carbon | 64.62 | 27.79 | 92.42 |

### *3.5.4. The relationship between implicit attitudes and actual choice behaviour*

The next comparison focused on the actual choice behaviour of the PIA and NPIA groups using a two factor ANOVA (factor 1 being implicit attitude: high or low; factor 2 being time pressure). The ANOVA revealed that there was no significant main effect for implicit attitude to carbon footprint on carbon choice ($F$=2.46, d.f.=1, n.s.), no significant effect for time pressure ($F$=0.66, d.f.=1, n.s.) and no significant interaction effect between implicit attitude and time pressure ($F$=0.03, d.f.=1, n.s.). The means are displayed in Table 3.6 below.

Table 3.6: Relationship between implicit attitude to carbon footprint and actual carbon behaviour, with or without time pressure (mean scores).

| | No time pressure | Time pressure | Overall mean |
|---|---|---|---|
| Positive implicit attitude towards low carbon | 26.92 | 26.50 | 26.71 |
| Non-positive implicit attitude towards low carbon | 26.00 | 25.33 | 25.67 |
| Overall mean | 26.48 | 25.94 | 26.21 |

The next analysis focused on the data in terms of frequency of low (L or LL) versus high (H or HH) carbon choices in both conditions (TP versus no TP). The data is displayed in Tables 3.7 and 3.8. There was a tendency for people with a positive implicit attitude towards low carbon to select more low carbon items, however, this fails to reach significance when either under no time pressure ($X^2$ = 0.96, d.f.=1, n.s.), or under time pressure ($X^2$ = 0.24, d.f.=1, n.s.).

Table 3.7: Relationship between implicit attitude to carbon footprint and number of low and high carbon choices (no time pressure).

| | Number of low carbon choices | Number of high carbon choices |
|---|---|---|
| Positive implicit attitude towards low carbon | 154 | 106 |
| Non-positive implicit attitude towards low carbon | 137 | 103 |

Table 3.8: Relationship between implicit attitude to carbon footprint and number of low and high carbon choices (time pressure).

| | Number of low carbon choices | Number of high carbon choices |
|---|---|---|
| Positive implicit attitude towards low carbon | 150 | 110 |
| Non-positive implicit attitude towards low carbon | 128 | 112 |

Finally, Tables 3.9 'a' and 'b' display the relationship between explicit and implicit scores and mean carbon choices. There have been arguments in the literature that when explicit and implicit attitudes are both positive towards an object, then together they have more predictive power (Maison, Greenwald & Bruin, 2004). Although the mean low carbon score is higher when explicit and implicit attitudes are both positive and lowest when both implicit and explicit attitudes are non-positive, none of the specific comparisons were significant. Self-reported attitudes to carbon might be significantly associated with self-reported sustainable behaviours, including carbon behaviours, but neither they, nor the measures of implicit attitude, were reliably associated with actual carbon behaviour in this simulated shopping task.

Table 3.9a and b: Overall means for actual carbon behaviour varying with explicit and implicit attitude under no time pressure (a), and under time pressure (b).

(a)

| | | IMPLICIT | |
|---|---|---|---|
| | | Non-positive | Positive |
| EXPLICIT | Non-positive | 25.1 | 25.5 |
| | Positive | 26.5 | 27.9 |

(b)

| | | IMPLICIT | |
|---|---|---|---|
| | | Non-positive | Positive |
| EXPLICIT | Non-positive | 24.7 | 26.4 |
| | Positive | 25.7 | 26.6 |

## 3.6. Discussion

This study has demonstrated that self-reported attitudes to carbon are significantly associated with self-reported carbon behaviours (e.g. 'I buy high efficiency lightbulbs', 'I buy locally produced foods', 'I turn the heat off in unused rooms' etc.), self-reported environmental behaviours (e.g. 'I avoid using toxic detergents', 'I avoid using aerosols', 'I buy organic products' etc.) as well as the generic category of sustainable behaviours (the two categories combined). This finding is in line with much of the published literature on this topic (Barber, Taylor & Strick, 2009; Corral-Verdugo, 1997; Honkanen et al., 2006; Schlegelmilch et al., 1996). There are many government agencies and NGO's who would see this as a very optimistic result in the battle against climate change. But, following the exhortations of Baumeister et al. (2007) and others this study attempted to move beyond self-reports of carbon behaviour to consider the carbon value of consumer choice in a simulated shopping task. Here it was found that positive pro-low carbon self-reported attitudes were not reliably associated with the actual choice of low carbon alternatives in the shopping task under either condition (time pressure or no time pressure). This contrast between self-reported environmental behaviour and actual behaviour is unfortunately also consonant with previous research. For example, Corral-Verdugo (1997) reported that 'beliefs (assessed verbally) only predicted the self-reported conservation, while competencies (assessed nonverbally) were only related to observed behavior' (1997, p. 135). Fielding et al. (2016) reported a 'weak, relationship between self-reported household recycling and objective measure of recycling' (2016, p.90). The findings are also in line with the conclusions of the meta-analysis of Kormos and Gifford (2014) which were that 'self-reports are only weakly associated with actual behaviour' (2014, p. 360).

The problem that we are faced with is that climate change requires urgent action not mere self-reports of action. Given that the vast majority of studies in the attitude-behaviour environmental domain (and elsewhere) use self-report measures of behaviour, this may mean that we are generating research findings that may be making policy makers, both in government and elsewhere, overly optimistic (and perhaps even complacent) about our readiness for actual behaviour change (and our ability to predict it).

The study reported here also found the implicit attitudes to low carbon, measured using the Implicit Association Test, were not significantly associated with either self-reports of behaviour or actual low carbon choices either under time pressure or no time pressure. This issue is returned to in Chapter 4, with a finer grain analysis of the data, but the broad picture still stands. There is some evidence that positive implicit attitudes to low carbon are associated with some low carbon behaviours, particularly when the choices are made under a degree of time pressure (Beattie & Sale, 2011; Geng et al., 2015) But the problem with some of these previous studies is that the behaviours are often relatively inconsequential (choice of a goody bag as a reward for taking part in the study; choice of a plastic carrier bag) in comparison to actual product choice, which is the central act when it comes to shopping. In this study, colour-coded carbon labels were competing with a whole series of other product features such as brand (well known, luxury, eco, value etc.) and price, as would happen in any supermarket. Perhaps, not surprisingly, because of years of effective advertising, it was found that these other features were very significant in guiding the choice of the experimental participants. The analyses (slightly anticipating the detailed results to be presented in Chapter 4) revealed, for example, that well-known brands were chosen 38.0% of the time, followed by value brands (32.4%) then organic/Eco brands at 17.0% of the time and finally luxury brands at 12.6% of the time. Choices of individual products varied enormously from product to product. Well-known brands of soup (Heinz) and toilet rolls (Andrex) were both chosen 58% of the time, followed by fabric conditioner (Lenor 56%). The least popular brand was coffee at 18% (Lavazza). Implicit attitudes to low carbon might not have been sufficiently powerful to override the others powerful implicit forces attracting us to these other features of products (Friese et al., 2006; see also McGuire & Beattie, 2016).

It was found, however, that the choice of the low carbon alternatives (signalled through a green carbon footprint) were more frequent than the choice of the high carbon alternatives (signalled through a black carbon footprint), but this was not reliably associated with either measure of attitude. Nevertheless, this might be useful information for those concerned with representing carbon footprint on products. In the U.K. there has been a good deal of misunderstanding about how to interpret carbon labels using the current format (Upham et al., 2011). Other countries, like Australia, have gone for a colour-coded traffic light approach. This was resisted in the U.K., perhaps unwisely, and Tesco eventually stopped labelling its own products at all, blaming the slow uptake on carbon labelling from competitors. But clearly the slow uptake from the consumers themselves was also a major issue (see Beattie, 2012). Perhaps other approaches, including colour coding, should have been tried first before abandoning this particular project. Colour coded carbon labels might actually have a role to lay in guiding consumer behaviour.

This study is clearly in need of further elaboration and extension. An experimental approach was used to investigate consumer choice to give us more control over some of the features that might influence this, including brand, carbon label, colour coding of carbon footprint, price etc.

There is nevertheless the opportunity to extend this research on implicit and explicit attitudes to carbon footprint to consider real consumer behaviour rather than simulated behaviour. Indeed, this has recently been attempted by Panzone et al. (2016) who used 900 panel members of the Dunhumby Shopper Thoughts Panel from the Tesco consumer data base, and the Tesco Club-Card data (which record all purchases at Tesco), to examine people's actual shopping preferences. They considered the relationship between such shopping habits and measures of both implicit and explicit attitudes. This is potentially an important study in terms of future research. Their results were also not that optimistic about the ability to predict actual behaviour from these particular attitudinal measures. They found that the sustainability IAT score did not significantly predict the sustainability of the food baskets, although it did predict one single measure, namely the share of expenditure allocated to bottled water – in that those with a positive implicit attitude to sustainability bought less. Their measures of explicit attitude also produced mixed results. Measure of 'Green Consumer Attitude' and 'Sustainable Food Preference' 'did not predict aggregate consumer behaviour' (Panzone et al., 2016, p. 15).

However, the study did have a number of methodological and conceptual shortcomings. Firstly, instead, of assessing the specific carbon footprint of each 'shopping basket', they used an Environmentally

Sensitive Shopper index or ESS (Panzone, Wossnik & Southerton, 2013). There are three sustainable categories included in the ESS index: fruit and vegetables purchases over total food expenditure, organic fruit and vegetables over total fruit and vegetables, on-line food and drink purchases over total food and drink purchases. It also includes three unsustainable categories: meat purchases over total food and drink purchases, red meat as a proportion of total meat and purchases of bottled water over total food and drink purchases. This index clearly has some merit. Meat has clearly a higher carbon footprint than fruit and vegetables, on-line shopping and bottled water have very different carbon footprints to their alternatives (in different directions, of course). But it still is, at best, a rough guide as to the sustainability of the shopping basket rather than a more exact measure. Secondly, they used an IAT with somewhat problematic images. Some required reading of information on products (e.g. the 'by air' writing on the green beans), which is difficult given the fast time constraints of the IAT. Some images appeared contradictory (a recycle crate with unsustainable products, like plastic bottles inside). This was included as a 'sustainable' image. Some images were highly ambiguous. The image of the bottled water had no labels, so a consumer could have filled these with tap water (as many people do). Thirdly, there is always an issue with respondents completing an online IAT. How can we be sure that the conditions were appropriate for completing the IAT (with no distractions)? How do we know that the individual completing the IAT was the same person choosing the actual products on the shopping trips to Tesco? After all, a Tesco Club-Card is generally shared in a household rather than being unique to an individual. Fourthly, there is always the possibility that those consumers with a positive implicit attitude towards sustainable products actually shopped elsewhere for these products, for example, in farmers' markets or local shops and specifically avoided a large retailer like Tesco which might not have the best reputation for environmentally friendly practices. Only the shopping at Tesco was analysed in this study. Indeed, Panzone et al. explicitly recognise this issue - 'consumers who reported not shopping primarily in the store brand who supplied the data had even more pro-environmental IAT scores compared to loyal customers. As a result, the insignificant IAT-behaviour relation might be caused by these consumers using their implicit pro-environmental attitudes primarily in retail channels with a positive reputation for environmental quality' (2016, p. 15).

Panzone's finding that implicit attitude did significantly predict the consumption of bottled water suggests that there may be some connection between implicit attitudes and product choices. Bottled water was one of the images included in their IAT, so it suggests that the selection of items in the IAT is a critical one. It may be very naïve to assume that any sample of images in the IAT will predict any sample of behaviours (because the images in the IAT essentially construct the concept of 'high' and 'low' carbon for the participants). So a degree of stimulus and behaviour specificity (and mapping) may need to be carefully thought out in future. The methodological and conceptual weaknesses in this study may have contributed to the failure to find any more general effects. But clearly we can extend research in this domain to correct these deficits.

In conclusion, climate change is the most pressing global problem we face, and psychology has a significant role to play in trying to understand the drivers behind consumer behaviour, given that the consumer is very significant factor in climate change. But if we are to do anything significant about climate change then we have to follow the recommendations of Baumeister and study behaviour and behavioural choice rather than just questionnaire responses about intentions to act, willingness to act, or reports of past behaviour. Questionnaire responses might be easier to obtain but they can encourage false (and overly) optimistic conclusions about how we can predict actual consumer choice, and therefore how things might change in the future. There are clearly new research possibilities for a focus on carbon attitudes and actual consumer carbon behaviour in this digital age (using the supermarket and similar data sets). We just need the impetus to change focus and begin some new lines of enquiry if we are to shed new light on this most pressing of issues.

# Chapter 4: So what does determine actual consumer choice? The effects of brand and carbon footprint information with or without time pressure

## 4.1. Introduction

Chapter three produced somewhat pessimistic conclusions about our ability to predict actual behaviour from measures of attitude, be they measures of explicit or implicit attitude. The fact that explicit attitudes only predict self-reported behaviour rather than actual consumer choice is not a positive conclusion (from the point of view of our planet, and the host of initiatives based solely on self-report measures of attitude), but it is a very important research finding. Unfortunately, measures of implicit attitude in this particular study also had little predictive power. But the question is, was the grain of the analysis sufficiently fine to provide insights into what determines patterns of consumer choice. In this chapter, this question is considered again in more detail with a much finer grain analysis of choice of brand and a consideration of how carbon footprint might influence this. What occasioned this more detailed consideration was, quite simply, the urgency of the issue. Stern (2006), after all, had been explicit 'Human activities are a major driver of this rapid change in our climate…particularly patterns of consumption and energy use, driven by consumer demand for higher standards of living'. In other words, we as consumers are playing a major role in the creation of this problem. One argument is that if we are part of the problem, then we *must* be part of the solution. This point has not been lost on agencies like the United Nations, selected governments around the world and many leading multinationals, indeed the very same multinationals that have made it their mission to promote and then satisfy this increasing consumer demand.

In a keynote lecture at Edge Hill University in February 2015, Beattie pointed to the case of Unilever. He pointed out that this is one of the top ten global companies in terms of both turnover and reach. This company reports an annual turnover of around £40 billion with its products sold in 190 countries across the globe (Unilever Sustainable Living Plan, 2013). It proudly boasts that 2 billion times a day, a consumer somewhere on the globe uses one of their products. The Key Performance Indicators (KPI) of this enormous company are, not surprisingly, primarily financial - they aim for 5% growth with fewer, bigger innovations. They aim to win a higher proportion of market share, and want to build their brands and win consumer preference. They are choosing to focus on premium products with higher margins. However, they recognize the essential dilemma that they (and we) are all facing. In their 'Sustainable Living Plan', they say that 'We are living in a world where temperatures are rising; water is scarce, energy expensive, food supplies uncertain and the gap between rich and poor increasing' (Unilever Sustainable Living Plan, 2013, p. 1.) Their conclusion is that 'Business must be part of the solution. Sustainable, equitable growth is the only acceptable business model' and that 'in order to live within the natural limits of the planet we will have to decouple growth from environmental impact'. Therefore, they have another KPI, which is not about finance, but about the environment. As a company, they aim to 'halve the greenhouse gas impact of our products across the lifecycle by 2020' (2013, p.16). In pursuit of this goal, Beattie argued, they reduced greenhouse gas emissions from their manufacturing chain and reduced deforestation. They have opted for more environmentally friendly sourcing of raw materials. They have doubled their use of renewable energy and produced concentrated liquids and powders. They have reduced greenhouse gas emissions from transport and reduced greenhouse gas emissions from refrigeration. They have also reduced employee travel. So what effect did these various initiatives have on their environmental impact? Their report concludes: 'Our greenhouse gas footprint impact per consumer has …. ***increased*** by around 5% since 2010' (2013, p.16). They then attempt to explain what has gone wrong. 'We have made good progress in those areas under our control but…the big challenges are those areas not under our direct control like…. ***consumer behaviour'.***

He said ‘It would seem that the problem essentially is us, as consumers, and how we behave. It is what we do with these good environmental products (in terms of our patterns of usage and our generation of waste, our fondness for refrigeration, the length of the showers we choose to take, our use of energy etc.) and why we choose the environmentally unfriendly alternatives in the first place’ (Beattie, 2015). So why might this be? In addition, what can we do about it?

There are a multiplicity of possible reasons for this - the effects of climate change are less personal than other looming disasters and people feel that climate change will primarily affect future generations (Hansen et al., 2013). Climate change cannot be reversed immediately and we know that *delayed* contingent reinforcement and punishment is highly problematic for behaviour change (see Skinner, 1938). Climate change also requires a ‘global response’, but because it is a global issue (Walker & King, 2008), involving many different countries, there seems to be a diffusion of responsibility, and people are merely leaving it to others. It also seems that quite simple experiences can occasion quite significant shifts of responsibility at the level of the individual (Beattie et al., 2010). For example, when experimental participants in the U.K. watched sections of Al Gore’s film ‘An Inconvenient Truth’ highlighting China’s industrialization and its dirty power stations, they were significantly more likely to agree to statements like ‘It is the responsibility of other countries, not the U.K., to reduce climate change’ and ‘Climate change is a problem to be solved by future generations’. This all happened because they had been briefly reminded of China’s huge coal reserves and its use of old technology in coal-burning technology (see also Beattie, 2010, p.221; Beattie, 2011). Uncertainty about the time course of climate change undoubtedly also plays an important role with powerful lobbies behind this uncertainty (according to the BBC, the US fossil fuel giants, the Koch Brothers, are spending $900 million on advertising), rather similar to the uncertainty about the relationship between smoking and lung cancer generated by the tobacco industry in the nineteen fifties, sixties and seventies (Conway & Oreskes, 2010).

However, climate change is complicated; it requires an understanding of basic physics (or perhaps more than basic physics) to understand the mechanisms underpinning it (without very high degrees of simplification), the public even find some of the proposed solutions far too complicated in terms of the physics involved. Take carbon labelling for example. This process of enhancing product information to promote more sustainable consumption has been stressed in a variety of top-level policy reports (see Upham, Dendler & Bleda, 2011). These include UN Agenda 21 United Nations (1992), the EU Sustainable Consumption and

Production Action Plan (Commission of the European Communities, 2008), the UK Sustainable Development Report (Defra, 2005), and the United States Environmental Protection Agency, 1998). However, Upham et al. (2011) tested the public's reaction to carbon labelling in a series of focus groups and found that they had genuine difficulty in understanding how a gas (or gases) could even be expressed in terms of its mass (260g of carbon etc.), which, of course, is the essence of carbon labelling. They also had severe difficulty in linking an emissions figure to its environmental impact.

Then there is the emotional valence of 'global warming' which sounds almost benign and, at the opposite extreme, the term 'climate change' sounds too catastrophic to contemplate. Therefore, in order to maintain some degree of psychological stability and to remain relatively optimistic about the future, we avoid contemplating climate change whenever possible (Ehrenreich, 2009). We may even subconsciously avoid seeing images connected with climate change as we do with other sorts of negative images (Isaacowitz, 2005; 2006; see also Beattie & McGuire, 2012).

Thus, for a myriad of reasons, it is clearly going to be difficult to get the public to change their behaviour in the light of this particular threat. However, some have maintained a degree of optimism despite all of this, and they have argued that it may be difficult to promote major behavioral change, but not impossible. These proponents of behaviour change suggest that, in order to do this successfully, we have to understand people better and to design better initiatives, which build on underlying psychological insights. The first step is to access the underlying attitudes of the public to climate change and sustainable living. An attitude is classically defined as 'a mental and neural state of readiness organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related' (Allport, 1935, p.810). Accessing these underlying attitudes might seem to be very difficult, but an extraordinary number of influential people and organizations think it is relatively easy – they think that you just have to ask the public to report their attitudes in carefully constructed surveys.

Take, for example, the arguments of Leahy (2007), the then CEO of Tesco (the multinational supermarket chain), when he announced a call to arms to tackle the problem of climate change. As pointed out in the introduction, his message was very 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 to make informed decisions to produce a 'revolutionary' change in patterns of consumption. He argued that 'Customers want to do more in the fight against climate change if only we can make it easier and more affordable', and pointed to numerous market research surveys, which seemed to support his conclusion. The results of the survey by Downing and Ballantyne (2007) and others were very consistent with the more recent British Social Attitudes survey (2012) which revealed that 76% of people 'believe climate change is happening and that humans are, at least partly, responsible' (the British Social Attitudes Survey, 2012; Park, Clery, Curtice, Philips & Utting, 2012). Even more recently, the Department of Energy and Climate Change (2015) in the U.K. found that 66% of people 'reported feeling very or fairly concerned about climate change' based on a survey using 1,981 face-to-face home interviews.

Leahy was basing his planned initiative, which was the carbon labelling of Tesco products, on self-reports where people said that they 'were prepared to change their behaviour'. Similarly, Defra started from the assumption that 'Policy action needs to be rooted in understanding and awareness of consumer behaviour' (2008, p. 22). They argued that we must focus on people's ability to act and people's willingness to act - 'Many people are willing to do more to limit their environmental impact, they have a much lower level of understanding about what they can do and what would make a difference' (2008, p.28). Having assessed the 'mental and neural state of readiness' (in Allport's words) and identified 'a positive attitude to the environment', they then carried out various segmentation analyses. These analyses were used to segment the population into identifiable groups with different socio-economic profiles, consumer habits and patterns of media consumption, and various campaigns were then planned and aimed at each of the segments. However, few of these social marketing campaigns had the intended outcomes (see Corner & Randall, 2011).

So why might this be? One could propose a very simple hypothesis - it might be more difficult to understand consumers because there is mounting evidence that people have two distinct cognitive systems each with its own properties and mode of operation, with one of these systems not open to introspection (Kahneman, 2011). Kahneman calls these systems – 'System 1' (the fast, automatic and largely unconscious system) and 'System 2' (the slower, more deliberate and reflective, conscious system). This could be the reason why many initiatives, aimed at behavioral adaptation to climate change, have failed. They have made the wrong basic assumption about human beings.

This hypothesis could help explain a number of things. Consider first one of the core problems in the attitude-behaviour literature. Why do people report positive attitudes about the environment, but then do very little to ameliorate the effects of their own lifestyle on the environment – this has been called the 'value-action' gap? This 'value-action' gap emerges repeatedly in the research literature in the area of consumption and elsewhere in a range of countries. For example, Aertsens et al. (2009) noted: 'While most consumers hold positive attitudes towards organic food (Magnusson et al., 2001; Saba & Messina, 2003; Kihlberg & Risvik, 2007), the proportion of consumers purchasing organic food on a regular basis remains low, with market shares of organic products in European countries, varying from below one percent in some Southern, Central and Eastern European countries to over 5% (Sahota, 2009; Padel et al., 2009)' (Aertsens et al., 2009, p. 1140). Similarly, the Swedish researchers Roos and Tjarnemo (2011) wrote 'While a large proportion of the population has positive attitudes towards caring for the environment, these positive attitudes are not always translated into actual behaviour. Sales of organic food products are low' (2011, p.983). Vermeir and Verbeke (2006) say that 'initiatives like sustainable organic food, product free from child labor, legally logged wood, and fair-trade products often have market shares of less than 1%' (MacGillivray, 2000). This is at least partly due to the attitude-behaviour gap: attitudes alone are often a poor predictor of behavioural intention or market place behaviour (Kraus, 1995; Ajzen, 2001).

There are clearly different ways of attempting to resolve this 'value-action' gap. You could assume that you have a good measure of underlying attitude but what you need to do is to add other psychological components into the model, like subjective norms (beliefs about how others will behave) and perceived behavioural control (whether you think that your behaviour will make a difference) in an attempt to boost its predictive power (Ajzen & Fishbein, 1980; Ajzen, 1985; 1991). Alternatively, you can consider other economic, marketing or commercial features of products (like price, quality, convenience, and brand familiarity, see Vermeir & Verbeke, 2006, p. 171) that may affect consumer choice and factor those into the model in an interactive way.

However, there is, of course, another possibility, which is that perhaps we have been measuring attitudes incorrectly in the first place, or the wrong sort of attitudes. Indeed, one might question whether our 'mental and neural state of readiness' is open to introspection, and whether we could ever hope to report it accurately in surveys (see Beattie, 2010). Allport himself seemed to show some awareness of this in his classic 1935 volume. He wrote 'The meagreness with which attitudes are represented in consciousness resulted in a tendency to regard them as manifestations of brain activity or of the unconscious mind. The persistence of attitudes which are totally unconscious was demonstrated by Müller and Pilzecker (1900)' (Allport, 1935, p. 801). He clearly did not rule out the concept of the unconscious attitude but chose to focus exclusively on the measurement of attitudes with self-report questionnaires.

However, interest in 'the meagreness with which attitudes are represented in consciousness', in other words 'implicit cognition' and 'implicit attitudes', has been growing in the past few years, and this could lead us to think very differently about the 'value-action' gap. This research might one day tell us that the 'value-action' gap does not actually exist because we have been measuring and factoring in the wrong measure of 'value' in the first place. In an international bestseller, the Nobel laureate and behavioural economist Daniel Kahneman (2011) has made a very convincing case for the central role of these implicit and automatic processes in everyday life. Take a very simple example, imagine looking at an angry face – as quickly as you recognise the gender of the person or the colour of the person's hair, you have decoded the facial expression.

This is 'System 1' thinking – it is automatic, unconscious and fast. A multiplication task, on the other hand, is much slower and more deliberate; it requires effort and is conscious. This is 'System 2' thinking in Kahneman's terminology. In everyday life, System 1 is always active, dealing with many of the routine aspects of everyday life. Kahneman characterises System 1 as a 'workaholic' and System 2 as sometimes a bit lazy (Kahneman, 2011, p.46). System 1 often jumps rapidly to conclusions, but System 2 does not always check the validity of the conclusions, even when it would be relatively easy to do so. The two systems work on different principles, System 1 works on the principle of associative activation – 'ideas that have been evoked trigger many other ideas, in a spreading cascade of activity in your brain. The essential feature of this complex set of mental events is its coherence. Each element is connected, and each supports and strengthens the others' (Kahneman, 2011, p.51). System 2 uses more propositional and logical reasoning.

Kahneman uses the example of 'bananas - vomit' to show how System 1 works in terms of spreading activation. Our minds automatically assume a causal connection between the two words, producing within us an emotional response, and changing the state of our memory so that we are now more likely to recognise and respond to objects and concepts associated with sickness and nausea. We are, for example, more likely to complete the frame 's-ck' as 'sick' rather than as 'sock' or 'suck', having been unconsciously primed with the paired concepts of 'bananas' and 'vomit', all because of this associative 'machine' underpinning System 1 thinking (see Beattie, 2015). Kahneman argues that as human beings we do not necessarily understand the causes and operations of our own cognitions and behaviour because of this fundamental division in our cognitive processes. 'When we think of ourselves, we identify with System 2, the conscious, reasoning self that has beliefs, makes choices, and decides what to think about and what to do. Although System 2 believes itself to be where the action is, the automatic System 1…is effortlessly originating impressions and feelings that are the main sources of the explicit beliefs and deliberate choices of System 2' (2011, p.21).

Greenwald (1990) has considered the accumulated effects of all of this associative activation for attitudes, our 'mental and neural state of readiness', and argued that we may well have implicit attitudes formed on such basic processes that are not available to introspection and are indeed unconscious. We may believe that we have a positive attitude to bananas because we think that they are healthy and nutritious, but our associative experiences may provide us with a very different implicit attitude to them (and Seligman, 1970, famously demonstrated that you only need a small number of negative experiences to make this happen). The problem with theorising about implicit attitudes was that we had no way to access implicit attitudes, or measure them reliably, until Greenwald developed a reaction time based task to measure associative connections called the Implicit Association Test or IAT (Greenwald, McGhee & Schwartz, 1998). See section 2.2.4. for a detailed description of the IAT.

In some domains, consciously reported explicit attitudes and implicit attitudes measured through speed of association are correlated (although the size of the correlation does vary). However, in other domains, there seems to be little or no correlation between the two measures and this has led Greenwald and Nosek (2008) to suggest that explicit and implicit attitudes can be 'dissociated'. When it comes to climate change, there appears to be no significant correlation between implicit and explicit measures, this time in terms of attitude to carbon footprint (Beattie & Sale, 2009). Some argue that this is not that surprising and that explicit and implicit attitudes reflect the two very different information-processing systems described by Kahneman and others with different processes of acquisition. Implicit attitudes are based on a slow-learning associative system whereas explicit attitudes are based on a fast learning system, which uses higher-level logic and symbolic representations (Sloman, 1996). Rydell et al. (2006) have also shown that you can change implicit and explicit attitudes with different sorts of information. Consciously accessible information about a target changes the explicit attitude towards that target, whereas subliminally presented primes, 'reflecting the progressive accretion of attitude object-evaluation pairings', changes the implicit attitude towards them. You can even change implicit and explicit attitudes in opposite directions by using associative information below the level of conscious awareness to change implicit attitudes, and consciously processed material (in opposition to this) to change explicit attitudes.

So what are the possible implications of not having one but two types of attitude, for behaviour in general, and more specifically for consumer behaviour in the context of the threat of climate change? Both types of attitude can be relevant for behaviour, but under different sets of circumstances and this is what the empirical research seems to suggest. 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 & Williams, 1995), but they are less good at predicting spontaneous behaviour under time pressure (Friese, Wänke & Plessner, 2006; Beattie, 2010; Beattie & Sale, 2011), or when consumers are under any sort of cognitive or emotional load (Gibson, 2008; Hofman, Rauch & Gawronski, 2007). Unfortunately, time pressure, cognitive load and the absence of any opportunity to deliberate, characterises much of everyday supermarket shopping (Beattie & 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). Therefore, in a context such as this, implicit attitudes, would seem to be a better predictor of actual consumer choice rather than explicit attitudes and thus require an indirect measure as opposed to a direct and self-reportable measure (Greenwald & Banaji, 1995).

The concept of implicit attitude could be a critical element in the fight against climate change. Implicit, rather than explicit attitudes may well be underpinning everyday habitual consumer behaviours. Such behaviours may be more difficult to change (Downing & Ballantyne, 2007) because attempts to change attitudes and behaviour just focus on certain types of message, ignoring the associative networks of the implicit system. Recent research investigated how implicit attitudes relate to how we process information relevant to climate change, assuming that the processing of relevant information is the start point of the whole process of behavioural change and there are many persuasive messages available about climate change. But what happens if people do not see these sorts of messages (Beattie et al., 2011)? The relationship between explicit and implicit attitudes and visual fixation of carbon labels on products was explored in Chapter 2. The research suggested 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. There was also no effect with the measure of implicit attitude. However, there was a significant statistical association between the 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 (out of a possible 16) 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 had a mean of 5.3 first fixations on carbon footprint whereas those with more negative explicit attitude had a mean of 6.5 first fixations on carbon footprint. 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.

Of course, these studies are about visual attention rather than choice but it is the actual behavioural choices that people make rather than merely what people notice that is the critical issue when it comes to climate change. However, one domain where actual choice has been explored is that of racial bias in recruitment. In this research, it was shown that, although the vast majority of people *report* having no preferences either way in terms of race or ethnicity, when implicit bias is measured through the IAT, focussing on the associative connections between the target categories (Black/White) and the attribute categories (Good/Bad), the majority of the sample had an implicit pro-White bias and the White participants had a *strong* pro-White bias. Furthermore, implicit bias measured in the IAT predicted shortlisting decisions in a fictitious job selection task in a way that explicitly reported attitude did not (see Beattie, 2013; Beattie, Cohen & McGuire, 2013; Beattie & Johnson, 2012).

This research opens up the possibility that we may have implicit attitudes at odds with what we report (and indeed at odds with how we think about ourselves), which can nevertheless influence our everyday decisions. So the question remains, to what extent do these implicit attitudes predict consumer choice (given the importance of consumption to climate change)? As already mentioned, Beattie and Sale (2011) had found that when participants were asked to select either a high carbon or low carbon goody bag at the end of an experiment measuring attitudes, those with a strong pro-low carbon implicit attitude were more likely to select the low carbon goody bag, but only under time pressure. Very similar results had been reported by Friese, Wänke and Plessner (2006) who also found that implicit attitude predicted the choice of a gift (a 'generic' gift versus a 'branded' gift) for taking part in the experiment, but again only under time pressure. These results are interesting, but of course, tell us very little about how people will behave in a real consumer choice situation for a number of reasons. Firstly, in terms of what might be called broad ecological considerations, consumer products are characterised by a number of different dimensions (brand, value, taste, health features, environmental implications etc.), all operating simultaneously, which could impact on consumer choice at both the associative and more rational levels. Advertising is used to build brands (be it well-known brands, luxury brands, organic or eco brands, or value brands) in an associative manner (Aaker & Biel, 2013), and when it comes to consumer choice under time pressure, even when System 1 might be more active, these other associations might swamp any implicit associations to do with our attitudes to carbon footprint. Secondly, in terms of experimental considerations, in both Friese et al. (2006), and Beattie and Sale (2011), the choice of the reward was left until the very end of the experiment. At this point, it might have been apparent to participants that the experiment was measuring attitudes to certain attributes of products, and might have produced some demand characteristics about what was or was not appropriate behaviour.

Of course, notwithstanding these points, both studies did suggest that time pressure is a critical variable in this domain and that implicit attitudes might be more predictive of behaviour when time is not freely available and when there is little opportunity to deliberate. This may have particular relevance for consumer choice especially in supermarkets where much everyday shopping occurs in advanced Western societies. These kinds of considerations formed the basis for the present study, where consumer choice of real brands as a function of both time and as a function of both implicit and explicit attitudes is studied.

The aim in this chapter is to investigate what sorts of factors determine choice, and whether this fundamental division of human beings (at least in terms of System 1 and System 2 thinking) has any relevance for our culture of consumption and our ability to adapt to face the threat of climate change. Here, the aim is to experimentally investigate whether carbon footprint information has any effect on consumer choice. There is recent evidence from Finland that it can influence consumer choice at least on meat products (Koistinen, Pouta, Heikkilä, Forsman-Hugg, Kotro, Mäkelä & Niva, 2013). In Australia there is evidence that carbon labelling, particularly using colour-coded carbon footprints (with a green footprint denoting 'below average carbon emissions' and black denoting ‘above average’) can influence actual shopping behaviour, but the effects are not particularly large (high carbon decreasing by 6%; low carbon increasing by 4%), unless paired with price (see Vanclay et al., 2011). But how would carbon label interact with the other information labels on products (see Gadema & Oglethorpe, 2011) and would it relate in any way to measures of explicit or implicit attitude? Further, is there any evidence of ‘dissociation’ in these attitudes towards the environment, which may help explain the relative inaction of the consumer towards climate change, and which attitudinal variables might predict a behavioural response to the various labels? This is a much finer grained analysis than Chapter three and aims to explore how brand and carbon footprint affect choice in much greater detail. The hypotheses are as follows:

H1: Consumer brands will have a significant effect on consumer choice with well-known branded products selected most frequently, particularly under time pressure.

H2: Colour-coded carbon footprint will significantly affect consumer choice.

H3: Explicit and implicit attitudes to carbon footprint will not be significantly correlated with each other.

H4: Explicit attitudes to carbon footprint will not be associated with the choice of (colour-coded) high or low carbon footprint products.

H5: Implicit attitudes to carbon footprint will be associated with the choice of (colour-coded) high or low carbon footprint products.

## 4.2. Method

### *4.2.1. Participants*

The participants used in this experiment were the same participants used in Chapter 3. Ethical approval was obtained from the Edge Hill University Research Ethics Committee (UREC). As in the previous Chapter, participants were informed about the test procedure and told that they could withdraw at any point during the experiment and that their data could be removed from the study and destroyed at any point up to three weeks after they had taken part in the experiment (no participant asked for their data to be removed and destroyed). They were fully debriefed at the end of the study.

### *4.2.2. Stimuli*

As in Chapter three, ten products were selected for this study. These were everyday products, central to any weekly shop. The same products were chosen: breakfast cereal (bran flakes), bread, cheese, coffee, fabric conditioner, ice cream, orange juice, soup, toilet roll and washing up liquid. These products all have a variety of information labels on the front of the products. The number of these informational labels varied from product to product, and depended to a certain extent on the price and brand of the product, with the more expensive products having either more information labels or more of their surface area covered by image, logo or icon.

As in Chapter three, the price of each product was superimposed onto the image of the product; price was always represented in white numbers on a black circular background. The positioning of the price sticker was always in the same position across the four individual products in that set. So for example, in the case of cheese, the price sticker was superimposed on the bottom left-hand corner of the product. When it came to bread, in each case the sticker was superimposed on the top right-hand corner. The prices superimposed on the images of the products were always the actual prices. The luxury brands were always the highest in price, then organic/eco, then the well-known brands followed by the value brands. All of the original details on the product remained the same and were not altered in any way.

As well as the addition of price information, the carbon footprint value for each item was also superimposed onto the front of each product. The intention was to manipulate carbon footprint information in order to test experimentally its effects on consumer choice. The question is - can carbon footprint information influence consumer decision making? This is a very important theoretical and practical issue for many businesses concerned about climate change. A core consideration was to vary carbon footprint in a systematic way by beginning with the actual carbon footprint of the product (derived from a variety of sources from both government and commercial databases) and then recalculating three additional values using this as the baseline in order to generate two high and two low carbon footprint values. For example, in the case of 'soup' the typical carbon value is 186 grams $CO_2$ for a standard can of 'generic' soup. This was represented with a '186g' on a black footprint and assigned arbitrarily to the value version of the product. This figure was then halved to generate a lower carbon footprint value (93g $CO_2$). This was represented with '93g' on a green carbon footprint and assigned arbitrarily to the well-known brand version of the soup. Then 10% was subtracted from this value to generate the lowest carbon footprint value. This was represented with '84g' also on a green background. Finally, 10% was added to the starting value which generated the highest carbon footprint value (here represented by '205g' on a black background). This was arbitrarily assigned to the organic/eco brand of the soup. In the case of the other products, the high and low values were assigned arbitrarily to the different versions of the products (luxury, well-known brand, value and organic/eco) with the only constraint being that each of the ten products had to have an equal number of high and low carbon footprint labels attached (5 of each in the final tally). The images of the various products complete with the added carbon footprints and price stickers were then placed on a white background and laminated, creating a series of flash cards. There were 40 flash cards in total.

### *4.2.3. Attitudinal measures*

In order to determine participants' explicit attitudes towards high carbon footprint and low carbon footprint, participants completed a computerised Likert scale and a Feeling Thermometer. Here participants rated how 'warm' or 'cold' they felt towards 'high carbon' and then how 'warm' or 'cold' they felt towards 'low carbon' where 1 = very cold, 3 = neutral and 5 = very warm. In order to calculate a Thermometer Difference (TD) score, the high carbon footprint score is subtracted from the low carbon score. Thus, a TD scores can range from -4 to +4, with a negative TD score indicating that the participant report a preference for high carbon footprint compared to low carbon footprint and a positive TD score indicating that they report a preference for low carbon footprint compared to high carbon footprint. The more extreme the number then the stronger the preference on this measure. For example, 1 would represent a mild preference for low carbon footprint, whereas 4 represents a very strong preference for low carbon footprint.

### *4.2.4. Implicit Association Test (IAT)*

As in Chapter 2 and Chapter 3, participants were also asked to complete the 'carbon footprint' Implicit Association Test or IAT designed to test their implicit attitudes to the target categories (High Carbon/Low Carbon) by measuring the associative connection between these and the attribute categories (Good/Bad) (Beattie, 2010, Beattie & Sale, 2010; Beattie & McGuire, 2012; Beattie & McGuire, 2015).

## 4.3. Shopping task

A total of 40 flash cards were laid out on a table displaying images of 10 different products (as described earlier) with four different brand variations of each (luxury brand, well-known brand, value brand and organic/eco brand). The four different brands for each product were laid out in a row. The particular order within the row was changed for each new participant. Each participant was asked to select a choice of items under a number of shopping conditions that included shopping alone under time pressure ('Imagine yourself shopping alone in a supermarket - you are in a real hurry') and shopping alone but with no time pressure ('Imagine yourself shopping alone in a supermarket - you are shopping with plenty of time on your hands'). Each condition was randomised between participants to control for possible order effects. Participants had to select 10 products in total. Once they had chosen their first product, they were then asked to select the next and so on. All choices were timed on a stop-watch. The order in which they had to choose the products was randomised across both conditions. Each participant was asked to complete the shopping task for all products under one condition before moving on to the next condition.

## 4.4. Results[5]

### *4.4.1. Consumer choice and the nature of the brand with no time pressure*

The first focus for the analysis was the relationship between brand and consumer choice under no time pressure. See Tables 4.1 and 4.2 It was immediately apparent that the brand chosen most frequently under no time pressure was the well-known brand (38.0% of all selections) followed by the value brand (32.4%) followed by the organic/eco brand with 17.0% and lastly the luxury brand at 12.6%.

[5] In this chapter, a much finer grained analysis is pursued to explore possible connections between both explicit and implicit attitudes and behavioural choices. Various categorisations are employed which restricted the distribution under each condition and for this reason non-parametric statistics were employed. This chapter is considered highly exploratory in both scope and design (this also applies to Chapter 5).

Table 4.1: The relationship between consumer choice of brand under no time pressure.

| **Brand** | **Percentage of times chosen by all participants** |
|---|---|
| Luxury | 12.6% |
| Well-known brand | 38.0% |
| Value | 32.4% |
| Organic/eco | 17% |

There was, however, considerable variation from product to product. So for example, when it came to products like soup (Heinz), toilet roll (Andrex) and fabric conditioner (Lenor) the well-known brands were chosen in over 50% of all occasions, and these well-known brands dominated consumer choice. However, in other cases the well-known brands were not chosen so frequently. For example, in the case of coffee, the well-known brand (Lavazza) was chosen only in 18% of cases; in the case or orange juice the well-known brand (Princes) was chosen in only 24% of cases. Value brands seemed to be selected more frequently when it came to washing-up liquid (62%) and bran flakes (52%). Organic/eco brands were selected most frequently when it came to coffee (32%) and ice cream (24%), but note that the well-known (in the case of the ice cream) and value brands (in the case of the coffee) are still selected more frequently in the case of these products. Luxury brands were selected most frequently when it came to orange juice (32%) and ice cream (28%). In both these cases these were the top selection (see Table 4.2).

Table 4.2: Brand choice across all participants under no time pressure (percentage choice).

| | Luxury | Well-known brand | Value | Organic/eco |
|---|---|---|---|---|
| Bran Flakes | 0% | 26% | 52% | 22% |
| Bread | 10% | 44% | 28% | 18% |
| Cheese | 2% | 44% | 36% | 18% |
| Coffee | 14% | 18% | 36% | 32% |
| Fabric Conditioner | 20% | 56% | 12% | 12% |
| Ice cream | 28% | 26% | 22% | 24% |
| Orange Juice | 32% | 24% | 30% | 14% |
| Soup | 16% | 58% | 14% | 12% |
| Toilet roll | 4% | 58% | 32% | 6% |
| Washing up liquid | 0% | 26% | 62% | 12% |
| Mean | **12.6%** | **38.0%** | **32.4%** | **17.0%** |

### *4.4.2. Consumer choice and the nature of the brand with time pressure*

Interestingly, under time pressure, the well-known brands became even more popular. Well-known brands were now selected in 42.8% of all cases compared to 38.0% under no time pressure. Value brands were selected 31.4% of the time, followed by luxury brands with 15.4% and lastly organic/eco with 10.4%. See Table 4.3.

Table 4.3: The relationship between consumer choice of brand under time pressure.

| **Brand** | **Percentage of times brand was chosen by all participants** |
|---|---|
| Luxury | 15.4% |
| Well-known brand | 42.8% |
| Value | 31.4% |
| Organic/eco | 10.4% |

Table 4.3 reveals a number of things. Firstly, it hints at the power of advertising for those brands that have become well-known (Hovis, Kellogg's, Heinz etc.), in that these brands are immediately recognisable and accessible under time pressure and when consumers are under time pressure, then the more likely they are to choose something they instantly recognise (Jensen & Drozdenko, 2008). The well-known brand of soup was selected most frequently of all products (74%) and the same for toilet roll (58%). See Table 4.4. Secondly, it demonstrates that the organic/eco brand drops to fourth place under time pressure (10.4%), which is lower than the luxury brand (15.4%). However, without time pressure, the organic/eco brand is selected more frequently (17.0%) than the luxury

brand (12.6%). This would seem to suggest that when we change the temporal context of consumer choice, it does influence consumer behaviour and that the organic/eco brand becomes more popular when there is some time for consideration.

Table 4.4: Brand choice across all participants under time pressure (percentage choice).

| | Luxury | Well-known brand | Value | Organic/eco |
|---|---|---|---|---|
| Bran Flakes | 0% | 48% | 42% | 10% |
| Bread | 8% | 44% | 34% | 14% |
| Cheese | 2% | 56% | 30% | 12% |
| Coffee | 24% | 20% | 40% | 16% |
| Fabric Conditioner | 26% | 42% | 18% | 14% |
| Ice cream | 44% | 16% | 20% | 20% |
| Orange Juice | 34% | 38% | 24% | 4% |
| Soup | 12% | 74% | 14% | 0% |
| Toilet roll | 2% | 58% | 38% | 2% |
| Washing up liquid | 2% | 32% | 54% | 12% |
| Mean | **15.4%** | **42.8%** | **31.4%** | **10.4%** |

### *4.4.3. Consumer choice: inferential statistics*

Statistical analyses focussed on the relationship between time pressure and brand choice. The first analysis considered the relationship between choice of organic/eco brand versus the well-known brand under both time pressure and no time pressure following the observations above (see Table 4.5). Under time pressure the well-known brands were chosen more frequently, whereas the organic/eco brands were chosen less frequently under time pressure and this difference in distribution was significant ($X^2$ = 9.25, d.f. = 1, $p$ < 0.01, 2-tailed test).

Table 4.5: The relationship between choice of organic versus well-known brand under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Organic/eco | 85 | 52 | **137** |
| Well-known brand | 190 | 214 | **404** |
| **Total** | **275** | **266** | **541** |

The next comparison considered choice of organic/eco brands versus luxury brands under time pressure and no time pressure, as shown in Table 4.6. The analysis suggests that the organic/eco brands were less likely to be chosen under time pressure compared to the luxury brands, which were more likely to be chosen under time pressure ($X^2$ = 8.03, d.f. = 1, $p$ < 0.01, two tailed test). In other words, under time pressure, consumers are significantly more likely to choose luxury brands and significantly less likely to choose organic/eco brands.

Table 4.6: The relationship between choice of organic/eco brands versus luxury brands under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Organic/eco | 85 | 52 | **137** |
| Luxury | 63 | 77 | **140** |
| **Total** | **148** | **129** | **277** |

A number of the statistical comparisons, however, revealed no significant differences in terms of the comparisons made. So, for example, both organic/eco brands and value brands are less likely to be chosen under time pressure in a similar pattern to each other with no significant difference in underlying distribution ($X^2$ = 3.48, d.f.=1, n.s.). See Table 4.7.

Table 4.7: The relationship between the choice of organic/eco brands versus value brands under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Organic | 85 | 52 | **137** |
| Value | 162 | 157 | **319** |
| **Total** | **247** | **209** | **456** |

Similarly, when well-known brands and luxury brands were compared, under time pressure and no time pressure, the participants were more likely to choose both the well-known brands and the luxury brands under time pressure in a very similar pattern and again there was no significant difference ($X^2$ = 0.17, d.f. = 1, n.s.). See Table 4.8.

Table 4.8: The relationship between the choice of well-known brands versus luxury brands under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Well-known brand | 190 | 214 | **404** |
| Organic | 63 | 77 | **140** |
| **Total** | **253** | **219** | **544** |

The next comparison focused on the selection of value brands and well-known brands under time pressure and no time pressure. Here it was found that the value brands were more likely to be chosen under no time pressure, the well-known brands were more likely to be chosen under time pressure. The differences in terms of absolute numbers under the two conditions were not that large and the difference failed to reach significance ($X^2$ = 1.05, d.f. = 1, n.s.). See Table 4.9.

Table 4.9: The relationship between the choice of value brands versus well-known brands under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Value | 162 | 157 | **319** |
| Well-Known brand | 190 | 214 | **404** |
| **Total** | **352** | **371** | **723** |

Similarly, when the choice of value brands and luxury brands were compared under time pressure and no time pressure, it was found that the luxury brands were more likely to be chosen under time pressure, but again, the difference in quantitative terms were not that great and the overall difference failed to reach significance ($X^2$ = 1.34, d.f. = 1, n.s.). See Table 4.10.

Table 4.10: The relationship between the choice of value brands versus luxury brands under time pressure/no time pressure.

| | No TP | TP | **Total** |
|---|---|---|---|
| Value | 162 | 157 | **319** |
| Luxury | 63 | 77 | **140** |
| **Total** | **225** | **234** | **459** |

### *4.4.4. Does carbon footprint influence consumer choice?*

An overview of this has been presented in Chapter 3, but here the data will be considered in a more nuanced way. The carbon footprint of each consumer choice is laid out in Table 4.11. 'HH' represents the product with the highest carbon footprint (starting value plus 10%), 'H' represents the product with a high carbon footprint (the starting value), 'L' represents the low carbon footprint product (half the starting value), and 'LL' represents the lowest carbon footprint (0.5 of the starting value minus 10%).

Table 4.11: Number of high and low carbon items chosen by each participant in the sample under no time pressure/time pressure.

| | **No Time Pressure** | | | | **Time pressure** | | | |
|---|---|---|---|---|---|---|---|---|
| | **(HH)** | **(H)** | **(L)** | **(LL)** | **(HH)** | **(H)** | **(L)** | **(LL)** |
| Participant 1 | 2 | 1 | 3 | 4 | 0 | 4 | 2 | 4 |
| Participant 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 |
| Participant 3 | 3 | 1 | 2 | 4 | 2 | 1 | 4 | 3 |
| Participant 4 | 1 | 3 | 4 | 2 | 1 | 4 | 3 | 2 |
| Participant 5 | 1 | 4 | 4 | 1 | 2 | 2 | 4 | 2 |
| Participant 6 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
| Participant 7 | 4 | 1 | 3 | 2 | 2 | 1 | 4 | 3 |
| Participant 8 | 1 | 1 | 5 | 3 | 2 | 1 | 5 | 2 |
| Participant 9 | 2 | 3 | 2 | 3 | 1 | 3 | 4 | 2 |
| Participant 10 | 1 | 3 | 5 | 1 | 2 | 1 | 4 | 3 |
| Participant 11 | 4 | 2 | 3 | 1 | 1 | 1 | 4 | 4 |
| Participant 12 | 1 | 2 | 4 | 3 | 2 | 2 | 3 | 3 |
| Participant 13 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 1 |
| Participant 14 | 3 | 4 | 2 | 1 | 5 | 1 | 2 | 2 |
| Participant 15 | 2 | 2 | 1 | 5 | 1 | 3 | 5 | 1 |
| Participant 16 | 3 | 1 | 4 | 2 | 4 | 3 | 3 | 0 |
| Participant 17 | 0 | 4 | 4 | 2 | 3 | 5 | 2 | 0 |
| Participant 18 | 3 | 2 | 2 | 3 | 4 | 1 | 2 | 3 |
| Participant 19 | 2 | 1 | 4 | 3 | 2 | 2 | 2 | 4 |
| Participant 20 | 3 | 1 | 5 | 1 | 3 | 3 | 2 | 2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Participant 21 | 3 | 2 | 4 | 1 | 3 | 1 | 3 | 3 |
| Participant 22 | 1 | 2 | 5 | 2 | 2 | 3 | 2 | 3 |
| Participant 23 | 1 | 3 | 2 | 4 | 0 | 2 | 3 | 5 |
| Participant 24 | 3 | 0 | 4 | 3 | 5 | 0 | 3 | 2 |
| Participant 25 | 0 | 3 | 4 | 3 | 1 | 3 | 3 | 3 |
| Participant 26 | 2 | 1 | 3 | 4 | 3 | 1 | 2 | 4 |
| Participant 27 | 4 | 2 | 1 | 3 | 1 | 2 | 4 | 3 |
| Participant 28 | 0 | 1 | 5 | 4 | 4 | 0 | 4 | 2 |
| Participant 29 | 2 | 4 | 3 | 1 | 3 | 2 | 2 | 3 |
| Participant 30 | 2 | 4 | 2 | 2 | 2 | 5 | 1 | 2 |
| Participant 31 | 2 | 0 | 4 | 4 | 3 | 1 | 3 | 3 |
| Participant 32 | 1 | 1 | 5 | 3 | 2 | 0 | 5 | 3 |
| Participant 33 | 1 | 2 | 5 | 2 | 1 | 2 | 5 | 2 |
| Participant 34 | 4 | 0 | 3 | 3 | 4 | 1 | 4 | 1 |
| Participant 35 | 1 | 3 | 4 | 2 | 1 | 4 | 2 | 3 |
| Participant 36 | 0 | 2 | 3 | 5 | 0 | 2 | 5 | 3 |
| Participant 37 | 1 | 2 | 1 | 6 | 2 | 2 | 2 | 4 |
| Participant 38 | 4 | 4 | 0 | 2 | 4 | 3 | 1 | 2 |
| Participant 39 | 2 | 3 | 1 | 4 | 1 | 4 | 2 | 3 |
| Participant 40 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 |
| Participant 41 | 2 | 4 | 2 | 2 | 1 | 3 | 2 | 4 |
| Participant 42 | 5 | 3 | 2 | 0 | 4 | 3 | 2 | 1 |
| Participant 43 | 1 | 1 | 3 | 5 | 3 | 4 | 2 | 1 |
| Participant 44 | 1 | 3 | 3 | 3 | 2 | 3 | 2 | 3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Participant 45 | 2 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| Participant 46 | 1 | 4 | 1 | 4 | 2 | 2 | 2 | 4 |
| Participant 47 | 3 | 1 | 2 | 4 | 2 | 2 | 2 | 4 |
| Participant 48 | 2 | 2 | 5 | 1 | 2 | 3 | 4 | 1 |
| Participant 49 | 0 | 1 | 5 | 4 | 0 | 3 | 4 | 3 |
| Participant 50 | 1 | 3 | 2 | 4 | 1 | 3 | 3 | 3 |

From Table 4.11 and 4.12 (below) it should be clear that the carbon footprint of the products did influence consumer choice. Table 4.12 shows that when there is no time pressure, the experimental participants chose low carbon items a mean of 3.10 times, very low carbon items a mean of 2.72 times, high carbon items a mean of 2.20 times and very high carbon items a mean of 1.98 times. In other words, they seem to prefer low as opposed to high carbon items (of course, signalled by the green footprint superimposed on the product). In addition, they also prefer the less extreme variations within each of these categories (the low carbon item was chosen more than the very low carbon item and the high carbon product was chosen more than the very high carbon product). Variations within the category were, of course, only signalled by the numerical value on either the green or the black background.

Table 4.12: Mean number of high and low carbon items chosen by each of the 50 participants under no time pressure/time pressure.

| | **No Time Pressure** | | | | **Time pressure** | | | |
|---|---|---|---|---|---|---|---|---|
| | HH | H | L | LL | HH | H | L | LL |
| **Mean** | **1.98** | **2.20** | **3.10** | **2.72** | **2.16** | **2.28** | **2.98** | **2.58** |

Nonparametric analyses revealed that the preference for low carbon items over high carbon items was significant – with either the full set ('HH+H' versus 'LL+L') compared (Wilcoxon Matched-Pairs Signed-Ranks Test, $Z$ = -3.322, n = 39, $p$ < 0.001, 2-tailed), or focussing just on the less extreme categories items 'H' versus 'L') (Wilcoxon Test, $Z$ = -2.833, n = 44, $p$ < 0.004, 2-tailed). It was also significant focussing just on the more extreme category items ('HH' versus 'LL') (Wilcoxon Test, $Z$ = -2.422, n = 42, $p$ < 0.05, 2-tailed). However, the apparent preference for the low carbon items ('L') versus the very low carbon items ('LL') was not significant (Wilcoxon Test, $Z$ = -1.212, n= 44, n.s.), neither was the choice of high carbon items ('H') versus the very high carbon items ('HH') (Wilcoxon Test, $Z$ = -0.812, n = 43, n.s.).

When the participants were under time pressure, they chose low carbon items a mean of 2.98 times and very low carbon items a mean of 2.58 times, high carbon items a mean of 2.28 times and very high carbon items a mean of 2.16 times. So again, the participants show a preference for low as opposed to high carbon items. As in the previous case, they seem to choose the low carbon items more than the very low carbon items and the high more than the very high carbon items, but when under time pressure the difference was not as extreme as it was when there was no time pressure. Again, nonparametric analyses revealed that the preference for low carbon items over high carbon items was significant – comparing the full set (‘HH+H’ versus ‘LL+L’) (Wilcoxon Matched-Pairs Signed-Ranks Test, $Z$ = -2.630, n = 38, $p < 0.05$, 2-tailed). The differences were also significant focussing either on the less extreme categories items (‘H’ versus ‘L’) (Wilcoxon Test, $Z$ = -2.362, n = 40, $p < 0.05$, 2-tailed). However, when it came to the more extreme category items (‘HH’ versus ‘LL’) the preference for low carbon was not significant (Wilcoxon Test, $Z$ = -1.317, n = 52, n.s.). When comparing the preference for the low carbon items (‘L’) versus the very low carbon items (‘LL’) this was not significant (Wilcoxon Test, $Z$ = -1.563, n=40, n.s.), neither was the choice of high carbon items (‘H’) versus the very high carbon items (‘HH’) (Wilcoxon Test, $Z$ = -0.657, n = 49, n.s.).

#### *4.4.5. Do measures of explicit and implicit attitudes to carbon footprint relate to one another?*

Table 4.13 shows the mean Likert scores, Thermometer Difference (TD) scores and D scores for the sample. The mean Likert score was 3.60, which is approximately midway between neutral and a moderate preference for low carbon, translating to a slight preference for low carbon. The mean TD score was 1.20, which also represents a slight preference for low carbon. The D score was 0.99, which represents a strong pro-low carbon preference for this particular set of high and low carbon items. The means are set out in Table 4.13.

Table 4.13: Mean Likert scores, Thermometer Difference (TD) scores and D scores for the sample.

| | **Likert (explicit)** | **TD score (explicit)** | **D score (implicit)** |
|---|---|---|---|
| **Mean** | **3.60** | **1.20** | **0.99** |

Figures 4.1 - 4.3 show simplified distributions of the Likert, TD and D scores in which the scores are assigned to just three categories – pro-low carbon (positive score above neutral), neutral (‘3’ for Likert; -1 to +1 for TD; -0.2 to +0.2 for D) and pro-high carbon (negative score below neutral). It is immediately apparent that on both explicit and implicit measures the participants emerge as pro-low carbon, and as

before (see Beattie, 2010) the scores on the implicit measures suggest that they are even greener (with the clear proviso that this result will depend upon the particular stimuli used in the IAT to represent high and low carbon products).

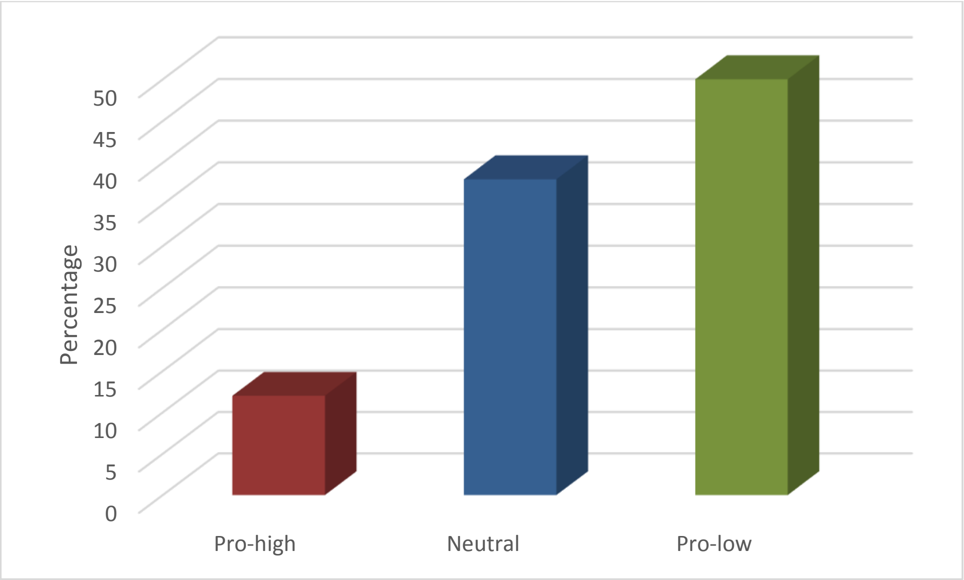



Figure 4.1: The underlying distribution for the Likert scores.

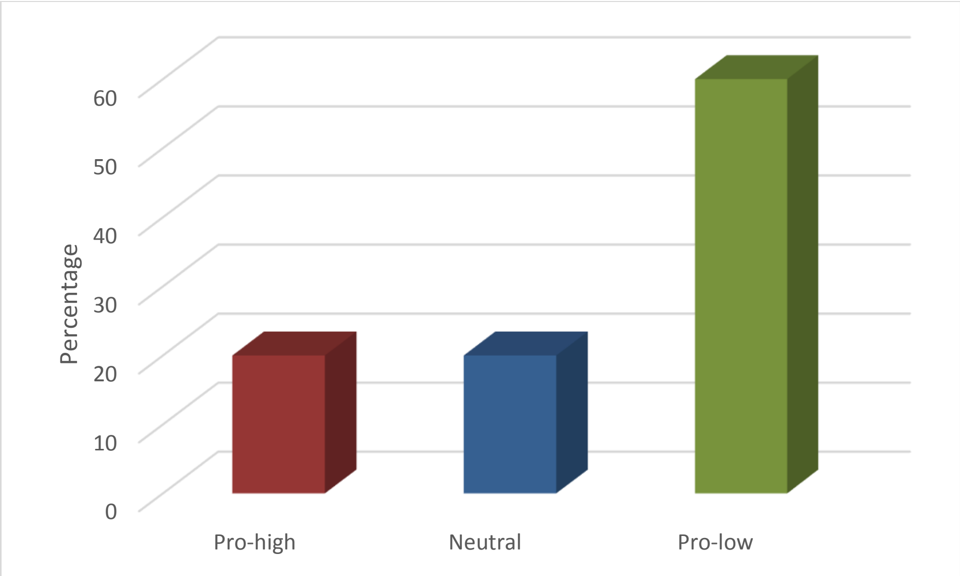



Figure 4.2: The underlying distribution for the Thermometer Difference scores.

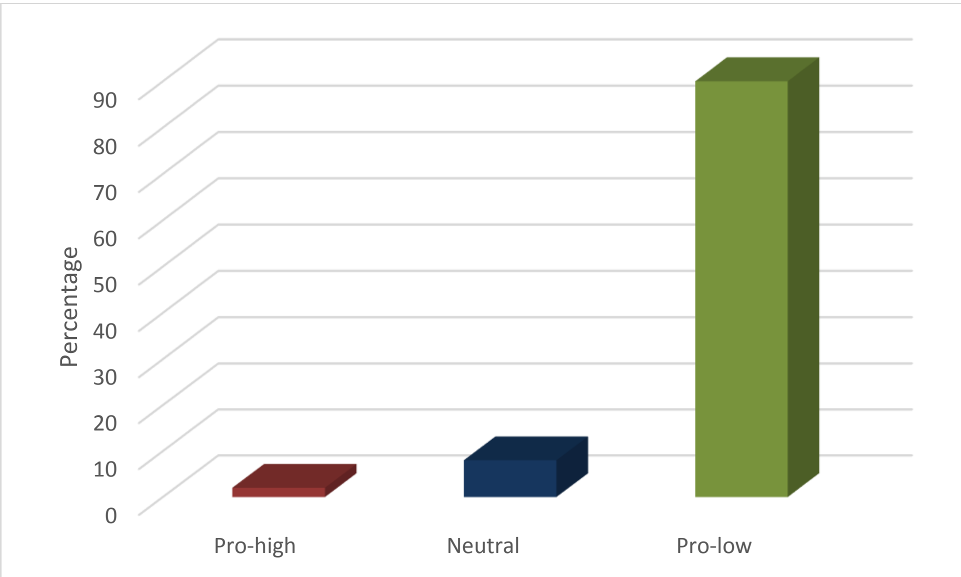



Figure 4.3: The underlying distribution for the D scores.

But do the explicit and implicit measures relate to each other? A Pearson product-moment correlation was computed to assess the relationship between the Likert and TD scores (explicit measures) and the D score (implicit measure). In line with previous research, there was no significant correlation between the Likert and D scores ($r$ = 0.016, n=50, n.s.). Neither was there a correlation between the TD and D scores ($r$ = 0.198, n=50, n.s.). This again suggests that explicit and implicit measures are 'dissociated' in this domain. Interestingly, the Likert and TD scores also did not correlate ($r$ = 0.056, n=50, n.s.), which suggests that self-reported attitudes ('I strongly prefer products with a low carbon footprint to a high carbon footprint' etc.), do not necessarily correlate with participants' reports of how 'warm' or 'cold' they felt towards low/high carbon products (see Table 4.14).

Table 4.14: Pearson product-moment correlation coefficient between D scores and Likert and Thermometer Difference scores.

| | Thermometer Difference (TD) | Likert |
|---|---|---|
| IAT | $r$ = 0.198 | $r$ =0.016 |
| Thermometer Difference | - | $r$ =0.056 |

### *4.4.6. Do explicit and implicit attitudes to carbon footprint influence the choice of high and low carbon products?*

The next question is whether these various measures of explicit and implicit attitudes predict choice of low or high carbon products when information about carbon label is also included, which vary but with all of the competing marketing information included. The statistical comparisons here consider the number of choices of low carbon products (either 'L' or 'LL') of that set of participants who score strongly pro-low carbon footprint on the various measures. In the case of the Likert scale, this set consists of those scoring '5' ('I strongly prefer products with a low carbon footprint to a high carbon footprint'). Using this criterion, 20% of the sample is identified as having a strong explicit attitude to low carbon. In the case of the Thermometer Difference measure, a criterion of +4 was used. This criterion identifies 26% of the sample and represents the maximum difference between feeling warm about low carbon and feeling cold about high carbon. In the case of the IAT, the criterion used is what has become the norm in the literature for identifying a strong implicit bias and that is 'greater than or equal to 0.8'. It should be stressed that this is an *arbitrary* criterion (Blanton & Jaccard, 2008; Blanton et al., 2007; 2015) and here identifies 52% of the sample, in other words, a much higher proportion than either of the other two criteria used for the explicit measures. The logic of this analysis is as follows: the focus will be on a possible bias in selecting low carbon items for those who fall within the set of a strong pro-low carbon attitude. This is compared with any bias in the residual sample that does not have a strong pro-low carbon attitude. If both groups come out with a significant bias this would simply reflect that it was a general bias towards selecting low carbon items by the overall sample. However, if those with a strong positive attitude to low carbon had a significant bias towards selecting low carbon items and this trend was not significant for those with a less strong attitude, then the suggestion would be that this reflects some meaningful properties of that attitudinal measure for predicting behaviour. A separate analysis was carried out when the choice was made not under time pressure and under time pressure. Table 4.15 shows the behavioural choices of those with a strong pro-low carbon attitude (measured by the Likert scale) under no time pressure. Table 4.16 shows the behavioural choices of those with weaker pro-low carbon attitudes (again measured by the Likert scale). In both cases, the results are significant and represent a bias in both groups towards low carbon choices. Therefore, this particular attitudinal measure (the Likert scale) does not discriminate in terms of actual behaviour those with a strong pro-low carbon attitude and those with a weaker attitude.

Table 4.15: The relationship between strong pro-low carbon attitude (Likert scale) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 67 | 33 | $X^2 = 11.56$, d.f.=1, $p < 0.01$, 2-tailed. |
| Expected frequency (under the null hypothesis that choice is not affected by carbon footprint information) | 50 | 50 | |

Table 4.16: The relationship between weaker pro-low carbon attitude (Likert scale) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 224 | 176 | $X^2 = 5.76$, d.f. =1, $p < 0.02$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 200 | 200 | |

In Tables 4.17 and 4.18, the same comparisons are made when the participants are under time pressure. What is striking from Table 4.17 is that those with a strong pro-low carbon attitude, as identified by the Likert scale, do not display a significant bias towards selecting low carbon items, but those with a weaker attitude (according to this scale) do. In other words, both under no time pressure and under time pressure, this attitudinal measure would seem to have little discriminatory power for predicting actual behaviour.

Table 4.17: The relationship between strong pro-low carbon attitude (Likert scale) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 51 | 49 | $X^2$ = 0.04, d.f. =1, n.s. |
| Expected frequency (under the null hypothesis) | 50 | 50 | |

Table 4.18: The relationship between weaker pro-low carbon attitude (Likert scale) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 227 | 173 | $X^2$ = 7.29, d.f. =1, $p < 0.01$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 200 | 200 | |

In the case of the Thermometer Difference, there is a very similar pattern. With no time pressure comparisons, there is an inherent bias towards choosing low carbon items and this is true for those with a strong pro-low carbon attitude (as measured by the TD) and those with a weaker pro-low carbon attitude. Hence, the TD does not discriminate the behavioural choice of the two groups. In the case of the time pressure, the results were significant, but in the opposite direction to that predicted – only those with the weaker pro-low carbon attitudes were significantly more likely to choose low carbon products. See Tables 4.19 - 4.22.

Table 4.19: The relationship between strong pro-low carbon attitude (TD) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 79 | 51 | $X^2$ = 6.02, d.f. =1, $p$ < 0.02, 2-tailed. |
| Expected frequency (under the null hypothesis) | 65 | 65 | |

Table 4.20: The relationship between weaker pro-low carbon attitude (TD) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 291 | 79 | $X^2$ = 121.5, d.f. =1, $p < 0.001$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 185 | 185 | |

Table 4.21: The relationship between strong pro-low carbon attitude (TD) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 74 | 56 | $X^2$ = 2.49, d.f. =1, n.s. |
| Expected frequency (under the null hypothesis) | 65 | 65 | |

Table 4.22: The relationship between non strong pro-low carbon attitude (TD) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 207 | 163 | $X^2$ = 5.23, d.f. =1, $p < 0.05$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 185 | 185 | |

In the case of the analyses using the IAT, the results are different. Under no time pressure, both groups (strong and weaker pro-low carbon implicit attitude) show a significant bias towards choosing low carbon items. However, under time pressure the strong pro-low carbon group does show a significant tendency to selecting low carbon items; the weaker pro-low carbon group does not show a significant tendency in this regard. In other words, when participants/consumers are under time pressure (as they are in many everyday consumer situation) those with a strong implicit attitude to low carbon are more likely to shop in a sustainable way. From a statistical point of view this is interesting because the group identified on the basis of the normative measure of strong implicit attitude (0.8 and above) was larger and therefore less selective, and less extreme, than the strong group identified by either of the other two measures. This makes the present result all the more interesting and significant.

Table 4.23: The relationship between strong pro-low carbon attitude (IAT) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 154 | 106 | $X^2$ = 8.86, d.f. = 1, $p < 0.01$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 130 | 130 | |

Table 4.24: The relationship between weaker pro-low carbon attitude (IAT) and behavioural choice under no time pressure.

| No time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 137 | 103 | $X^2$ = 4.82, d.f. = 1, $p < 0.05$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 120 | 120 | |

Table 4.25: The relationship between strong pro-low carbon attitude (IAT) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 150 | 110 | $X^2 = 6.16$, d.f. = 1, $p < 0.02$, 2-tailed. |
| Expected frequency (under the null hypothesis) | 130 | 130 | |

Table 4.26: The relationship between weaker pro-low carbon attitude (IAT) and behavioural choice under time pressure.

| Time pressure | Number of low carbon choices (L or LL) | Number of high carbon choices (H or HH) | Outcome of statistical test |
|---|---|---|---|
| Observed frequency | 128 | 112 | $X^2 = 1.06$, d.f. = 1, n.s. |
| Expected frequency (under the null hypothesis) | 120 | 120 | |

### *4.4.7. Do either explicit or implicit attitudes to low carbon products predict the choice of organic or eco brands?*

In the last section, it was found that carbon footprint not only influenced consumer choice, but also that attitude to low carbon (either self-reported or implicit) seemed to impact on that choice. One important theoretical question is how general the behavioural impact of such underlying attitudes might be? Although only attitude to low and high carbon products was measured, would this measure also predict the choice of organic or eco products? It is important to remember that the carbon footprint was randomly assigned to the range of products. Although there may be a relationship between carbon footprint and organic/eco products in general, this would not have been the case in this particular experimental context, where these two variables were randomly manipulated.

Tables 4.27-4.30 show how both implicit and explicit attitudes relate to the choice of organic/eco products under conditions of no time pressure or time pressure. These results are extremely interesting. The first analysis (Table 4.27) shows that of the 26 participants with a strong pro-low carbon implicit attitude, 22 of them chose one or more organic/eco products, only four of these participants did not choose organic/eco products, when there was no time pressure. This contrasts with a much more even split (13/11) for those with a weaker pro-low carbon implicit attitude. In other words, when the participants as ‘consumers’ had time to make their selection, this act of choice of organic/eco products was significantly affected by their underlying implicit attitude. This did not occur when participants were under time pressure (see Table 4.28).

Table 4.27: The relationship between implicit attitude to low carbon and choice of organic/eco products under no time pressure.

| | No. of participants with strong pro-low carbon implicit attitude (D=0.8 or higher) | No. of participants with weaker pro-low carbon implicit attitude (D less than 0.8) | Outcome of statistical test |
|---|---|---|---|
| One or more organic/eco choices | 22 | 13 | $X^2 = 5.51$, d.f. = 1, $p < 0.02$, 2-tailed. |
| No organic/eco choices | 4 | 11 | |

Table 4.28: The relationship between implicit attitude to low carbon and choice of organic/eco products under time pressure.

| | No. of participants with strong pro-low carbon implicit attitude (D=0.8 or higher) | No. of participants with weaker pro-low carbon implicit attitude (D less than 0.8) | Outcome of statistical test |
|---|---|---|---|
| One or more organic/eco choices | 12 | 9 | $X^2 = 0.40$, d.f. = 1, n.s. |
| No organic/eco choices | 14 | 15 | |

Measures of explicit attitude to low carbon also significantly predicted the choice of organic/eco products, but again only when the choice was not made under time pressure. It must be remembered that the operational definition of a strong pro-low carbon explicit attitude was more extreme in terms of where it lands on the underlying distribution of scores than the implicit criterion, and uniquely identifies just 10 individuals but every single one of them chose an organic/eco product when not under time pressure. This was not the case for those with a weaker pro-low carbon explicit attitude (see Table 4.29). However, when the choices were made under time pressure those with a strong pro-low carbon explicit attitude still preferred organic/eco products, whereas the majority of those with a weaker attitude here chose no organic/eco products. However, this difference failed to reach significance (see Table 4.30). In other words, those who hold the strongest attitude to low carbon products (either implicit or explicit) have some tendency to choose organic/eco products, but only when they are not under time pressure, suggesting that they may need more time to process the label and/or reflect on the nature of their choice.

Table 4.29: The relationship between explicit attitude to low carbon and choice of organic/eco products under no time pressure.

| | No. of participants with strong pro-low carbon explicit attitude (5 on Likert scale) | No. of participants with weaker pro-low carbon explicit attitude (4 or less, Likert) | Outcome of statistical test |
|---|---|---|---|
| One or more organic/eco choices | 10 | 25 | Fisher's Exact Probability Test, $p < 0.05$, 2-tailed test. |
| No organic/eco choices | 0 | 15 | |

Table 4.30: The relationship between explicit attitude to low carbon and choice of organic/eco products under time pressure.

| | No. of participants with strong pro-low carbon explicit attitude (5 on Likert scale) | No. of participants with weaker pro-low carbon explicit attitude (4 or less, Likert) | Outcome of statistical test |
|---|---|---|---|
| One or more organic/eco choices | 7 | 14 | Fisher's Exact Probability Test. n.s. |
| No organic/eco choices | 3 | 26 | |

## 4.5. Discussion

This particular experiment attempted to uncover some of the core psychological factors underpinning consumer choice on the understanding that the behaviour of consumers is particularly relevant to issues to do with climate change and the reduction of greenhouse gas emissions. Indeed, consumer behaviour would appear to be one of the major obstacles on the road to reducing greenhouse gas emissions. The multinational Unilever, for example, has introduced a number of (very expensive) major initiatives in the last few years to reduce the environmental impact of their goods, but found that their greenhouse gas footprint impact per consumer had '….***increased*** by around 5% since 2010' (Unilever Sustainable Living Plan, 2013, p.16). Consumer behaviour seems to have been responsible for this unanticipated increase, rather than decrease, in carbon footprint associated with Unilever products.

This experiment attempted to answer a number of basic psychological questions. Firstly, what brand aspects of products (well-known brand, value brand, luxury brand, organic/eco brand etc.) predict consumer choice? In addition, what are the implications of time pressure on such choices, given that under increasing time pressure there is less opportunity for deliberation and reflection? Secondly, do measures of explicit or implicit attitude towards carbon footprint impact on patterns of choice when environmental information is available? What, for example, happens if carbon footprint, experimentally manipulated in various ways, is added to products? Will this influence consumer choice when this particular type of environmental information has to compete with all of the other information that is available on products? How does time pressure impact on any of these relationships?

In this behavioural choice study, it was immediately apparent that we, as consumers, are very sensitive to both brand information and value in our selection of products. The brands chosen most frequently under no time pressure were the well-known brands - Heinz, Kellogg's, Hovis etc. (chosen in 38.0% of all selections, with four alternatives to choose from) followed by the value brand (32.4%). Significantly, further down the list was the organic/eco brand with 17.0% and lastly the luxury brands at 12.6%. However, when behavioural choice is made under time pressure, this trend became even more pronounced and the well-known brands were selected even more frequently (pointing to the power of advertising for promoting brand recognition). Well-known brands were now chosen in 42.8% of all cases and value brands 31.4% of the time (down slightly). Organic/eco brands were now in fourth and last place with only 10.4% of selections.

This time dimension had a statistically significant effect on consumer choice in terms of the selection of well-known brands compared to organic/eco brands. Under time pressure, consumers were also significantly more likely to choose luxury brands and significantly less likely to choose organic/eco brands. Given the social and temporal aspects of much supermarket shopping, often characterised by significant time pressure, this is not an optimistic conclusion regarding environmentally sensitive choices.

It must be remembered that carbon footprint information was represented in a very obvious visual way on these particular products with colour coded footprints (green for below average, black for above average) and they were represented on the front of products rather than the backs (see Beattie et al., 2010). This result shows that representing carbon footprint in this way can influence consumer choice. Participants (with a positive implicit attitude to carbon footprint within this sample) were guided by these colour-coded carbon footprints but not by the numerical values of carbon footprint, representing the gradations of high and low carbon, within them. There was no statistical difference between the two levels of high carbon footprint that were added to the products, or the two levels of low carbon footprint. Given that most countries have not introduced colour-coded carbon footprint but have instead opted for numerical values on a plain background, this might well explain why these campaigns have so far been relatively unsuccessful in promoting behavioural change and the selection of the low carbon alternatives (see Beattie, 2010; 2012).

The next question was whether these various measures of explicit and implicit attitudes predicted the choice of low or high carbon products when information about the carbon footprint is included on real products, which vary in terms of brand and with all of the competing marketing information included. In the case of the explicit measure (the Likert scale), both under no time pressure and under time pressure, this attitudinal measure had little discriminatory power for predicting actual behaviour. When under time pressure, both groups (strong and weak pro-low carbon attitude) showed a low carbon bias in terms of behavioural choice. When under no time pressure, the weak explicit attitude group did display a low carbon preference; the strong group did not, which, of course, was exactly the opposite of what was predicted. In the case of the implicit measure, however, the results were different in one important regard. Under no time pressure, both groups (strong and weak pro-low carbon implicit attitude) displayed a significant bias towards choosing low carbon items (as was the case with the explicit group). However, under time pressure, the strong pro-low carbon implicit group did show a significant tendency in selecting low carbon items; the weak pro-low carbon implicit group did not show a significant tendency in this regard. In other words, when participants/consumers are under time pressure, those with a strong implicit attitude to low carbon are more likely to shop in a sustainable way. This result only becomes apparent when you consider the individual choices in some detail. Measures of explicit attitude to low carbon also significantly predicted the choice of organic/eco products, but here only when the choice was not made under time pressure, suggesting that they may need more time to process the label and/or reflect on the nature of their choice.

In summary, these results give us some insight into some of the variables that affect consumer choice and point towards the attitudinal measures that may help us predict consumer behaviour that is more sustainable. Organic/eco brands are clearly not the first choice option, particularly under time pressure. Some individuals, however, with a strong positive implicit attitude towards low carbon are more sensitive to these brands and to carbon footprint information. In the case of implicit attitudes measured using the IAT, one might say that it is extraordinary that a simple reaction time measure, which simply computes the response time in a categorisation task, can predict anything at all in a separate domain. However, the simple measure predicts the choice of low carbon items under time pressure and even predicts the choice of organic/eco products (at least when there is more time for the consumer to reflect). The advantage of this simple measure is that participants do not seem quite so able to distort it for reasons of social desirability, in order to appear greener than they really are compared to self-report measures (see Steffens, 2004). Therefore, it may provide us with a simple diagnostic tool to test the public's actual readiness to go green, in the fight against climate change, and this could turn out to be very important indeed. One could imagine redoing the segmentation analyses of Defra and other leading organisations where one attempted to profile the population in terms of both explicit and implicit attitudes rather than relying merely on what people say.

Of course, the research also raises some very general issues about whether or not consumers are dissociated in a number of respects, and whether two separate (but potentially interacting) systems of unconscious/implicit and conscious/explicit attitudes really do exist (see Gawronski, Hofmann & Wilbur, 2006; Rydell et al., 2006). This is by no means universally accepted in the psychological literature; indeed, it is currently the subject of much quite heated debate (see Blanton & Jaccard, 2006; Blanton et al., 2007; 2009 for a critique of this position and Greenwald, Nosek & Sriram, 2006; McConnell & Leibold, 2009; Ziegert & Hanges, 2009 for some rebuttals). However, it would seem that in some domains, this notion of implicit attitudes, deriving from various associative connections and operating unconsciously alongside our more reflective attitudes (and indeed conflicting with them on occasion), might have some credibility (Beattie, 2013; Kahneman, 2011). Such a view, after all, might not surprise those psychologists who worked in the 1930s alongside some of the major tobacco companies to promote smoking (subliminally) through the association of smoking with societal success, social acceptance, masculinity or feminity and confidence. It might not even have surprised Gordon Allport in his early work on racism and 'the inner conflict' (Allport, 1954/1979). It is certainly an idea worth exploring further in the domain of consumption and climate change. If we really do have a fundamental division when it comes to our underlying attitudes towards the environment, then this could be critical in the battle against climate change. After all, most of us say that we know that we need to adapt our behaviour as consumers in the light of the threat of climate change, but then actually do nothing. Until we start to promote low carbon products and low carbon lifestyles in a way that impinges on our automatic, unconscious system, little may actually change in this regard. We cannot leave choice of low carbon products solely to reason and reflection, it could be far too late. As Kahneman (2011) himself has noted, System 2 (the system of reason and reflection) can be very lazy indeed; it leaves a great deal to System 1, and System 1 is currently prioritising well-known brands and value brands over those with the right environmental properties. System 1, in the domain of consumption, is directing us to choose those things that we have been taught to value – big brands (and status) and economical brands (and money) rather than environmental brands. This may well need to change. We need to think about how to promote low carbon lifestyles as something to do with a new sort of societal status, fun, necessary, caring, cooperative, clever, perceptive, confident, a must have, the next big thing, a new revolution, in a way that System 1 might notice.

# Chapter 5: Can the presence of others promote more sustainable consumer choice?

## 5.1. Introduction

As we have already seen, the IPCC identify a number of aspects of human activity that contribute to greenhouse gas emissions (GHG), and thereby impact on climate change. These include such things as population size, economic activity, energy use, land use patterns, technology and climate change policy. However, they also include another major factor that they identify as 'lifestyle', where 'lifestyle' reflects aspects of the behavioural choices that we make in our everyday lives that have an effect on GHG. Of course, the reason that 'lifestyle' could be particularly important in this context is that it is something that could potentially change (and potentially change faster and more dramatically than many of the other factors like 'population size' or 'land use patterns'). Indeed, 'lifestyle' is identified as one of the common *enabling factors* that underpin adaptation and mitigation responses, according to the IPCC. Clearly, we need a much better understanding of the variables that influence lifestyle choices, and particularly those choices with a direct bearing on GHG, if we are to prevent further changes in our climate. This is the focus of the present study which empirically investigates one very simple but extremely important question, namely how does the presence of others, whilst we are shopping, influence our choice of more sustainable products? The IPCC highlight a number of policy instruments for changing behaviour, including the labelling of fuel or other products and the clear identification of vehicle efficiency. However, when products are labelled (either in terms of their environmental consequences for example, ‘eco’/‘organic’ etc. or in terms of their carbon footprint) how does the presence of others affect whether they are selected or not?

There are two broad hypotheses that one might develop to predict the likely effects. One hypothesis is that the presence of others should lead consumers to focus more on the environmental labels (either organic/eco or carbon label) because of the growing awareness about climate change amongst the public and their belief that climate change is ‘real’ (Leiserowitz, 2006). The public also say in numerous surveys that they are prepared to adapt their behaviour to help reduce climate change (Downing & Ballantyne, 2007; Park, Clery, Curtice, Philips & Utting, 2012) and that they want more information about the associated environmental impacts of their purchases (Berry, Crossley & Jewel, 2008; but see also Beattie & Sale, 2009; Beattie, 2010). Selecting environmentally friendly options or low carbon products, whilst in the presence of others, allows people to present their very public concerns about the environment and climate change, and indeed potentially elevate their social status in the group through this public display of environmental awareness (Griskevicius, Tybur & Van den Bergh, 2010). The second broad hypothesis is that there are more pressing concerns when shopping than the environmental features of the products. Such things as brand, reputation, price and the value for money of the products are likely to be more significant variables in guiding consumer choice. The environmental features of such products could well be significantly less important than any of these other features. Furthermore, features like ‘brand reputation’ and ‘value for money’ are also highly likely to be influenced by the presence of others as consumers wish to display that they can afford luxury items or branded goods or that they are keen to get value for money from their purchases. Both of these broad hypotheses now need to be elaborated and shown, not just to be plausible, but highly credible in the light of both theory and the existing empirical evidence.

### *5.1.1. Social status and consumer choice*

The starting assumption for both hypotheses is the observation reported in a number of academic disciplines that consumer choice and social status are connected (see Hopkins & Kornienko, 2004; Han, Nunes & Dreze, 2013; Kim & Jang, 2014). Indeed, the public display of status through purchased goods has been defined as ‘conspicuous consumption’. The term ‘conspicuous consumption’ was first introduced by the economist Thorstein Veblen in 1899 in his classic book ‘The Theory of the Leisure Class', where it was used to define 'the advertisement of one's income and wealth through lavish spending on visible items' (Heffetz, 2011, p.1101). Here consumption is understood as a communicational act, which occurs in a social context and which interlocutors can interpret. Implicit in this theory is that shopping with others may well influence the choices that are made.

There are many different theoretical perspectives on conspicuous consumption, including one that derives from evolutionary biology, namely 'costly signalling theory'. The basic premise behind this theory is that certain animals (including humans) use conspicuous display as a form of communication that signals inclusiveness fitness. However, these displays must come at a cost, in that they need to take a considerable amount of 'effort, risk, economic resources and time' to work in this respect (see Griskevicius, Tybur, Sundie, Ciandini, Miller, & Kendrick, 2007). Take, for example, the peacock, displaying its tail to attract attention during courtship in order to signal the quality of its genetic makeup by the sheer elegance and spread of its feathers. This is obviously a costly signal in that this elaborate signal makes the peacock more vulnerable to predators.

For an action to qualify as 'costly signalling' it needs to meet the following four criteria. Firstly, it 'must be costly to the signaller in terms of economic resources, time, energy, risk or some other significant domain … Second, it must be easily observable by others. Third, the display must ultimately increase the odds that the signaller will gain some fitness advantage through the display, such as increased ability to attract desirable mates. Finally, the signal must be an indicator to potential mates of some important trait or characteristic, such as access to resources, pro-social orientation, courage, health, or intelligence' (Griskevicius et al., 2007, p.86). Expensive or luxury purchases (Veblen, 1899) obviously meet these criteria (and commercial advertising is, of course, based upon this fundamental idea). The ostentatious purchase of luxury goods (the adverts tell us) will lead to us attracting more friends and sexual partners through our ability to signal that we have access to the appropriate financial resources (Black & Morton, 2015). The question is whether the purchase of more environmentally friendly or more sustainable products could potentially follow similar principles. Some environmentally friendly products are more expensive than their less environmentally friendly counterparts (Ling, 2013; Rödiger & Hamm, 2015), so the purchase of these products is a rather straightforward (but important) way in which inclusive fitness can be signalled (more access to financial resources). However, what happens if the environmentally friendly or low carbon products are *not* more expensive? Can they still signal inclusive fitness as defined by costly signalling theory? After all, they can still be configured to meet the four criteria (from Griskevicius et al., 2007, p.86).

Firstly, they are costly to the signaller in that the consumer choosing the products needs to have spent the time in learning about and understanding environmental issues or carbon footprint (and to have spent the time in situ interpreting the label on the product itself). Secondly, the selection of the environmentally friendly or low carbon products is potentially observable by others (because of the presence of labels on the products). Thirdly, caring about our environment/planet could perhaps make you more desirable to others, and fourthly, the behaviour in question could be an indicator to potential mates of an important trait or characteristic, namely pro-social orientation.

Griskevicius, Tybur and Van den Bergh (2010) suggested that there are indeed links between pro-environmental consumer choice and elevated status and ‘that activating status motives can lead people to shy away from luxury and instead choose self-sacrifice’ (2010, p.392). They argued that people are indeed willing to act pro-environmentally because it enhances their social status. Griskevicius et al. (2010) used the example of the Toyota Prius (a ‘green’ hybrid car which costs more than a conventional equivalent) and compared it with the Honda Civic (a cheaper but highly efficient equivalent standard car). In a survey conducted in 2007 amongst customers who had purchased the Toyota Prius, advertised as ‘The planet’s favourite hybrid’, over half of the people in the survey said that the main reason for buying the Prius was that it ‘makes a statement about me'. Only a quarter of the customers bought the car because it actually had lower emissions (New York Times, 2007). One owner openly admitted 'I want people to know that I care for the environment'. In other words, the main reason for buying a Prius seemed to be related to social identity, and elevating social status, through consumer choice.

Griskevicius et al. (2010) then empirically investigated the connection between pro-environmental behaviour and elevated status. Participants in their study were given a 'motivational prime' in the form of a short story that was aimed to prime high status motivation. The short story required them to imagine that they were 'graduating from college, looking for a job, and deciding to go work for a large company because it offers the greatest chance of moving up' (2010, p.395). The story went on to describe the upmarket place of work with its 'upscale lobby and nice furniture'. As the readers came to the end of the story, they 'learn that they will have an opportunity to receive a desirable promotion. The story ends as the reader ponders moving up in status relative to his or her same-sex peers' (2010, p.395). In a control condition, participants were also asked to read a story of a similar length that was not designed to prime social status. Instead, the participants 'read about losing a ticket to an upcoming concert and searching through the house. After the person finds the ticket, he or she heads off to the concert with a same-sex peer' (2010, p.395). There was also a second control condition where participants did not read a story, but were simply asked to make their product choices. After the various manipulations, participants were asked to imagine that they were out shopping for three different products, 'a car', 'a household cleaner' and 'a dishwasher'. For each product, there was a luxury option and an environmentally friendly option. Both options were similar in price, they were made by the same manufacturer and had three key features describing the product. So for example, in the case of the dishwasher, the luxury option was describes as follows:

> 'Sub-Zero ED40 Elite Dishwasher ($1,100). Comes in choice of stainless steel or white exterior with black chrome trim. Features a revolutionary heated drying system that eliminates water spots. Has powerful water sprays but produces no sound' (2010, p.404).

The pro-environmental version was described as:

> 'Sub-Zero Eco-Trend Dishwasher ($1,100). Has a standard 40-minute running cycle. Uses a recirculating water system to save water. Is made with recycled components' (2010, p.404).

Participants saw the products on a computer screen in random order and asked 'If you were out shopping for a car/dishwasher/household cleaner, which of these two products would you buy?'

The study revealed that in the control condition, participants were more likely to choose the luxury options than the pro-environmental options, whereas, in the experimental group, where participants had been primed with the status motivation story, they were more likely to choose the pro-environmental option. The authors concluded that ‘activating status motives led people to increase the likelihood of choosing pro-environmental green products over more luxurious non-green products’ (2010, p.396).

This study tells us that pro-environmental consumer choice can be related to status and that it is possible to prime this form of behaviour. Griskevicious et al. (2010) then considered the effects of social context on this, by investigating the choice of ‘luxurious non-green products’ and ‘green products’ in a private setting (shopping online) versus a public setting (shopping in a supermarket). Participants again read the same story designed to prime status motivation with a control group reading a story unrelated to status motivation. For the private setting, participants were told to ‘Imagine that you are shopping online by yourself at home’. In the public setting, participants were told to ‘Imagine that you are out shopping at a store’. Participants were then asked to ‘indicate their preferences between three green versus three non-green products’. The items were ‘a backpack’, ‘some batteries’ and ‘a table lamp’. Again, each product had a ‘green’ and a ‘non-green’ alternative that were similar in price and manufactured by the same company. The results revealed that when participants in the priming condition were told to imagine that they were shopping in public, they showed an increased preference for green products compared to the control condition. However, when shopping in the private condition, participants in the priming condition actually showed a decrease in the preference for green products. The authors conclude that 'when purchases are being made in private - when reputational costs were not salient - activating status motives appears to somewhat increase the attractiveness of luxurious (non-green) products… status motives increased attractiveness of pro-environmental products specifically when people were shopping in public. When people were shopping in private, however, status motives increased desire for luxurious, self-indulgent non-green products' (2010, p.397). In other words, when people were aware that their choices could be observed by others and had the possibility of influencing other people's perception of them, they were more likely to choose pro-environmental products.

In the next study of this series, Griskevicius et al. (2010) investigated what happens to behavioural choice when the green and non-green items are priced differently. They found that the experimental participants were more likely to choose green products when they were more expensive than the non-green products. However, when the non-green products were more expensive than their green counterparts, and, in addition, status motivation was activated, the green items were selected less often than their more expensive non-green counterparts. In other words, price is more effective than environmental features in signalling status.

The research by Griskevicius and his colleagues suggests that costly signalling theory may well underpin pro-environmental behavioural choice, particularly in the presence of others. However, at the same time, the results of their final study highlights the plausibility of the second broad hypothesis outlined earlier. Environmental features may drive more sustainable choices in the presence of others (because of the relationship between apparent pro-social behaviour and status), but other features like cost may be equally or more important (because of the relationship between resource and status). In other words, both broad hypotheses are plausible in the light of the existing empirical evidence.

When environmental choices are considered at a more specific level (for example, organic/eco versus carbon footprint), there are a number of other important considerations. Some environmental labels, like 'organic', have been around for a considerable time and are well recognized. Organic farming began in the early part of the 20th century (Padel, 2001), pioneered by Sir Albert Howard, who encouraged 'natural farming techniques'. However, it was not until 1940 that the term 'organic' was actually given to this form of natural farming when Lord Northbourne used the word in his book 'Look to the Land' (1940). The early 1990s saw an increase in the popularity of organic products, which coincided with the encouragement of organic farming by the European Union. Since then the popularity of organic food has risen and its total sales in the last decade have quadrupled globally (Czarnezki, 2011). It was not until 2002 that an official label was introduced in the U.S. by the U.S. Department of Agriculture (Heckman, 2006). This label is now used in over eighty countries worldwide (United States Department of Agriculture, 2015). As well as carrying an organic label certifying that the particular item has been farmed without the use of chemicals, organic food is usually packaged in such a way that the design will 'carry graphic design work characteristic of organic produce for effective advertising' (International Trade Centre, 2012, p.4). Typically, the word 'organic' is displayed in large lettering on the front of the packaging so that it is obvious to the consumer that the product is indeed organic.

Similar to organic products, the packaging of 'eco' products, or products that are 'ecologically friendly' are usually designed with large lettering and graphics that make it obvious to the consumer that the particular item is better for the environment describing the item as 'Eco' or 'Ecologically friendly'. Eco products have less impact on the environment than their standard equivalent and although products that are labelled as 'Eco' do have to meet certain standards, they are not regulated by the government so the standards are likely to be less stringent than they are for organic labelling (Loureiro, McCluskey & Mittelhammer, 2001).

‘Organic’ or ‘eco’ labels may well be selected more when shopping with friends because the labels are (culturally) familiar and thus will have high signalling value. Other environmental labels may, however, have much less of an impact. For example, Gadema and Oglethorpe (2011) asked 428 participants to rank order the attributes displayed on packaging that they feel would benefit them most when shopping. The three most important attributes were information about ‘quality and taste’, ‘nutritional information’ and ‘price’. The three least important attributes were ‘information about food miles’, ‘information about the carbon footprint of the product’ and the ‘attractiveness of the packaging’. Obviously, information about food miles and carbon footprint are critical if individuals are going to prioritise more sustainable forms of shopping, but they may currently not be perceived as that important.

Moreover, Upham, Dendler & Bleda, (2011) showed that there was little understanding of the concept of the carbon label amongst organised focus group sessions. They found that, although *all* of their participants in the focus groups were aware of carbon footprint labels, the vast majority of their participants were confused about the carbon emission measurement included on the label. Participants showed their lack of understanding of the contents of the carbon footprint labels with comments such as ‘when you see stuff like 12 kg and 55 kg, how much is that, what does that actually mean? I can't quantify it in any way' and 'I've no idea what 260 g of carbon looks like… I have no idea what the impact of 260 g is like' (Upham et al., 2011, p.352). Upham et al concluded that 'The public found it very difficult to make sense of labelled emissions values without additional information' (2011, p. 348).

As mentioned in previous chapters, Beattie et al. (2010) investigated visual attention to carbon labels on actual products in an eye-tracking study. Participants' eye gaze was analysed whilst they viewed images of a variety of real products presented on a computer screen. Each product had a carbon label clearly displayed on the front or back. It was found that the carbon label was not of immediate concern to most of the experimental participants. It was also found that the experimental participants showed little visual attention to the carbon label in the first 5 seconds of viewing (roughly the time taken to make a selection in a supermarket, see Louw & Kimber, 2007; Young, 2004). For example, only 5.2 frames of 40 millisecond gaze was directed to the carbon label in the case of the detergent product, which is only 4% of the total 5 second period (see also Beattie, 2012; Beattie & McGuire, 2015).

Thus, there is empirical evidence that organic or eco products may have labels that are familiar to people, and generally understood (Loureiro et al., 2001), and therefore could potentially signal social status in the way that luxury or branded items do (albeit on a different dimension).

However, the social signalling value of carbon footprint information is likely to be much less potent, partly because the concept is poorly understood (Upham et al., 2011) and partly because it elicits only limited visual attention, therefore it will not have the same social signalling value as other labels (see Chapter 2, and see also Beattie, 2010; Beattie et al., 2011; Beattie, 2012; Beattie & McGuire, 2015).

One possible implication of this is that organic or eco brands may be chosen more by consumers whilst shopping with others (like well-known brands and luxury items) as a result of costly signalling theory (because they are more expensive and because they signal pro-social behaviour). However, in terms of costly signalling theory, carbon footprint is less likely to influence consumer choice when shopping with others. This is because the concept is not well understood by individual consumers, and because there is little correlation between carbon footprint and price and therefore carbon footprint cannot signal resource (like luxury, well-known, organic and eco brands). For the sake of clarity, the specific hypotheses are detailed below:

H1: Participants will be more likely to choose both well-known brands and luxury brands when shopping with friends than when shopping alone in comparison to value brands.

H2: Given that organic/eco products are well recognised and can signal pro-social status and increased resource, participants will be more likely to buy them when shopping with friends compared to value brands.

H3: Organic/eco brands should behave in a similar fashion to well-known brands and luxury brands (given their associative links with social status), and, therefore, there should be no difference in terms of the choice of organic/eco brands versus popular/luxury brands when shopping with friends compared to shopping alone.

H4: The choice of high/low carbon footprint products is unlikely to be affected by whether a consumer is shopping alone or with friends. This is because most participants will have little faith that their friends will recognize and understand the carbon label, therefore, its choice will have little value in signalling social status.

## 5.2 Method

### *5.2.1. Participants*

As in Chapter 3 and 4, there were fifty participants recruited to take part in this experiment (19 males and 31 female). The mean age of participants was 27.7 ranging from 18 to 67. Participants included staff and students from Edge Hill University (n= 34), and members of the public (n=16). Each participant received £5.00 for taking part in the experiment. Ethical approval was obtained from the Edge Hill University Research Ethics Committee (UREC). As in the previous chapters, participants were informed about the test procedure and told that they could withdraw at any point during the experiment and that their data could be removed from the study and destroyed at any point up to three weeks after they had taken part in the experiment (no participant asked for their data to be removed and destroyed). They were fully debriefed at the end of the study.

### *5.2.2. Shopping task*

The shopping task procedure mirrored that of the shopping task procedure in Chapter 4 however the shopping conditions were different in this experiment. Each participant was asked to select a choice of items under two shopping conditions - shopping alone ('Imagine yourself shopping alone in a supermarket') and shopping with friends ('Imagine yourself shopping in a supermarket - you are shopping with friends'). Unlike the shopping task in the previous chapter, there was no time pressure in either condition. As before, each condition was randomised between participants to control for possible order effects. Participants had to select 10 products in total for condition 1, and 10 products in total for condition 2. Once they had chosen their first product, they were then asked to select the next and so on. The order in which they had to choose the products was randomised across both conditions. Each participant was asked to complete the shopping task for all products under one condition before moving on to the next condition.

## 5.3. Results

### *5.3.1. Consumer choice whilst shopping alone: descriptive statistics*

The first analysis focused on the relationship between brand and consumer choice whilst shopping alone (see Figure 5.1). It was immediately apparent that the brand chosen most frequently when shopping alone was the well-known brand (38.0% of all selections) followed by the value brand (32.4%), followed by the organic/eco brand with 17.0% and lastly the luxury brand at 12.6%.

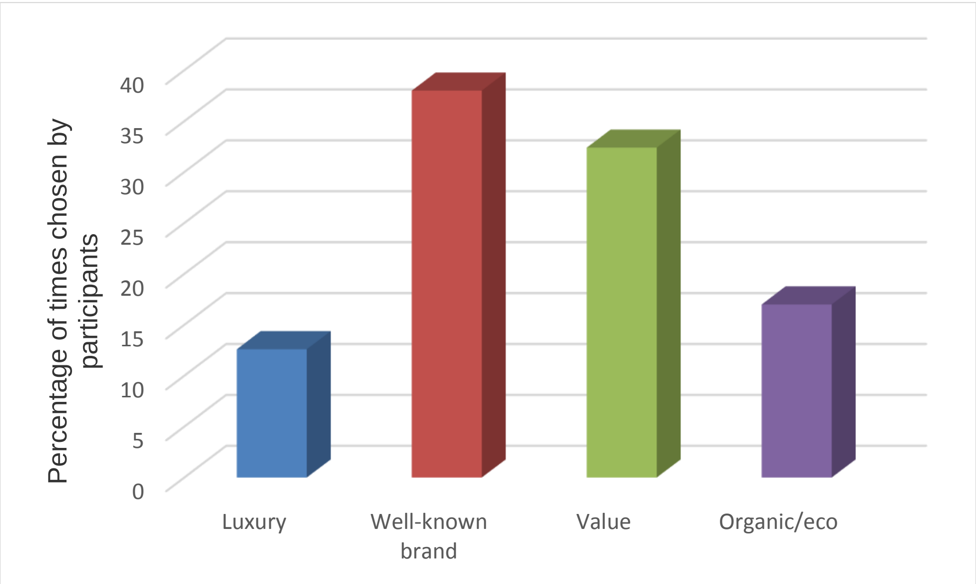



Figure 5.1: Consumer choice whilst shopping alone.

There was, however, considerable variation from product to product. So for example, when it came to products like soup (Heinz), toilet roll (Andrex) and fabric conditioner (Lenor) the well-known brands were chosen in over 50% of all occasions, and these well-known brands dominated consumer choice. However, in other cases the well-known brands were not chosen so frequently. So, for example, in the case of coffee, the well-known brand (Lavazza) was chosen only in 18% of cases; in the case of orange juice the well-known brand (Princes) was chosen in only 24% of cases. Value brands seemed to be selected more frequently when it came to washing-up liquid (62%) and bran flakes (52%). Organic/eco brands were selected most frequently when it came to coffee (32%) and ice cream (24%), but note that the well-known and value brands are still selected more frequently in the case of these products. Luxury brands were selected most frequently when it came to orange juice (32%) and ice cream (28%). In both of these cases these were the top selection (see Table 5.1).

Table 5.1: Brand choice across all products shopping alone (percentage choice).

| | Luxury | Well-known brand | Value | Organic/ eco |
|---|---|---|---|---|
| Bran Flakes | 0% | 26% | 52% | 22% |
| Bread | 10% | 44% | 28% | 18% |
| Cheese | 2% | 44% | 36% | 18% |
| Coffee | 14% | 18% | 36% | 32% |
| Fabric Conditioner | 20% | 56% | 12% | 12% |
| Ice cream | 28% | 26% | 22% | 24% |
| Orange Juice | 32% | 24% | 30% | 14% |
| Soup | 16% | 58% | 14% | 12% |
| Toilet roll | 4% | 58% | 32% | 6% |
| Washing up liquid | 0% | 26% | 62% | 12% |
| Mean | **12.6%** | **38.0%** | **32.4%** | **17.0%** |

### *5.3.2. Consumer choice whilst shopping with friends: descriptive statistics*

Interestingly, when shopping with friends, the well-known brands became even more popular. Well-known brands were now selected in 41.0% of all cases compared to 38.0% when shopping alone. Value brands were, however, selected much less frequently when shopping with friends - 20.4% compared to 32.4% when shopping alone. Organic/eco and luxury brands were both selected more frequently when shopping with friends (19.4% versus 17.0% for organic/eco and 19.2% versus 12.6% for luxury). See Figure 5.2.

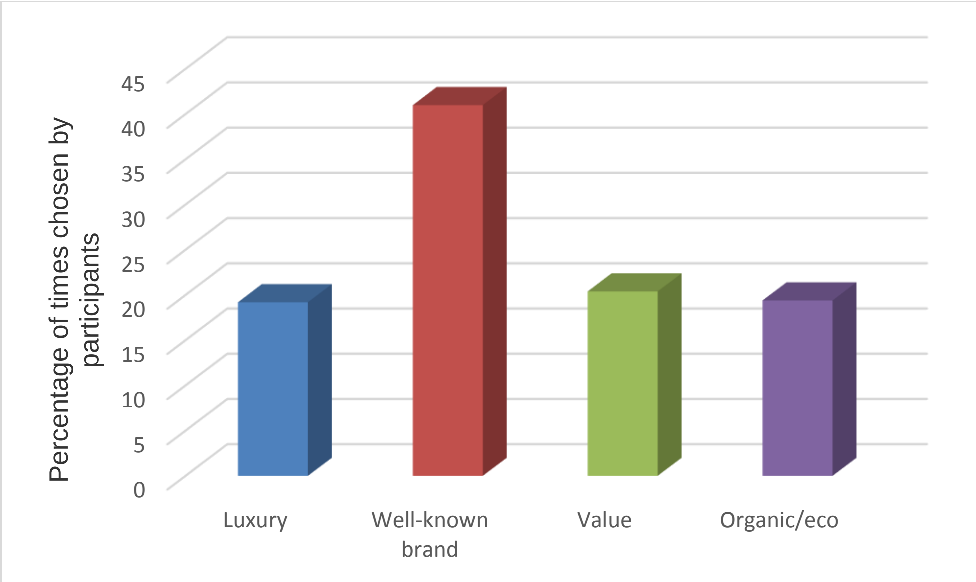



Figure 5.2: Consumer choice whilst shopping with friends.

These results reveal a number of things. Firstly, it emphasises the power of advertising for well-known brands (Hovis, Kellogg's, Heinz etc.), in that these brands are immediately recognisable and accessible under both conditions – shopping alone and shopping with friends. The well-known brand of soup was selected most frequently of all products (74%) and the same for toilet roll (58%). See Table 5.2. Secondly, it demonstrates that value brands are selected much less frequently when shopping with friends (20.4%). However, the luxury, the well-known and the organic/eco brands are all selected more frequently when shopping with friends than when shopping alone. This would seem to suggest that when we change the social context of consumer choice, it does influence consumer behaviour - some brands become more popular but the value brand, becomes much less so.

Table 5.2: Brand choice across all products whilst shopping with friends (percentage choice).

| | Luxury | Well-known brand | Value | Organic/eco |
|---|---|---|---|---|
| Bran Flakes | 6% | 44% | 34% | 16% |
| Bread | 12% | 54% | 12% | 22% |
| Cheese | 8% | 60% | 16% | 16% |
| Coffee | 30% | 12% | 28% | 30% |
| Fabric Conditioner | 22% | 48% | 12% | 18% |
| Ice cream | 48% | 18% | 8% | 26% |
| Orange Juice | 36% | 18% | 16% | 30% |
| Soup | 14% | 64% | 8% | 14% |
| Toilet roll | 10% | 62% | 22% | 6% |
| Washing up liquid | 6% | 30% | 48% | 16% |
| Mean | **19.2%** | **41.0%** | **20.4%** | **19.4%** |

### *5.3.3. Consumer choice: inferential statistics*

The first comparison (see hypothesis 1) considers choice of well-known brands versus value brands when shopping alone and when shopping with friends, as shown in Figure 5.3. This difference was significant ($X^2 = 11.2$, d.f. = 1, $p < 0.001$, two tailed test) - in other words, when shopping with friends compared with shopping alone, consumers were significantly more likely to choose well-known brands and significantly less likely to choose value brands.

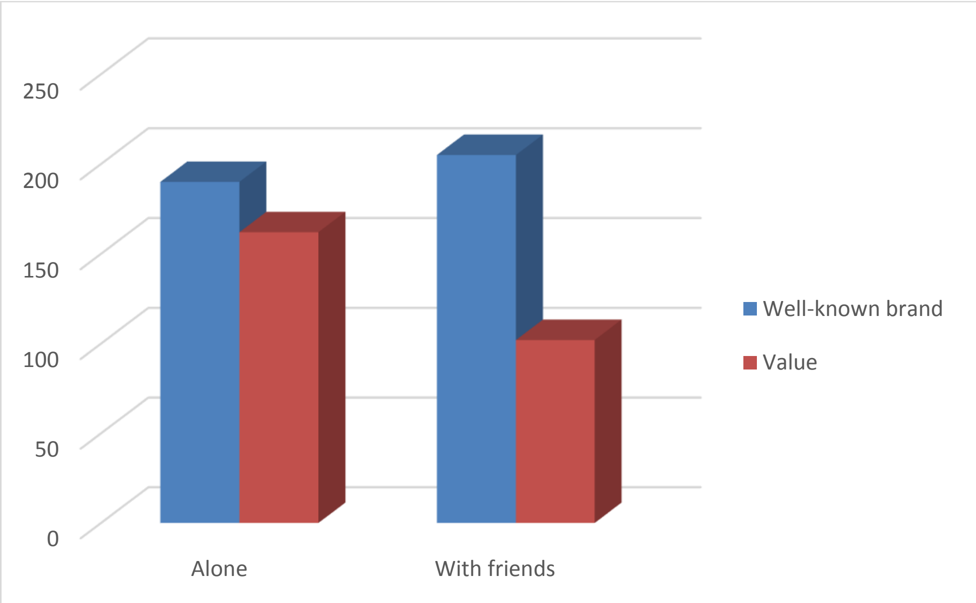



Figure 5.3: The relationship between choice of well-known brands versus value brands when shopping alone or shopping with friends.

The next comparison focused on value brand versus the luxury brand when shopping alone and when shopping with friends (see Figure 5.4). Again, the comparison was highly significant ($X^2 = 19.1$, d.f. = 1, $p < 0.001$, two tailed test). What is very striking about Figure 5.4 is that when shopping with friends, value products and luxury products (which, of course, differ enormously on price) were chosen (approximately) equally often.  This was not the case when shopping alone, where the choice of value products predominates.

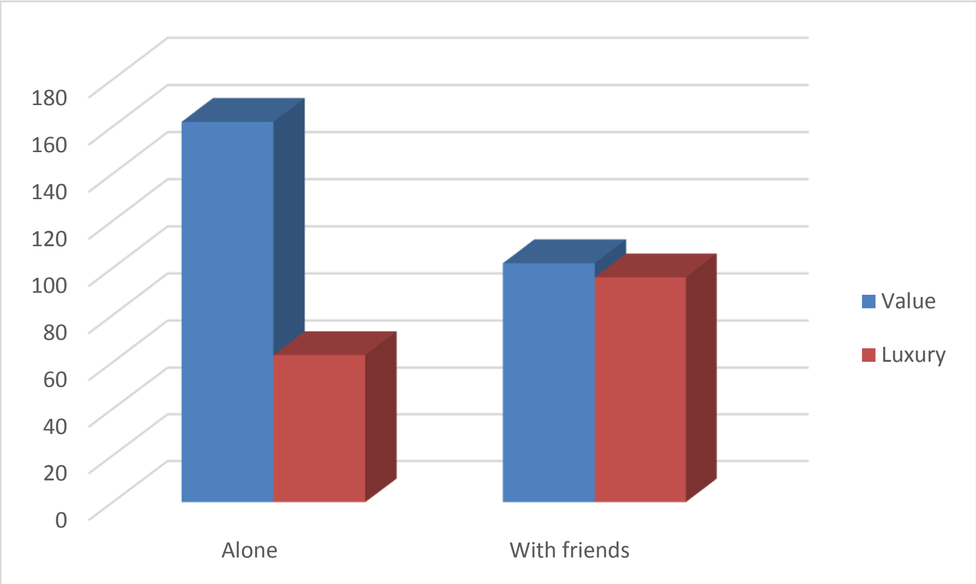



Figure 5.4: The relationship between the choice of value brands versus luxury brands when shopping alone or shopping with friends.

The next analysis considers the choice of organic/eco versus value brand when shopping alone and when shopping with friends (see hypothesis 2).  This comparison was again significant ($X^2$ = 9.44, d.f. = 1, $p$ < 0.01, 2-tailed test).  It is clear from Figure 5.5 that this was largely attributable to the marked drop in the selection of value brands when shopping with friends.  There was little difference in the selection of organic/eco products, although they were selected slightly more frequently when people were shopping with friends.

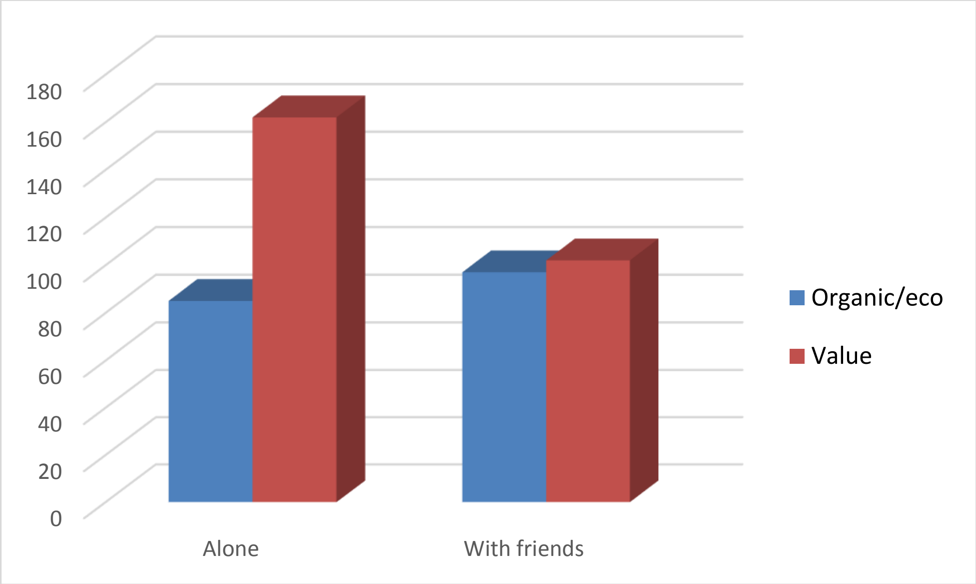



Figure 5.5: The relationship between the choice of organic/eco brands versus value brands alone or shopping with friends.

A number of additional statistical comparisons, however, revealed no significant differences in terms of the comparisons made. So, for example, in the case of organic/eco brands versus well-known brands (see hypothesis 3) there was no significant difference in underlying distribution ($X^2$ = 0.09, d.f.=1, n.s.). See Figure 5.6.

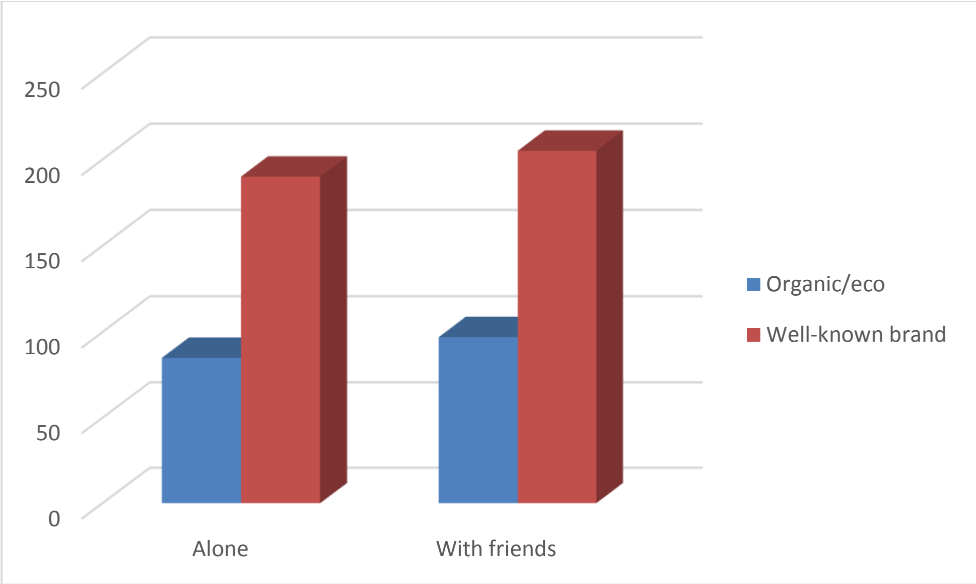



Figure 5.6: The relationship between the choice of organic/eco brands versus well-known brands when shopping alone or shopping with friends.

Similarly, with organic/eco brands versus luxury brands there was no significant difference ($X^2$ = 1.73, d.f. = 1, n.s.). See Figure 5.7.

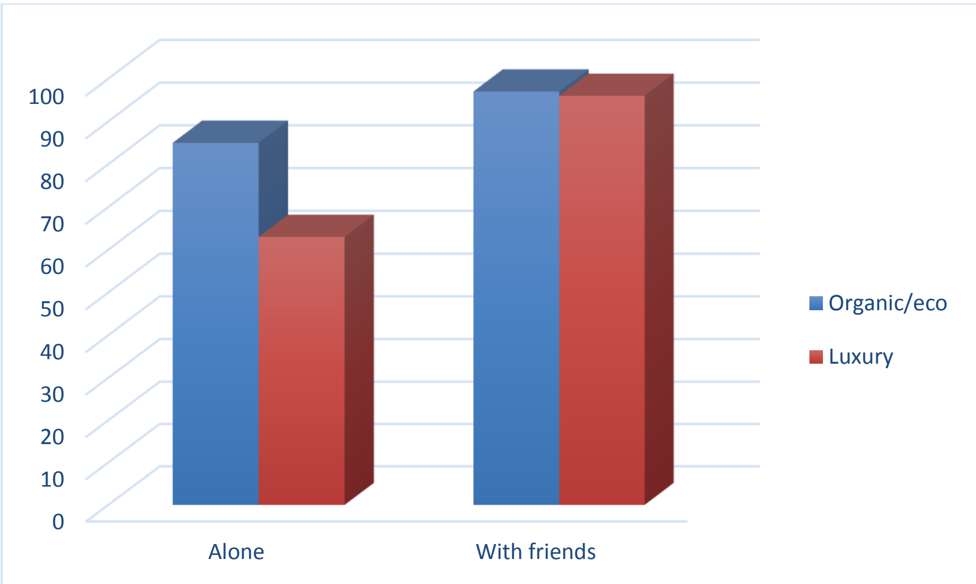



Figure 5.7: The relationship between choice of organic/eco brands versus luxury brands shopping alone or shopping with friends.

A similar pattern emerged when the analysis focused on the relationship between well-known and luxury brands when shopping alone and when shopping with friends. In both cases, participants were more likely to choose these brands when shopping with friends ($X^2$ = 3.4, d.f. = 1, n.s.).

### *5.3.4. Does the social context of shopping influence the choice of high carbon or low carbon footprint products?*

The number of high and low carbon footprint items chosen are laid out in Table 5.3. 'HH' represents the product with the highest carbon footprint assigned (actual carbon footprint value plus 10%), 'H' represents the product with a high carbon footprint (the actual value), 'L' represents the low carbon footprint product (half the actual value), and 'LL' represents the lowest carbon footprint (0.5 of the actual value minus 10%).

Table 5.3: Number of high and low carbon items chosen by each participant when shopping alone or with friends.

| | **Alone** | | | | **With Friends** | | | |
|---|---|---|---|---|---|---|---|---|
| | HH | H | L | LL | HH | H | L | LL |
| **Total** | **99** | **110** | **155** | **136** | **113** | **129** | **147** | **110** |

From Table 5.3 and 5.4 (below) it is clear that the carbon footprint of the products did have some effect on consumer choice, but not in the way that organic/eco labels did. Table 5.4 shows that the experimental participants chose low carbon items (L) a mean of 3.10 times when shopping alone and a mean of 2.94 times when shopping with friends. They chose very low carbon items (LL) a mean of 2.72 times when shopping alone and a mean of 2.20 times when shopping with friends. The choice of low carbon items showed the *reverse* pattern to that shown by organic/eco products in that low carbon items were selected *more often* when shopping alone; organic/eco products were chosen more frequently when shopping with friends.

Table 5.4: Mean number of high and low carbon items chosen by each participant when shopping alone or with friends.

| | **Alone** | | | | **With friends** | | | |
|---|---|---|---|---|---|---|---|---|
| | HH | H | L | LL | HH | H | L | LL |
| **Mean** | **1.98** | **2.20** | **3.10** | **2.72** | **2.26** | **2.58** | **2.94** | **2.20** |

The first statistical comparison here considers the choice of high carbon footprint products (H) versus low carbon footprint products (L) when shopping alone and when shopping with friends (see Figure 5.8). When shopping alone, the low carbon footprint products were chosen more frequently than when shopping with friends, whereas the high carbon footprint products were chosen less frequently than when shopping with friends. However, this difference was not significant ($X^2$ = 1.50, d.f. =1, n.s.).

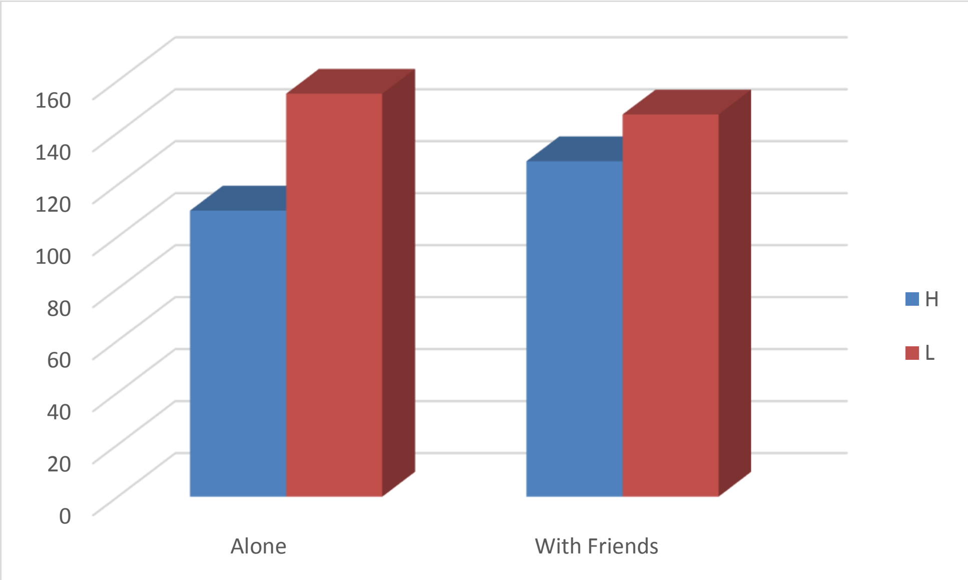



Figure 5.8: The relationship between the choice of high carbon products (H) versus low carbon products (L) when shopping alone or shopping with friends.

The next comparison focused on the selection of very high carbon footprint products (HH) and the very low carbon footprint products (LL) when shopping alone and when shopping with friends. Figure 5.9 reveals that when shopping with friends very high and very low carbon products were chosen equally often, but the participants were more likely to select the very low carbon products when shopping alone. This difference, however, failed to reach significance ($X^2$ = 3.36, d.f. = 1, n.s).

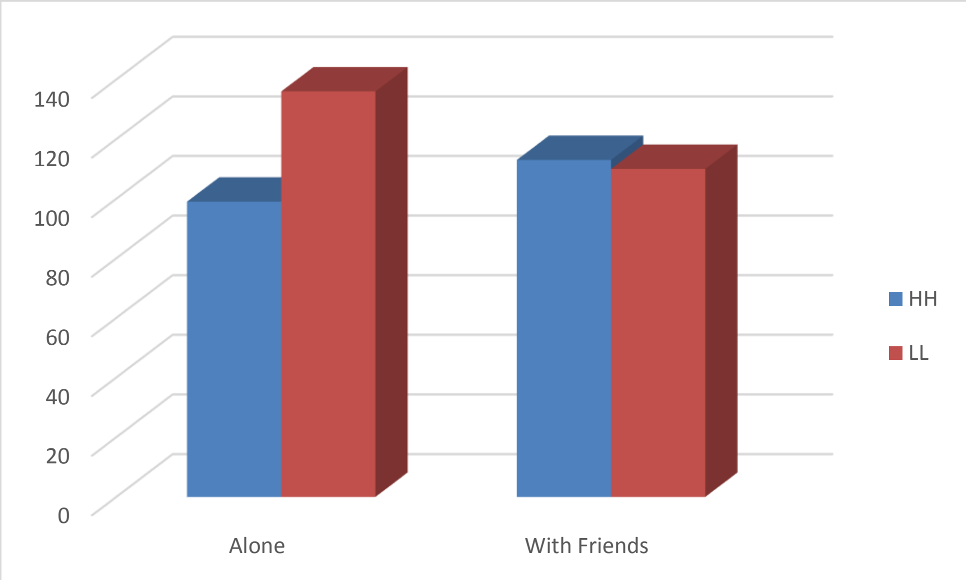



Figure 5.9: The relationship between the choice of very high carbon products (HH) versus very low carbon products (LL) when shopping alone or shopping with friends.

The next analysis focused on a comparison of any high carbon footprint products (H+HH) with any low carbon footprint products (L+LL), in other words the full set of products (thus increasing the N). See Figure 5.10. Here, the results did reach significance ($X^2$ = 4.52, d.f. = 1, $p$ < 0.05, 2-tailed), suggesting that low carbon products were significantly more likely to be chosen when shopping *alone* than with friends (contrary to hypothesis 4).

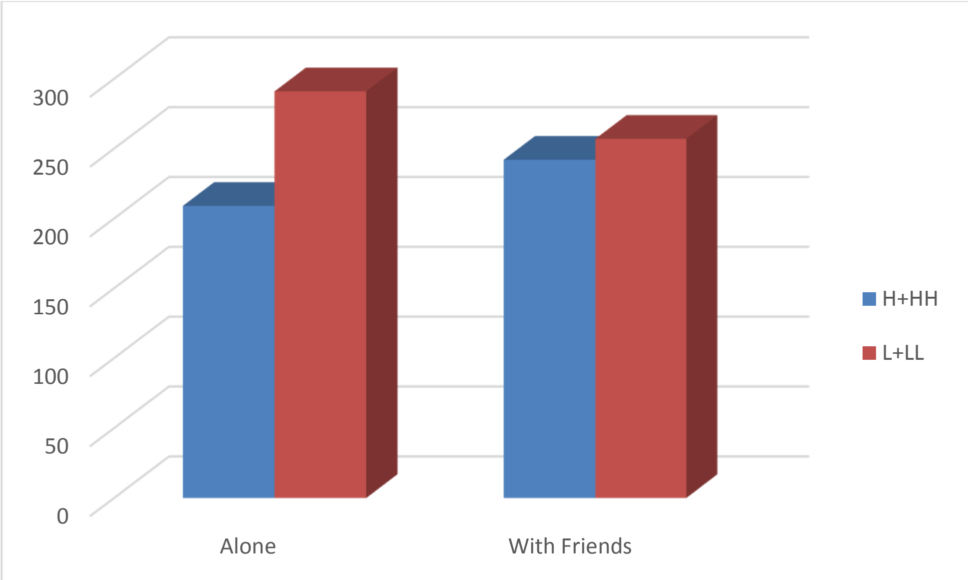



Figure 5.10: The relationship between the choice of any high carbon products (H+HH) versus any low carbon products (L+LL) when shopping alone or shopping with friends.

## 5.4. Discussion

The IPCC have clearly identified a number of aspects of human activity that impact on climate change. These include such things as population size and land use patterns that will be either difficult or impossible to change in the time available, and 'lifestyle' that could potentially be changed. 'Lifestyle' involves many of the behavioural choices that we make in our everyday lives. Of course, 'lifestyles' can be changed (although anything that is an ingrained habit requires careful consideration, see Beattie & McGuire, 2014), but only if we understand them. This essentially provided the rationale for the present study. This study was an attempt to understand more about consumer choice and how it links to issues to do with the environmental characteristics of products in the context of all of the other relevant features that differentiate products from one another (like brand, value, price etc.). ‘Lifestyle’ has also been identified as one of the common *enabling factors* that can underpin both adaptation and mitigation responses to climate change, according to the IPCC. But for this to be true, it is argued that we need a much better understanding of the variables that influence lifestyle choices, and particularly those choices with a direct bearing on GHG. In the present chapter, one simple question is empirically investigated, namely how does the presence of others, whilst we are shopping, influence our choice of more sustainable products? The IPCC have repeatedly highlighted a number of policy instruments for changing behaviour, including product labelling. However, when products are labelled (either in terms of their environmental consequences for example, ‘eco’/‘organic’ etc. or in terms of their carbon footprint) how does the presence of others people affect whether the ‘good’ products are selected or not?

The basic hypothesis in this chapter was that patterns of consumption are linked to social status (and that the choice of pro-social goods, just as with expensive goods, can reflect our social status), and by drawing upon ‘costly signalling theory’, it enables the consideration of how consumer choice can reflect and reify social status. Statistical comparisons were in terms of consumer choices made whilst shopping alone or whilst shopping with friends.

This study found that shopping with friends has a significant effect on consumer choice. We are more likely to select well-known brands and luxury products when shopping with friends. This, of course, makes perfect sense from a costly signalling theory perspective – by purchasing these well-known and luxury brands we signal to our friends that we have the resource to purchase these kinds of items. Similarly, we are more likely to purchase organic or eco brands when shopping with friends. Again, this is interpretable in terms of costly signalling theory, which would posit that we signal our pro-social orientation through our consumer selections. Organic/eco products seem to have some of the same social properties that well-known brand and luxury brand have in terms of status, and the organic/eco labels seem to communicate this effectively. However, carbon footprint labels did not seem to work in this way. The experimental participants were significantly more likely to choose low carbon items (signalled using various carbon labels) when shopping alone than when shopping with friends, indeed exactly the opposite of the other better-known environmental labels. This is an important and potentially very worrying finding given the emphasis placed on features like carbon labels to guide more sustainable consumer behaviour by the IPCC and others. Perhaps these labels are not obvious enough to allow social signalling, or perhaps people think that others around them will not be able to evaluate properly carbon footprint (Upham et al., 2011). The consumer selecting low carbon products whilst shopping with friends will not, therefore, acquire the elevation in social status that they desire.

These results of the present study could potentially have a number of important implications. It is pointless for the IPCC or anyone else to identify enabling factors like product labelling as a driver of lifestyle change, in the fight against climate change, if we do not understand how these labels actually work. We already know that carbon labels attract little visual attention (Beattie et al., 2010; Beattie, 2012; Beattie & McGuire, 2015) and that they are poorly understood (Upham et al., 2011; Zhao & Zhong, 2015), but now we know that carbon labels do not work *socially*. There is no social cachet, no elevation in social status, no drive to select these items more frequently whilst shopping with friends. To put it crudely, carbon labels do not operate like peacock feathers but we would like to tentatively suggest that they should, and this issue of the social signalling value of these labels needs careful attention.

Of course, this study was, in reality, a simulation of actual consumer behaviour. However, it is the kind of simulation that has been used many times in the past to successfully identify some of the core factors that drive forward patterns of consumption (see for example Wang & Lang, 2015). Perhaps in the future we could design an intervention to promote carbon labels and then use this particular kind of experimental approach to test for any effects (and follow it up with more ecologically-sound ethnographic approaches). Nevertheless, the goal of future research in this area should be clear. If there is little social signalling value of carbon labels at the present time (even when these labels are colour-coded, as they were in the present study, in order to make it easier for a low carbon choice to be made, see Beattie, 2010; Vanclay et al., 2011), then we need to focus on this social dimension in order to make carbon labelling a success. We need to either change the labelling scheme so that it is more salient to consumers generally and/or rethink the whole packaging design of low carbon products, as well as work on the *values* attached to it. After all, if social signalling is one major influence on consumer choice – then people need to be persuaded that low carbon is both recognised and appreciated by others in order for it to have the social cachet that is currently missing.

Perhaps supermarkets could introduce their own 'low carbon' range in the same way that they have their own organic, luxury and healthy ranges. This would enable the consumer to 'signal' to others, through the obvious packaging, that they are buying low carbon, hinting to others of their effort and commitment in reducing their own personal carbon footprint. Alternatively, perhaps supermarkets should introduce low carbon aisles where they only shelve low carbon footprint products - this would enable consumers to display (again, very publically) their interests in the long-term future of our planet through the aisles they inhabit and the choices that they make. Supermarkets could even give priority to those who have bought low carbon items and introduce an express low carbon check-out. After all, they already have check-outs for 'ten items or less'. By introducing an express checkout for low carbon customers, it would not only make buying low carbon more convenient, it would allow the consumer to be publically viewed by others as being 'green'. Giving priority to consumers in this way could slowly make buying low carbon products more appealing.

Of course, there are broader implications as well, regarding behaviour change. The advertising industry, for many decades, has conditioned us to believe that high status products, such as fast cars and luxury holidays, symbolise wealth and success and that we need them (see Dichter, 1960; Packard, 1957). However, this 'high carbon' lifestyle that many aspire to is the polar opposite of a sustainable lifestyle. Perhaps then, it is the next generation that we need to target whilst their *underlying* attitudes are still developing. But it will not be enough just to transmit the basic information about carbon footprint, rather we need to change our underlying values about it. We need to make low carbon lifestyles fashionable. We need the future generation to grow up with aspirations about leading a low carbon lifestyle in the same way that the current generation were brought up with aspirations of living the ‘luxurious’ and ‘ostentatious’ high carbon lifestyle.

There have been many educational programmes that have targeted school-children, in the hope that education could change both attitudes and behaviour. Although knowledge about climate change is the strongest predictor of *intention* to engage in pro-environmental behaviour (Scannel & Grouzet, 2010; Bord, O’Connor & Fisher, 2000; Lazo, Kinnell & Fisher, 2000), education alone is usually not enough (Schultz, 2015). It is the emotional responses of the next generation to aspects of the environment, which we need to change, if we want them to *act* appropriately (see Damasio, 1994). Perhaps, children could then take on the role of the educator and educate their parents about climate change and the importance of our ‘lifestyle’ choices. Instead of children taking on their parent’s attitudes, maybe one day it could be the other way around. But, of course, such a solution takes time, and that is perhaps the most worrying aspect of this whole thing.

# Chapter 6: Can implicit and explicit attitudes be modified using film and does this affect consumer choice?

## 6.1. Introduction

The thesis thus far has explored the relationship between both self-reported attitudes, and implicit attitudes and consumer choice. The results presented in this thesis seem to suggest that self-reported attitudes are good predictors of self-reported environmental and sustainable behaviour but not *actual* behaviour, such as visual attention to carbon labels (see Chapter 2) or actual selection of products marked with carbon labels (Chapter 3). However, there is some relationship between *implicit* attitudes and actual consumer choice (using the experimental analogue developed in this thesis), in that it was found that colour-coded carbon footprint information did have an influence on consumer choice, even under time pressure, but only for those consumers with a strong positive implicit attitude to low carbon. Unlike some domains like race (Beattie, 2013; Beattie, Cohen & McGuire, 2013) the relationship between implicit attitudes to carbon footprint and carbon behaviour is relatively weak, but nevertheless *any* relationship in this domain needs to be identified and exploited as a matter of extreme importance. A focus in the future just on self-reported attitudes, using the Likert scale and similar measures, may simply lead to complacency and error.

One logical consequence of this is that we must consider how we might change both implicit and explicit attitudes to more sustainable lifestyles. This is clearly a matter of considerable urgency. Leading scientists and government bodies are unanimous in arguing that we need to change our behaviour if we are to ameliorate the effects that climate change is having on our planet, and if we do not adapt our behaviour, these conditions will only get worse, ‘People are experiencing the significant impacts of climate change, which include changing weather patterns, rising sea levels, and more extreme weather events. The greenhouse gas emissions from human activities are driving climate change and continue to rise. They are now at their highest levels in history. Without action, the world’s average surface temperature is projected to rise over the 21st century and is likely to surpass 3 degrees Celsius this century - with some areas of the world expected to warm even more’ (United Nations, 2017).

In this chapter, the issue of whether we can modify attitudes and behaviour using film will be explored. One possible hypothesis is that we must produce change in our underlying implicit attitudes to carbon lifestyles (and products) to affect changes in carbon behaviour of the right magnitude and with the right temporal quality - i.e. not temporary in nature (see Beattie, 2013; Gregg, 2008). An alternate hypothesis would be that we must change both explicit *and* implicit attitudes to carbon lifestyles to affect changes in carbon behaviour through consumer choice (this would seem to be one possible implication of Greenwald et al.'s, 2009 meta-analysis). A third hypothesis would be that, although measures of attitude (or 'predispositions to act'), are a useful and important concept (indeed at the very core of psychology), the critical issue for the current global warming crisis is changing carbon behaviour (through patterns of consumer choice), regardless of any explanatory resource that we might want to evoke in order to explain it (like the concept of 'attitude'). It is behaviour change that is most significant (indeed the only thing that is significant) because it is that (and only that) which will impact on greenhouse gas emissions and global warming. This line of reasoning led to this final empirical investigation. Can we demonstrate change in explicit and implicit attitudes and/or change in behaviour through experimental interventions? How do any changes in attitude and/or behaviour interconnect?

Behaviour change in this area is not necessarily going to be easy or straightforward. There still seems to be some confusion amongst the general public about the seriousness of climate change, which is perhaps not surprising given the conflicting reports in the media (Boykoff & Boykoff, 2004; Boykoff, 2007). There is also confusion amongst the general public about the science behind climate change and how the facts and figures presented to them should be interpreted (Lowe et al., 2006; Pidgeon & Fischhoff, 2011**)**. The government has attempted to make climate change messages more comprehensible to the general public through a series of media campaigns (Act On $CO_2$, 2007). The Department of Energy and Climate Change spent £6m on a campaign, which backed scientists' opinions that global climate change is caused by human behaviour. Yet after just one week of the first airing of the television campaign, the advertising regulator had received over 200 complaints from viewers saying that the adverts used in the campaign were 'misleading'. The campaign was heavily criticized for using fear to promote change. In addition, some viewers claimed that the whole basis of the campaign about anthropogenic climate change 'was not supported by the available empirical evidence' (Corner & Randall, 2011). Clearly, there is a job to be done.

Another attempt at influencing how the public perceive climate change has been through film. Over the last fifteen years there has been a number of films made about climate change, be they fictional films such as 'The Day After Tomorrow' (2004), 'Lost City Raiders' (2008), 'The Age of Stupid' (2009) or documentary-style films including 'The 11th Hour' (2007), 'Merchants of Doubt' (2014) and more recently 'Before the Flood' (2016). Each of these films were made, not just to entertain or educate, but to raise awareness of climate change in the hope that people would (ultimately) change their behaviour. However, in order for a climate change campaign or film to have the desired response (i.e. by raising awareness, changing attitudes, changing behaviour) there are a number of aspects that need to be considered. Climate change needs to be communicated *realistically* and *accurately* (see Lowe et al., 2006). If the representation of climate change is unrealistic, it could, quite possibly, be interpreted as too improbable and therefore have the opposite effect. The threat depicted in the specific campaign or film (in this example the threat of climate change) needs to be *felt* by the viewer (van der Linden, Maibach & Leiserowitz, 2015; Witte, 1992, 1998). The campaign or film needs to target the viewer on an emotional level if direct action is to follow (consider, for example, the work of Damasio (1994) who has explored how emotion can affect behaviour in other risk-based domains, like gambling). Targeting the emotions of the viewer would seem to be a crucial component of behaviour change. According to Baumeister, Vohs, DeWall and Zhang 'Conscious emotion commands attention and stimulates analysis, learning, and adaptation, often occurring in the aftermath of behavior and its outcomes' (2007, p.172). This is echoed by Pidgeon and Fischhoff (2011) who say that 'Emotion creates the abiding commitments needed to sustain action on difficult problems, such as climate change. It motivates climate scientists, as well as their audiences and critics' (2011, p.38). They say that 'appropriately framed emotional appeals can motivate action, given the right supporting conditions, in particular a sense of personal vulnerability, viable ways to act, feelings of personal control and the support of others' (Pidgeon & Fischoff, 2011, p.38; see also Spence & Pidgeon, 2010). But when it comes to film, the impact of the emotions does not always transfer to actual behaviour '…most films are watched and emotions felt without any apparent behavioral consequence. That is, plenty of actual emotions produce no behaviors' (Baumeister, Vohs, DeWall & Zhang 2007, p.177).

Others, however, disagree with this position and argue that knowledge is the best predictor of behaviour and that by educating people with facts about climate change then a change in behaviour will follow, 'The ultimate aim of education is to shape human behaviour' (Hungerford & Volk, 1990, p.257). Indeed, as has already been mentioned, knowledge about climate change is the strongest predictor of *intention* to engage in pro-environmental behaviour (Scannel & Grouzet, 2010; Bord, O'Connor & Fisher, 2000; Lazo, Kinnell & Fisher, 2000). Hines, Hungerford and Tomera (1987) suggest that before an individual can engage in environmentally appropriate behaviour, they must have, not just knowledge and awareness of the problem, but some knowledge of those behaviours which will bring about change. However, Howard (1999) states that when considering behaviour change, one has to consider *three* components: ‘affect’, ‘cognition’, and, of course, ‘behaviour’ - ‘The affective component consists of a person's feeling towards an object, the cognitive component consists of a person's knowledge and understanding of an object and the behavioural component involves a person's actual behaviour towards the object’ (1999, p.153). So if we are attempting to successfully change behaviour, some would argue that we need a combination of emotion *and* knowledge-based content in campaigns and films in order to achieve the desired effect.

Another critical element to any successful campaign or film is the level of the audience’s response efficacy. Response efficacy has been defined as the personal belief that one’s own *behaviour* will actually make a difference to the circumstances affected by the proposed threat. There also needs to be a belief amongst the audience that they can do something about the problem and that their personal responses will be effective in the resolution of the problem. This has been termed as self-efficacy (Witte, 1992; Rogers, 1983).

One film in particular which does appear to include these critical elements is the award-winning documentary 'An Inconvenient Truth'. Upon its release, ‘An Inconvenient Truth’ became an international success, reaching out to audiences on a global level. It is currently ranked 11$^{th}$ in the highest grossing documentary films of all time. The film was released in 2006, directed by Davis Guggenheim and written and presented by Al Gore, the former Vice-President of the United States of America. The film received an Academy Award for 'Best Documentary Film' and it also gained Al Gore a Nobel Peace Prize in 2007 (Ryan, 2007; Lin, 2013). Indeed, Al Gore was regarded as 'the single individual who has done the most to create greater worldwide understanding of the measures that need to be adopted [to counteract climate change]' (The Norwegian Nobel Committee, 2007; see also Jacobsen, 2011). Upon the release of the film, there was a sense of urgency amongst government bodies, journalists and film critics that the general public should take it upon themselves to watch the film and learn about the dangers of global warming and the effect that climate change is having on our planet. Indeed, the Chicago Sun-Times' in-house film critic, Roger Erbert, wrote 'You owe it to yourself to see this film. If you do not, and you have grandchildren, you should explain to them why you decided not to' (Erbert, 2006; see also Lin, 2013). Since its release, 'An Inconvenient Truth' has been used on a variety of national curricula to educate school-children about the causes and effects of climate change (Howell, 2014). The U.K. government sent all U.K. secondary schools a copy of 'An Inconvenient Truth' accompanied by guidance notes for teachers outlining class activities and lesson plans to use alongside the film (Department for Children, Schools and Families, 2007; Williams, 2010).

Copies were also given to 50,000 teachers in the US to educate students about the impact of climate change. It has also been used to educate students in Scotland (Leask, 2007), Northern Europe (David, 2006) and Spain (Expatica, 2007; Libin, 2007; see also Nolan, 2010).

The aim of this film was to help mitigate the effects of climate change by encouraging people to take responsibility for their own actions. The makers of the film wanted to raise awareness about climate change amongst the general public. They wanted people to have an understanding about the causes of climate change in the hope that this knowledge would subsequently change behaviour. Some evidence suggests that the film did achieve what it set out to do. A survey conducted amongst Americans shortly after the release of the film revealed that there was an increase in the number of people who believed that climate change was 'mostly caused by human activity' (The Pew Research Centre for the People and the Press, 2008; see also Jacobsen, 2011). There was also evidence of behaviour change, in that the purchasing of 'voluntary carbon offset' had increased in a two-month period in the areas where 'An Inconvenient Truth' had been shown (Jacobsen, 2011). People's 'concern' about climate change had also increased, which was in part due to the publicity in the media surrounding the film (Brulle, Carmichael & Jenkins, 2012). Indeed, Brulle et al. concluded that 'media coverage of climate change directly affects the level of public concern. The greater the quantity of media coverage of climate change, the greater the level of public concern' (Brulle, Carmichael & Jenkins, 2012, p.17).

Other studies have attempted to measure the effectiveness of climate change films on reported attitudes and emotions. In previous research, the effects of short extracts taken from 'An Inconvenient Truth' on participants' levels of 'happiness', 'sadness', 'anger', 'tension', 'calmness', 'energy' and 'tiredness' had been tested, as well as a consideration of the effects of various extracts from the film on participants' explicit attitudes towards climate change (see Beattie, Sale & McGuire, 2011). See introduction for details. It was found that selected extracts from 'An Inconvenient Truth' did have a significant effect on participants' mood state as well as on participants' explicit attitudes/ social cognitions with respect to climate change. Participants felt significantly less happy and less calm after watching each of the clips. Yet, participants' levels of anger and tension were not significantly affected. Each of the clips affected motivation to act and empowerment (and some of the clips affected levels of fatalism). Message acceptance, and concepts of shifting responsibility, however, were not significantly affected.

This study thus demonstrated that films can be effective in certain ways. However, from the point of view of the present concerns (changing our *behaviour* with respect to carbon lifestyles to ameliorate the effects of climate change), there are a number of clear limitations with this particular study. Firstly, only self-report measures of mood attitudes and social cognitions were used to assess the effectiveness of the selected film clips, with all of the issues of social desirability that they present. There was no attempt to measure participants' *implicit* attitudes to climate change before, or after, watching any of these clips to measure the effectiveness of the film on their underlying attitudes. As has been demonstrated, implicit attitudes might well be a better predictor of behaviour, especially when under time pressure or under some kind of cognitive load, reminiscent of actual consumer behaviour (Beattie, 2010, 2012; Dovidio, Kawakami & Gaertner, 2002; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, Jackson, Dunton & Williams, 1995). Secondly, there was also no attempt to measure the effect that these film clips might have on behaviour change amongst the participants. There was no behavioural choice task incorporated in the design. These limitations are important if we are to assess the effectiveness of any film on attitudes and behaviour. There is one other important point about this study - measurements were only taken immediately after watching each of the seven clips - there was no follow-up questionnaire in the subsequent weeks, or months, following the exposure to the extracts of the film, in order to measure any possible longer-term effects on the participants' mood or explicit attitudes/cognitions.

Another study that tested the effects of a climate change film on viewers' perceptions of climate change was conducted by Lowe, Brown, Dessai, de França Doria, Haynes and Vincent (2006). Lowe et al. collected data from a total of 301 filmgoers in the foyer of a cinema screening of 'The Day After Tomorrow' - a science fiction disaster film made in 2004 which tells the story of a new ice age which happens overnight as a result of global warming. Each participant was handed a two-part questionnaire. The first part of the questionnaire was completed before watching 'The Day After Tomorrow' and the second part was completed immediately after the participants had watched the film. The second part of the questionnaire had identical questions to the first part with some additional questions added and a space to write extra comments if necessary. The results from this study revealed that participants' feeling of concern about climate change had significantly increased after they had watched the film. Participants were also asked to indicate if they thought that 'sudden climate change', as depicted in the film, was likely to happen on a scale from 1 = 'absolutely impossible' to 8 = 'absolutely certain'. Responses to this question revealed that participants felt that there was a ‘medium likelihood’ of ‘sudden climate change’ like that depicted in the film (with a mean response of 4.34). Another question asked the participants, both before and after watching the film, what the likelihood of them *personally* experiencing climate change in their lifetime. Counter-intuitively, responses revealed that participants felt that they were significantly *less* likely to experience climate change in their own lifetime after viewing the film compared to being asked the very same question before they had seen the film. This reaction, however, may have been a result of the extreme and unrealistic depiction of climate change (Hallam & Marshment, 2000). Hence, Lowe et al. conducted focus groups a month after the screening of the film. Indeed, some comments that the researchers collected in the focus group drew upon this very issue with comments such as ‘…it is just like fantasy’ (p. 447). Another commented that ‘I don’t personally agree that the world can freeze in a day. It can’t, how can you freeze the world in a day?’ (p. 448). There were also comments criticizing the scientific credibility of the film, for example, ‘If you knew just how scientific the film was then it would probably have a stronger impact’ and ‘I don’t believe the science behind it was conveyed well enough. It made it completely unbelievable’ (p. 448). Despite the negative responses, there were respondents who admitted that they had changed their behaviour since watching the film and that they had started to recycle more. However, others commented that any such changes were not lasting and that they soon slipped into their old habits. Other participants did actually feel motivated to change their behaviour, but did not know how to go about it. One particular participant said that ‘It made you think you should do something and it kind of finished without telling you what you could actually do’ (p. 449). The researchers concluded that ‘while the film increased anxiety about environmental risks, viewers experienced difficulty in distinguishing science fact from science fiction. Their belief in the likelihood of extreme events as a result of climate change was actually reduced’. They also concluded that ‘Following the film, many viewers expressed strong motivation to act on climate change. However, although the film may have sensitized viewers and motivated them to act, the public do not have information on what action they can take to mitigate climate change’ (2006, p.435).

But, of course, all of the data collected in the Lowe et al. study were either self-reports of attitudes, or self-reports of behaviour. There was no attempt to measure the effects of the film on *actual* behaviour in this particular study. Nor did the researchers attempt to measure implicit attitudes of the participants and test any effects that this film may have had on underlying attitudes. In terms of the possible longer-term effects of the film - although the researchers held a focus group a month after the viewing of the film, there was no quantitative data collected in the follow-up by way of a direct comparison with the data collected before and immediately after, viewing the film. Similarly, there were no focus groups held either before participants had watched the film or, indeed, immediately after watching the film, so comparisons could not be made in terms of the qualitative data collected – so again, no longer-term effects could be tested in this regard.

One study that did attempt to measure the longer-term effects of a climate change film was a study by Howell (2011, 2014). At a screening of 'The Age of Stupid', Howell sought to test the effects of the film on participants' attitudes to climate change including their 'concern', 'motivation', 'fear', 'responsibility' and 'agency' before and after watching 'The Age of Stupid'. The Age of Stupid is a 92 minute, low budget, British documentary film set in the future in 2055. Pete Postlethwaite plays an archivist who lives in a Global Archive which he describes as a vast storage structure which contains the art work from every national museum. He lives a lonely existence in a world that is suffering from the devastating effects of climate change with very little life left. The film opens with images of different landmarks from different parts of the world in 2055, albeit, very different to how they look today. We see the London Eye and the buildings surrounding it submerged in water, we see the mountains in the Swiss Alps with an empty ski lift, there is no snow on the Alps, just dry lifeless hills that have been scorched in the heat.  Las Vegas is no longer a vibrant resort where the bars and restaurants are open 24 hours a day, here we see Las Vegas deserted and buried by sand.  New Orleans has been completely wiped out and there are no ice caps in the arctic, they melted long ago - there is just vast ocean.

The archivist (Pete Postlethwaite) then carefully explains to the viewers of the film that 'The conditions we are experiencing now were actually caused by our behaviour in the period leading up to 2050.  In other words, we could have saved ourselves'.  The film interweaves both a fictional film and real life documentary footage including real news clips that have been broadcast over the years in different parts of the world.  As well as appealing to the audience on an emotional level, there is also an educational element which provides the audience with scientific facts about climate change.

Howell (2011) issued 241 filmgoers with a multiple-choice questionnaire before seeing 'The Age of Stupid' in order to collect baseline data (time 1) to compare to the subsequent questionnaires. Participants were asked to rate their level of concern about climate change, their motivation to act, their knowledge, agency and fear on a 5-point scale.  Once participants had watched the full-length film, they were asked to complete a second questionnaire in order to test any immediate effects the film had on their attitudes (time 2). As well as including items from the first questionnaire, additional questions were added.

Howell found that the percentage of participants who indicated that they were ‘very concerned’ about climate change had increased at time 2 (83.3%) from when they were first asked about their level of concern before watching the film at time 1 (81.7%) but this was not a significant increase. The questionnaires also included a series of statements where participants were required to rate their level of agreement from ‘strongly disagree’ to ‘strongly agree’ with a variety of statements. The statements included - ‘I feel motivated to try to do something about climate change/global warming’, ‘I can do something to prevent climate change/global warming getting worse’ and ‘I know what I can do to reduce my carbon footprint’. The results revealed that levels of motivation had significantly increased immediately after seeing the film compared to the baseline. There was also a significant increase in percentage of participants who felt that they ‘could do something to prevent climate change/global warming’ immediately after watching the film compared to before they had seen the film. However, participants were significantly less inclined to agree with the statement ‘I do as much as I can about climate change/global warming’ immediately after seeing the film compared to the baseline. Perhaps surprisingly, a large percentage of the participants felt that the devastation caused by climate change portrayed in the film was ‘likely’ to occur. Indeed 21.9% felt that there was a ‘medium likelihood’ of this devastation occurring, 29.4% felt that it was ‘likely’, 32.9% felt that it was ‘very likely’ and 8.3% felt that it was ‘virtually certain’.

There was a follow-up questionnaire 10 weeks after participants had watched the film to see if the effects of ‘The Age of Stupid’ were lasting (time 3). Howell found that, amongst the 67.2% of the original set of participants who completed the questionnaire at time 3, levels of concern had dropped below the baseline to 81.5% with more respondents indicating that they were ‘A little concerned’ at time 3 (4.3%) compared to time 1 (2.9%). There was a significant reduction in motivation between time 2 (95.8%) compared to time 3 (91.4%). A reduction in the level of agreement with the statement ‘I can do something to prevent climate change’ was evident at time 3 compared to time 2, and very little difference when compared to time 1. People were significantly less likely to agree with the statement ‘It is worth lobbying politicians about climate change’ at time 3 compared to time 1 and time 2.

In order to measure any changes in behaviour as a result of watching ‘The Age of Stupid’ Howell also included a list of behaviours at time 3. These behaviours included ‘Actively involved in campaigning group', 'Turned down heating/cut time heating on', 'Cut down/avoid driving', 'Avoiding buying bottled water'. Participants responded by selecting the appropriate answer from the following three alternatives: 'Not done/doing', 'Done/doing more, due to film' or 'Done/doing but not due to film'. Out of all of the statements listed in this part of the questionnaire, the item which most people said that they had either done or were doing because of watching the film was 'Trying to raise awareness among people I know' (27.8% of participants), followed by 'Decided to reduce/stop holiday flying long-term' (21.9% of participants). The joint third most popular behaviour change reported as a result of watching the film was 'Planning/taking holidays without flying this year' and 'Buying more local produce' both with 17.9 participant selecting this response.

Howell then issued another questionnaire to this set of participants approximately 15 months after seeing the original film - time 4 (Howell, 2014). The questions included those presented in the original set of questionnaires at time 1 and time 2 and the behavioural questions which were listed on the questionnaire at time 3. Of the 43.2% of the original set of respondents who completed the questionnaires at time 4, higher levels of concern had dropped to below that reported immediately after seeing the film at time 2, levels of motivation at time 4 had also dropped below levels of motivation reported at time 2.

In terms of reported behaviour recorded at time 3 and time 4, of the 13 listed behaviours on the questionnaire, only 2 behaviours had increased (‘Washing clothes at 30º’ and ‘Buying more local produce’) all other reported behaviours had decreased at time 4 compared to time 3. At time 3, twenty participants reported that they were planning on taking a holiday which *did not* involve flying - a decision which they reported was made as a consequence of watching the film, however, when it came to time 4, eight participants reported that they did actually take a holiday which involved flying. The remaining 11 people did not.

Nolan (2010) tested the effectiveness of ‘An Inconvenient Truth’ on participants’ knowledge about climate change, beliefs about climate change, motivation and pro-environmental behaviour. Participants were split into two groups. One group completed the questionnaire before watching the film and the other group completed an identical questionnaire after watching the film (curiously an independent groups design). The survey required participants to indicate whether certain activities, such as driving a car, was a major or minor cause of global warming or whether it was not a cause at all. Other items on the questionnaire required participants to indicate how likely it was that ‘the earth’s annual temperature will increase at least 3 degrees Fahrenheit within the next 50 years’ on a scale from 1 (not at all) to 7 (very).

Participants were also asked to indicate their motivation to reduce GHG emission ranging from 1 (not very) to 7 (extremely). In order to test the effectiveness of the film on participants' intentions to act they were asked to report 'how many miles they had driven in the past week, month and year, and how many miles they intended to drive in the next week, month, and year' (2010, p.5).

In terms of knowledge, those participants who completed the questionnaire after watching the film scored slightly higher than those who completed the questionnaire before watching the film ($M$ = 10.59 compared to $M$ = 9.75). However, this comparison was not significant. Those who completed the survey after watching the film were significantly more likely to believe that global temperatures will increase in 50 years' time. Participants in the group who completed the questionnaire after watching the film also felt more motivated to reduce their own GHG emissions. Sixty per cent of participants who completed the survey after watching the film reported that they intended to decrease their driving compared to just 26% of participants who completed the questionnaire before watching the film.

In the second part of this study, 27 participants were randomly assigned to either of two conditions. As in the first part of the study, condition 1 required participants to complete a questionnaire before watching ‘An Inconvenient Truth’ and condition 2 required participants to complete the questionnaire after watching ‘An Inconvenient Truth’. A follow-up questionnaire was also issued to participants where they were required to complete the same survey a month after watching the film. The results revealed that, as in the earlier study, participants knew more about the causes of global warming in the group who completed the questionnaire after watching the film compared to those participants who completed the survey before watching the film, but this was not significant. Participants expressed more concern with regards to global warming than those who completed the questionnaire before watching the film. The behavioural intention of those participants who completed the questionnaire after watching the film was significantly higher than those participants who completed the questionnaire before watching the film.

When it came to the follow-up questionnaire conducted one month after watching the film, the analyses revealed that there were no significant lasting effects on participants’ knowledge about climate change, although knowledge did remain stable between time 2 and time 3. The film also had no lasting effects on concern or motivation in the follow-up 1 month later.

Although in this study Nolan did test the longer-term effects of ‘An Inconvenient Truth’, the effects were only tested on people’s reported attitudes. Implicit attitudes were not tested. The independent groups design employed in this study also means that we cannot be confident of any change within an individual as a consequence of the film.

There are very few studies that have actually attempted to measure the effect of climate change films on implicit attitudes. However, one recent study by Janpol and Dilts (2016) tested the effects of viewing documentary films about natural environments and built environments on people's implicit perceptions of nature and built environments. They also attempted to test the effects of the film on people's behaviour. In their study, eighty-one participants were split into two different conditions. In one condition participants were asked to watch a 50-minute film about Dolphins. This was the nature condition. In the second condition (the built condition) participants were asked to watch a 50-minute film about bridges. Each participant was given a ticket with a unique code which identified their experimental condition to the researchers (but not to the participants). Once all of the participants had watched either film, they were asked to complete a game known as FlexiTwins (Bruni & Schultz, 2010). FlexiTwins is a game version of the Implicit Association Test that measures participants' implicit connectedness to 'nature' or to 'built' environments. Upon completion of FlexiTwins, participants were informed that the ticket they were given at the start of the experiment was now worth one dollar and that they could make a charitable donation to either a 'Save the Dolphin Fund' or 'Save the Bridges Fund'. They found that there were significant differences between both conditions. Participants who watched the dolphin film were significantly more likely to hold an implicit connectedness with the natural environment than those participants who watched the bridge film. When it came to the behavioural measure, participants were more likely to make a donation to the 'Save the Dolphin Fund' than the 'Save the Bridges Fund' regardless of which particular condition they had been assigned to (95% of participants donated to the dolphin fund from the dolphin film condition and 60% donated to the dolphin fund from the bridges condition). However, a significant proportion of participants in the dolphin condition were more likely to make their donation to the 'Save the dolphin Fund' than those participants in the bridges film condition.

Although this study did measure implicit attitudes, these attitudes were only tested immediately after watching the films, there was no attempt to test for any longer-term effects. The authors also failed to measure implicit attitudes before watching either of the films so it is difficult to gauge the effect that these particular films had on implicit attitudes as it might be the case that participants in the dolphin condition already held implicit connections to nature and vice versa. In terms of the charitable donation, the authors attempted to measure actual behaviour by informing participants that the tickets were actually worth a dollar, however this was not real money. What would have happened if they were given a dollar at the start of the experiment and given the choice to donate to either charity or to keep the dollar themselves?

The specific hypotheses for this study are detailed below:

H1: Powerful film clips about climate change will have a significant effect on self-reported attitudes to carbon footprint.

H2: Powerful film clips about climate change, particularly those with a strong emotional content, may have a significant effect on implicit attitude to carbon footprint.

H3: Powerful film clips about climate change, particularly those with a strong emotional content, may have a significant *immediate* effect on lifestyle choices with different carbon footprint implications. These may or may not endure when tested several weeks later.

## 6.2. Method

The aim of this experiment was to measure the immediate *and* the longer-term effects of short extracts from the film 'An Inconvenient Truth' on both implicit and explicit attitudes, and the effects of the extracts on behaviour in a behavioural choice task. Six film clips were selected for use in this experiment, all of which had been used in the previous study (Beattie, Sale & McGuire, 2011). One clip from the Beattie et al. study was excluded due to it having a reverse effect making people *less* willing to act and causing a reported negative shift in responsibility amongst the participants. Two of the clips were selected because they were primarily aimed at participants' emotions ('Rising Sea Levels' and 'Small Planet') as identified by two independent judges. These particular clips produced the most significant effect on levels of 'sadness' in Beattie et al. (2011), as well as decreasing happiness levels, and therefore are most appropriate for targeting people's emotional state in the present study. Two of the clips contained primarily factual information about climate change (as identified by two independent judges) and aimed to increase the knowledge of participants concerning climate change ('Paradox' and 'Natural Resources'). In addition, two of the clips seemed to target emotions as well as providing significant information ('Polar Bear' and 'Population Growth') again, as identified by two independent judges. There was also a control condition where participants watched two clips unrelated to climate change ('how to assemble a flute' and 'how to thread cotton through a needle').

### *6.2.1. Film clip selection*

In order to test the suitability of the grouping for each of the clips i.e., if the two clips selected for the emotional condition, the information condition and the combined information and emotion condition were grouped appropriately, twenty additional participants were asked to watch each of the six short clips and rate each in terms of 'emotional content' and 'informational content' on a scale from 1 - 5, as in 1: 'No emotional content; 5: Considerable emotional content; 1: No substantive information; 5: Considerable substantive information. The 'Small Blue Planet' clip was rated highest in terms of emotional content ($M$ = 4.9) yet lowest in terms of informational content ($M$ = 1.0). The second highest rating for emotional content was for the 'Rising Sea Levels' clip ($M$ = 4.8), this clip also received a low score for its informational content ($M$ = 1.8). In terms of informational content, the 'Natural Resources' clip was rated highest ($M$ = 4.8), however, this scored lowest in terms of its emotional content ($M$ = 1.5). The second highest score for informational content was for the 'Paradox' clip ($M$ = 4.1). This clip also received a low score for its emotional content ($M$ = 1.8). There was little difference between the scores given for emotional content ($M$ = 3.8) and for information content ($M$ = 3.9) of the 'Population Growth' clip. Similarly, there was little difference in the scores given for the emotional content of the 'Drowning Polar Bear' clip ($M$ = 2.9) and for the informational content ($M$ = 3.1).

### *6.2.2. Stimuli: film clips*

Clip 1: Rising Sea Levels *(emotional)*

This clip is an illustration of what the future of our coastlines will look like if Greenland's ice completely broke up and melted. The opening clip shows the rapid stages of the melting ice in Greenland from 1992, then an image of how Iceland looked ten years later in 2002 with even more ice melted and then what it looked like in 2005. Over that short period of time we can see the dramatic depletion of ice. Al Gore goes on to say that Tony Blair's scientific advisor says that, because of what is happening in Greenland right now, the maps of the world will have to be redrawn. He then shows more illustrations of what would happen to specific coastlines if just half of Greenland's ice and half of Antarctica's ice broke off and melted. The animated diagram shows land disappearing under water in Florida. We see areas where people live disappearing under water in San Francisco Bay. The Netherlands also disappears rapidly under water. The area in Beijing which homes tens of millions of people gradually disappears, as does Shanghai - the home of 40 million people. Then we see Calcutta disappearing, the area covered here homes 60 million people. We see the World Trade Memorial site disappear under water in Manhattan. This clip is played out to a backdrop of music thus creating a more emotional and dramatic feel.

Clip 2: Small Planet *(emotional)*

This clip opens with an image of earth taken from outer space. Here we see earth as a small 'pale blue dot'. Al Gore puts into perspective everything that has happened on that pale blue dot, from 'triumphs to tragedies, wars and famines'. He describes the pale blue dot as 'our only home'. He stresses that that this small blue planet is at risk if we fail to take action. Throughout this clip there is gentle music in the background that adds to the emotionality of the clip. This clip allows the viewer to take a different perspective of our planet. Al Gore stresses that everything that has ever happened to the entire human race has happened on that small blue planet.

Clip 3: Paradox *(information)*

Here Al Gore explains that the effects of global warming causes, not only more flooding in certain areas, but it also causes drought. He uses powerful imagery of two neighbouring provinces, one of which depicts adults waist high in deep water wearing life jackets and a baby sat in a washing up bowl floating on dirty flood water, whilst the other image shows young children walking to school on dried up cracked ground. He goes on to explain to the audience why this paradox happens, and that global warming increases precipitation and relocates the precipitation. He also explains that global warming causes evaporation from the oceans but also takes moisture out of the soil and land. He shows an image of Lake Chad in 1963, 1973, 1987 and in 2001 demonstrating it drying up over those years until it finally disappears.

Clip 4: Natural Resources (*information*)

Al Gore articulates how we can go about changing our behaviour to prevent any more GHG emissions. He uses a graph to demonstrate that if we reduce our electricity use, we can save a percentage from the entire global warming pollution. If we have higher fuel efficiency cars and other transport efficiency as well as using renewable technology etc. then this too will cut down on GHG emissions. He also shows graphically how these behaviours combined can help to get the population to lower emission levels like those seen in the 1970s.

Clip 5: Polar Bear (*emotion and information*)

The content of this particular clip is both informational as well as emotional. It begins by Al Gore showing a digital animation of the sun's rays hitting the Arctic ice caps. He goes on to explain to the viewers that these ice caps act as a mirror and reflect 90% of the rays back into space. He informs us that when these rays hit the water, the water absorbs 90% of the heat. The water, therefore, heats up and speeds up the melting of the ice caps until they gradually disappear under water. We discover that there is a faster build-up of heat in the Arctic Ocean than anywhere else on the planet. We then see an animation of a polar bear swimming towards an ice floe. As the polar bear approaches the ice floe, it tries to climb on but the ice breaks into pieces as it is too thin to hold any weight. We discover that scientists are beginning to find polar bears that have actually drowned after swimming up to 60 miles in search of ice but without finding any.

Clip 6: Population Growth (*emotion and information*)

In this particular clip, Gore shows a graph of the rise in population growth from over the years. He demonstrates that during the Baby Boomer generation in 1945, population crossed the 2.3 billion mark. In 2005 (just forty years later), the population reached 6.4 billion and by 2050 population it is expected to rise to 9.1 billion. He explains that it took 10,000 generations to reach 2 billion, yet in just one lifetime it jumps by 7 billion. He also explains how population growth is already placing extra pressure on the earth, putting more demands on food, more demand for water, and pressure on vulnerable natural resources such as forests.

### *6.2.3. Explicit attitude measures*

Participants were asked to complete the same basic explicit measures used in the previous chapters (Chapter 2, 3 and 4). These measures included the Likert scale and the Feeling Thermometer. See section 2.2.3 for a detailed description.

### *6.2.4. Implicit attitude measure*

#### *Implicit Association Test*

Participants were also asked to complete a carbon footprint Implicit Association Test to assess their implicit attitudes to high and low carbon footprint products (all three measures have been used extensively in Beattie & Sale, 2009; Beattie & Sale, 2011; Beattie & McGuire, 2012; Beattie & McGuire, 2015; Beattie & McGuire, 2016). A detailed description of this particular Implicit Association Test can be found in section 2.2.4.

### *6.2.5. Behavioural choice task*

Eighty images representative of everyday behaviour were selected for the behavioural choice task. These images included food items, modes of transport, sources of energy etc. Forty images were used on trial 1 (before participants watched the film clips), and forty were used on trial 2 (after participants had watched the film clips). The image sets were randomised between conditions and tasks throughout the experiment. For each set of forty images there were twenty matched pairs with a high carbon and a low carbon alternative. For example, one matched pair was an image of an energy saving lightbulb versus an image of a standard bayonet cap lightbulb, another matched pair was an image of wind turbines versus an image of electricity pylons and another set was an image of a local British holiday versus a luxury holiday abroad. The behavioural choice task before, and immediately after, were matched in terms of number of stimuli which represented transport, energy, food etc. The matched pairs were displayed on a computer screen. The side of the screen where the high carbon and low carbon alternatives were placed alternated throughout the experiment. Beneath each pair, there was a letter 'A' under one image and a letter 'B' under the other image. Participants were required to select their preferred item by pressing either 'A' or 'B' on the keyboard. Once they had selected their preferred item, the next set of matched pairs was displayed on the computer screen. This was repeated until the participant had selected 20 items in total on trial 1 and 20 items on trial 2.

### *6.2.6. Participants*

One hundred and twenty participants were recruited to take part in this study. Participants included staff and students from Edge Hill

University and members of the public both male (n=34) and female (n=86) between the ages of 18 and 68 (*M* = 23.6, *SD* = 11.06). There were four conditions comprising this study. Condition 1 was an information condition where participants watched two clips giving them new information about climate change. In condition 2, participants watched two clips aimed at targeting their emotions. In condition 3, participants were required to watch 2 clips which were both highly emotional but also contained new information about climate change. Finally, condition 4 was the control condition where participants watched two short clips not connected to climate change. Instead, they were clips that informed participants how to thread cotton through a needle, the second clip instructed participants how to construct a flute. Thirty participants were assigned to each of the three experimental conditions and thirty in the control condition. In order to test the longer-term effectiveness of the film clips in terms of explicit attitudes, implicit attitudes and behaviour, participants were invited back between 4 and 6 weeks later to complete the explicit measures, the IAT and the behavioural choice task. Participants were recruited using opportunity sampling and also notified in lecture theatres of the experiment. Participants were rewarded with £3.00 for the initial experiment and £2.00 for the follow-up experiment. Alternatively, students had the option of receiving 2 course credits for taking part in the experiment.

Ethical approval was obtained from the Edge Hill University Research Ethics Committee (UREC). Participants were fully informed about the test procedure and told that they could withdraw at any point during the experiment and that their data could be removed from the study and destroyed at any point up to three weeks after they had taken part in the experiment (either after Trial 1 or after Trial 2). No participant asked for their data to be removed and destroyed). Participants were fully debriefed at the end of the study.

**Trial 1 and Trial 2:**

Upon arrival in the experimental lab, participants were given a raffle ticket which they were required to hand back once they had completed trial 1 and 2. The number on the raffle ticket represented their participant number. On the back of the raffle ticket participants were asked to write down their student number or email address so that they could be contacted for the follow-up study and so that they could be reminded of their participant number for trial 3 (the follow-up to the study).

Participants were seated behind a desktop computer monitor and asked to complete the Likert scale and the Feeling Thermometer. Once they had completed the explicit attitudes measures, they were then asked to complete the IAT. Once the initial attitude measures were complete, participants were then asked to take part in a behavioural choice task. Here they were shown a total of 40 images including food items, methods of transport, sources of energy and household items – 20 of these images were high carbon items which were matched with 20 low carbon items. The images were shown in pairs on a computer screen displaying the high carbon option alongside the low carbon alternative and the letters 'A' under the image to the left of the computer screen and 'B' under the image on the right of the screen. Participants had to select their preference by pressing the letters 'A' or 'B' on the keyboard before moving on to the next set of paired items. Only two images were displayed on the computer screen at any one time. Once they had selected their preferred item, participants clicked on the 'next' button on the screen and they were then shown another set of paired items where they were required to select 'A' or 'B'. There were 20 pairs in total. When participants had completed the first choice task, they were then asked to watch two short film clips (each clip lasting approximately 2 minutes). Participants were assigned to either the 'emotion' condition, the 'information' condition, the 'information and emotion' condition or the control condition. There were 30 participants in each condition. Once participants had watched both clips they were then asked to complete the explicit attitude measures again

(Likert and Feeling Thermometer) and the IAT plus another behavioural choice task.

**Trial 3:**

Participants returned 4-6 weeks after completion of trial 1 and 2. Upon arrival, participants were given the same raffle ticket that they were issued with at the start of part 1 in order to be reminded of their participant number. Each participant was asked to check that the student ID/contact email address was theirs and then once they had completed trial 3 they were required to keep hold of their raffle ticket and quote the number if they wished to withdraw their data. Participants were then seated behind a desktop computer and asked to complete the explicit attitude measures (Likert and TD) and the IAT again. Once they had completed the attitude measures they were then asked to complete a second behavioural choice task. This time, participants were presented with a series of 40 high and 40 low carbon matched items. The stimuli used in the behavioural choice task were the same images used in trial 1 and trial 2 of this experiment.

## 6.3. Results[6]

In this first analysis, the effects of the film as a whole is considered - that is to say, the three experimental groups (watching either the

[6] In this chapter, there were 120 participants who were asked to make a set of 20 dichotomised behavioural choices before and after watching a film clip yielding 2,400 choices before and after watching the clips (distributed across four conditions – control, emotion, emotion and information

‘information’ extracts, ‘emotion’ extracts or the ‘emotion and information’ extracts) are combined and compared with the control group on each of the attitudinal measures (Likert, Thermometer Difference and D score) and on the behavioural measures (number of low carbon choices). Table 6.1 shows the effects of film on Likert scores. There is very little difference in terms of mean Likert score before watching the film (*M* = 3.50) compared to the mean Likert scores after watching the film (*M* = 3.72). The control group stays constant with a mean of 3.73 (both before and after). See Table 6.1.

Table 6.1: Mean Likert scores for the experimental groups versus the control group before (trial 1) and after (trial 2) watching the film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Experimental (all extracts)** | 3.50 | 3.72 | 3.61 |
| **Control** | 3.73 | 3.73 | 3.73 |
| **Total** | 3.56 | 3.73 | 3.64 |

A series of 2 x 2 ANOVAs were used to test for possible main effects of groups (experimental versus control), trials (pre-film and post-film), and a possible interaction effect between groups x trials. The analysis revealed that in the case of the Likert score there were no

combined). Given the distribution of the data, parametric statistics were employed, principally ANOVAs for behavioural choices and the relationship to explicit and implicit attitudes.

significant main effects and no significant interaction effect (see Table 6.2).

Table 6.2: ANOVA summary of Likert scores for all three experimental groups combined versus the control group.

| **ANOVA Summary (Likert)**<br>All films v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.67 | 1 | 0.67 | 0.89 | 0.3464 |
| **Trials** | 1.67 | 1 | 1.67 | 2.21 | 0.1385 |
| **Groups x Trials** | 0.55 | 1 | 0.55 | 0.73 | 0.3938 |
| **Error** | 178.29 | 236 | 0.76 | | |
| **Total** | 181.18 | 239 | | | |

***Thermometer Difference***

Table 6.3 shows the means for all three experimental groups combined ('information', 'emotion' and 'emotion and information') versus the control group on the Thermometer Difference scale (TD). Participants felt warmer to 'low carbon' on 'trial 2' than on 'trial 1' in the case of the experimental group, but not for the control group. In terms of TD score, there was a significant 'trials' effect (see Table 6.4). In other words, participants said that they felt significantly 'warmer' about low carbon items on trial 2. The mean Thermometer Difference score rose from 1.68 on 'trial 1' to 2.21 on 'trial 2'. There was no significant effect for groups, and the interaction effect (groups x trials) approached, but did not reach significance ($F$= 3.53, d.f. = 1, $p$ = 0.0615). What is striking here is that the experimental group increased in TD score by 0.72, whereas the control group decreased by 0.03.

Table 6.3: Mean Thermometer Difference scores for the experimental groups versus the control group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Experimental (all extracts)** | 1.52 | 2.24 | 1.88 |
| **Control** | 2.13 | 2.10 | 2.12 |
| **Total** | 1.68 | 2.21 | 1.94 |

Table 6.4: ANOVA summary of Thermometer Difference scores for all three experimental groups versus the control group.

| **ANOVA Summary (TD)** All films v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 2.45 | 1 | 2.45 | 1.35 | 0.2465 |
| **Trials** | 17.07 | 1 | 17.07 | 9.39 | 0.0024 |
| **Groups x Trials** | 6.42 | 1 | 6.42 | 3.53 | 0.0615 |
| **Error** | 429.24 | 236 | 1.82 | | |
| **Total** | 455.18 | 239 | | | |

### *6.3.1. IAT scores before and after film*

Table 6.5 shows the mean IAT scores for the experimental versus the control group. Table 6.5 reveals that film did not appear to elevate D score for the experimental group (indeed it went down from 1.17 to 0.95), similarly the D score of the control group also decreased. What is also striking from Table 6.5 is that the D scores for both the experimental and the control group were already very high on ‘trial 1’. In other words, the participants were already (implicitly) strongly preferring low carbon, so there is an issue about whether any experimental manipulation could elevate this even further. It is also important to note that when the D scores decreased on ‘trial 2’, it still meant that participants remained within the band of strongly preferring low carbon - i.e. they did not change category. There were no significant main effects, nor was there a significant interaction effect (see Table 6.6). This decrease in D score was not significant.

Table 6.5: Mean D scores for the experimental groups versus the control group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Experimental (all extracts)** | 1.17 | 0.95 | 1.06 |
| **Control** | 1.15 | 1.08 | 1.11 |
| **Total** | 1.16 | 0.98 | 1.07 |

Table 6.6: ANOVA summary of D scores for all three experimental groups versus the control group.

| **ANOVA Summary (D score)**<br>All films v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.13 | 1 | 0.13 | 0.18 | 0.6718 |
| **Trials** | 1.97 | 1 | 1.97 | 2.74 | 0.0992 |
| **Groups x Trials** | 0.22 | 1 | 0.22 | 0.31 | 0.5782 |
| **Error** | 169.85 | 236 | 0.72 | | |
| **Total** | 172.17 | 239 | | | |

***6.3.2. Behaviour (low carbon choices)***

From Table 6.7 it should be noted that the experimental group made a mean of 12.02 low carbon choices in ‘trial 1’, with the control group making a mean of 13.30 low carbon choices. In other words, in the case of the experimental group, approximately 60% of the choices were low carbon. The ANOVA revealed that there was a significant main effect for trials ($F$=9.48, d.f.=1, $p$ < 0.002), and a significant interaction ($F$=18.04, d.f.=1, $p$ < 0.0001). In other words, the experimental group made significantly more low carbon choices on trial 2, whereas the control group actually made fewer low carbon choices on trial 2. There was no significant groups effect. In other words, the experimental group and the control group did not significantly differ.

Table 6.7: Mean behavioural choices (low carbon) for the experimental groups versus the control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Experimental (all extracts)** | 12.02 | 14.18 | 13.10 |
| **Control** | 13.30 | 11.63 | 12.47 |
| **Total** | 12.34 | 13.54 | 12.94 |

Table 6.8: ANOVA summary of behavioural choice (low carbon) for all three experimental groups versus the control group.

| **ANOVA Summary (Behaviour – Low Carbon choices)** All films v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 18.05 | 1 | 18.05 | 1.98 | 0.1607 |
| **Trials** | 86.4 | 1 | 86.4 | 9.48 | 0.0023 |
| **Groups x Trials** | 164.35 | 1 | 164.35 | 18.04 | <.0001 |
| **Error** | 2150.38 | 236 | 9.11 | | |
| **Total** | 2419.18 | 239 | | | |

### *6.3.3. Information v control*

***Likert score***

The next set of analyses focuses exclusively on a comparison of the experimental group exposed to the ‘information’ films compared with the control group in terms of their impact on Likert scores (see Table 6.9). What is apparent from Table 6.9 is that the Likert scores of the experimental group decreased from ‘trial 1’ to ‘trial 2’, whereas the control group stayed at exactly the same level ($M$ = 3.73). Table 6.10 shows that there are no significant main effects nor is there a significant interaction effect.

Table 6.9: Mean Likert scores for the Information group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information** | 3.53 | 3.47 | 3.50 |
| **Control** | 3.73 | 3.73 | 3.73 |
| **Total** | 3.63 | 3.60 | 3.62 |

Table 6.10: ANOVA summary of Likert scores for the Information group versus the Control group.

| **ANOVA Summary (Likert)**<br>Information v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 1.63 | 1 | 1.63 | 2.09 | 0.151 |
| **Trials** | 0.03 | 1 | 0.03 | 0.04 | 0.8418 |
| **Groups x Trials** | 0.04 | 1 | 0.04 | 0.05 | 0.8235 |
| **Error** | 90.67 | 116 | 0.78 | | |
| **Total** | 92.37 | 119 | | | |

***Thermomeer Difference***

In terms of Thermometer Difference scores, participants in the experimental group did feel warmer towards 'low carbon' on 'trial 2', this did not occur in the case of the control group. However, the ANOVA revealed that there were no significant main effects, nor was there a significant interaction effect.

Table 6.11: Mean Thermometer Difference scores for the Information group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information** | 1.53 | 2.17 | 1.85 |
| **Control** | 2.13 | 2.10 | 2.12 |
| **Total** | 1.83 | 2.13 | 1.98 |

Table 6.12: ANOVA summary of Thermometer Difference scores for the Information group versus the Control group.

| **ANOVA Summary (TD)**<br>Information v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 2.13 | 1 | 2.13 | 1.20 | 0.2756 |
| **Trials** | 2.7 | 1 | 2.7 | 1.52 | 0.2201 |
| **Groups x Trials** | 3.34 | 1 | 3.34 | 1.88 | 0.173 |
| **Error** | 205.8 | 116 | 1.77 | | |
| **Total** | 213.97 | 119 | | | |

***IAT***

Table 6.13 reveals that in the case of the D scores, the D score of the experimental group decreased from trial 1 ($M$ = 1.47) to trial 2 ($M$ = 0.88). There was also a decrease in the case of the control group.

However, the ANOVA revealed that the only significant effect was a trials effect, but there was no significant interaction effect. Again, it is important to note that the D scores of the participants in both the experimental and the control groups (but particularly in the experimental group) were very high to begin with. Even when there was a decrease in D score after watching the film, the D scores were still in the band higher than 0.80, in other words, still strongly pro-low carbon.

Table 6.13: Mean D scores for the Information group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information** | 1.47 | 0.88 | 1.18 |
| **Control** | 1.15 | 1.08 | 1.11 |
| **Total** | 1.31 | 0.98 | 1.15 |

Table 6.14: ANOVA summary of D scores for the Information group versus the Control group.

| **ANOVA Summary (D score)**<br>Information v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.11 | 1 | 0.11 | 0.17 | 0.6809 |
| **Trials** | 3.29 | 1 | 3.29 | 4.96 | 0.0279 |
| **Groups x Trials** | 1.93 | 1 | 1.93 | 2.91 | 0.0907 |
| **Error** | 77.01 | 116 | 0.66 | | |
| **Total** | 82.34 | 119 | | | |

***Behaviour (low carbon choices)***

In terms of actual low carbon choices, Table 6.15 reveals that in the case of the experimental group, the number of low carbon choices increased from 11.61 on ‘trial 1’ to 13.43 on ‘trial 2’. In the control group, the number of low carbon choices actually decreased between ‘trial 1’ and ‘trial 2’. The ANOVA revealed a very significant groups x trials interaction effect. In other words, the ‘information’ film had a significant effect on the number of low carbon choices by the experimental group, but not for the control group. None of the main effects were significant.

Table 6.15: Mean behavioural choices (low carbon) for the Information group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information** | 11.67 | 13.43 | 12.55 |
| **Control** | 13.30 | 11.63 | 12.47 |
| **Total** | 12.48 | 12.53 | 12.51 |

Table 6.16: ANOVA summary of behavioural choice (low carbon) for the experimental group versus the control group.

| **ANOVA Summary (Behaviour – Low Carbon choices)** Information v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.21 | 1 | 0.21 | 0.02 | 0.8878 |
| **Trials** | 0.08 | 1 | 0.08 | 0.01 | 0.9205 |
| **Groups x Trials** | 88.4 | 1 | 88.4 | 9.00 | 0.0033 |
| **Error** | 1139.3 | 116 | 9.82 | | |
| **Total** | 1227.99 | 119 | | | |

### *6.3.4. Emotion v Control*

***Likert score***

The next set of analyses focused on the effects of the ‘emotion’ films on both attitudinal and behavioural measures. Table 6.17 shows that the mean Likert score went up in the case of the experimental group from 3.43 to 3.93, but stayed constant at 3.73 for the control group. However, the ANOVA revealed that there were no significant main effects nor was there a significant interaction effect.

Table 6.17: Mean Likert scores for the Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Likert Trial 1** | **Likert Trial 2** | **Total** |
|---|---|---|---|
| **Emotion** | 3.43 | 3.93 | 3.68 |
| **Control** | 3.73 | 3.73 | 3.73 |
| **Total** | 3.58 | 3.83 | 3.71 |

Table 6.18: ANOVA summary of Likert scores for the Emotion group versus the Control group.

| **ANOVA Summary (Likert)** Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.08 | 1 | 0.08 | 0.13 | 0.7191 |
| **Trials** | 1.88 | 1 | 1.88 | 2.99 | 0.0864 |
| **Groups x Trials** | 1.86 | 1 | 1.86 | 2.96 | 0.088 |
| **Error** | 72.97 | 116 | 0.63 | | |
| **Total** | 76.79 | 119 | | | |

***Thermometer Difference***

In the case of the Thermometer Difference scores, there is an increase in the mean Thermometer Difference score for the experimental group from 1.53 to 2.50, but a slight decrease in the case of the control group. The ANOVA revealed that there was a significant interaction effect, in that ‘emotion’ films did significantly increase how warm participants felt about low carbon. There was also a significant trials effect (this was totally driven by the change in TD score in the experimental group).

Table 6.19: Mean Thermometer Difference scores for the Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **TD Trial 1** | **TD Trial 2** | **Total** |
|---|---|---|---|
| **Emotion** | 1.53 | 2.50 | 2.02 |
| **Control** | 2.13 | 2.10 | 2.12 |
| **Total** | 1.83 | 2.30 | 2.07 |

Table 6.20: ANOVA summary of Thermometer Difference scores for the experimental group versus the control group.

| **ANOVA Summary (TD)** Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.3 | 1 | 0.3 | 0.20 | 0.6556 |
| **Trials** | 6.53 | 1 | 6.53 | 4.38 | 0.0385 |
| **Groups x Trials** | 7.51 | 1 | 7.51 | 5.03 | 0.0268 |
| **Error** | 173.13 | 116 | 1.49 | | |
| **Total** | 187.47 | 119 | | | |

***IAT***

In the case of the IAT scores, the effects of the film are contrary to the theoretical prediction in that there is a *decrease* in D scores from ‘trial 1’ to ‘trial 2’ (but not a significant drop) in the case of the experimental group the drop was 0.33, in the case of the control group the drop was 0.07. Again, it should be noted that the D scores were already very high in 'trial 1' i.e. in the most pro-low carbon band (greater than 0.80). The ANOVA (Table 6.22) revealed that none of the effects were significant.

Table 6.21: Mean D scores for the Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Emotion** | 1.15 | 0.82 | 0.99 |
| **Control** | 1.15 | 1.08 | 1.11 |
| **Total** | 1.15 | 0.95 | 1.05 |

Table 6.22: ANOVA summary of D scores for the Emotion group versus the Control group.

| **ANOVA Summary (D score)**<br>Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.49 | 1 | 0.49 | 0.84 | 0.3613 |
| **Trials** | 1.25 | 1 | 1.25 | 2.13 | 0.1471 |
| **Groups x Trials** | 0.48 | 1 | 0.48 | 0.82 | 0.3671 |
| **Error** | 67.93 | 116 | 0.59 | | |
| **Total** | 70.15 | 119 | | | |

***Behaviour (low carbon choices)***

In terms of the behavioural measure, when participants were exposed to the 'emotion' films, there is an increase in the number of low carbon choices of 3.76. In the case of the control group, there were fewer low carbon items chosen on ‘trial 2’. The ANOVA revealed that there was a very significant interaction effect ($p < 0.001$) which shows that ‘emotion’ films do have a significant impact on people’s choices of low carbon items. There was also a significant trials effect ($p < 0.05$) but this, of course, was entirely attributable to the increase in the choice of low carbon items by the experimental group across trials.

Table 6.23: Mean behavioural choices (low carbon) for the Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Emotion** | 11.57 | 15.33 | 13.45 |
| **Control** | 13.30 | 11.63 | 12.47 |
| **Total** | 12.43 | 13.48 | 12.96 |

Table 6.24: ANOVA summary of behavioural choice (low carbon) for the Emotion group versus the Control group.

| **ANOVA Summary (Behaviour – Low Carbon choices)** Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 29.01 | 1 | 29.01 | 3.57 | 0.0613 |
| **Trials** | 33.08 | 1 | 33.08 | 4.07 | 0.046 |
| **Groups x Trials** | 221.4 | 1 | 221.4 | 27.23 | <.0001 |
| **Error** | 943.3 | 116 | 8.13 | | |
| **Total** | 1226.79 | 119 | | | |

### *6.3.5. Information and emotion v Control*

***Likert***

The next set of analyses focused on those films high in both information content and emotion on the various attitudinal measures and the behavioural choice task. In terms of Likert score, there was a slight increase for the experimental group, with the control group staying constant. But the ANOVA revealed that none of the main effects were significant, nor was the interaction effect.

Table 6.25: Mean Likert scores for the Information and Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information and Emotion** | 3.53 | 3.77 | 3.65 |
| **Control** | 3.73 | 3.73 | 3.73 |
| **Total** | 3.63 | 3.75 | 3.69 |

Table 6.26: ANOVA summary of Likert scores for the Information and Emotion group versus the Control group.

| **ANOVA Summary (Likert)**<br>Information and Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.21 | 1 | 0.21 | 0.31 | 0.5788 |
| **Trials** | 0.41 | 1 | 0.41 | 0.61 | 0.4364 |
| **Groups x Trials** | 0.4 | 1 | 0.4 | 0.59 | 0.444 |
| **Error** | 78.57 | 116 | 0.68 | | |
| **Total** | 79.59 | 119 | | | |

### *Thermometer Difference*

In terms of Thermometer Difference scores, again, there was a slight increase in the case of the experimental group (up by 0.57) and a slight diminution in the case of the control group. However, none of the effects were significant.

Table 6.27: Mean Thermometer Difference scores for the Information and Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information and Emotion** | 1.50 | 2.07 | 1.78 |
| **Control** | 2.13 | 2.10 | 2.12 |
| **Total** | 1.82 | 2.08 | 1.95 |

Table 6.28: ANOVA summary of Thermometer Difference scores for the Information and Emotion group versus the Control group.

| **ANOVA Summary (TD)**<br>Information and Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 3.33 | 1 | 3.33 | 1.94 | 0.1663 |
| **Trials** | 2.13 | 1 | 2.13 | 1.24 | 0.2678 |
| **Groups x Trials** | 2.71 | 1 | 2.71 | 1.58 | 0.2113 |
| **Error** | 199.53 | 116 | 1.72 | | |
| **Total** | 207.7 | 119 | | | |

### *IAT*

In the case of the IAT scores, there was an apparent increase in the D scores from ‘trial 1’ to ‘trial 2’ for the experimental group from 0.89 to 1.15 (an increase of 0.26), and a slight decrease in the case of the control group of 0.07. None of the main effects were significant and this apparent interactional trend was also not significant.

Table 6.29: Mean D scores for the Information and Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information and Emotion** | 0.89 | 1.15 | 1.02 |
| **Control** | 1.15 | 1.08 | 1.11 |
| **Total** | 1.02 | 1.11 | 1.07 |

Table 6.30: ANOVA summary of D scores for the Information and Emotion group versus the Control group.

| **ANOVA Summary (D score)**<br>Information and Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 0.27 | 1 | 0.27 | 0.42 | 0.5182 |
| **Trials** | 0.27 | 1 | 0.27 | 0.42 | 0.5182 |
| **Groups x Trials** | 0.9 | 1 | 0.9 | 1.41 | 0.2375 |
| **Error** | 73.91 | 116 | 0.64 | | |
| **Total** | 75.35 | 119 | | | |

***Behaviour (low carbon choices)***

In the case of the behaviour measure, the experimental group did make more low carbon choices on trial 2 compared to trial 1, an increase of 0.94. What was also interesting here was that the control group made fewer low carbon choices in 'trial 2' compared to 'trial 1' – a decrease of 1.67. The ANOVA revealed that there was a significant interaction effect ($p < 0.05$). In other words, those films, which combined information and emotion, did have a significant effect on the selection of more low carbon items.

Table 6.31: Mean behavioural choices (low carbon) for the Information and Emotion group versus the Control group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Information and Emotions** | 12.83 | 13.77 | 13.30 |
| **Control** | 13.30 | 11.63 | 12.47 |
| **Total** | 13.07 | 12.70 | 12.88 |

Table 6.32: ANOVA summary of behavioural choice (low carbon) for the Information group versus the Control group.

| **ANOVA Summary (Behaviour – Low Carbon choices)** Information and Emotion v Control | | | | | |
|---|---|---|---|---|---|
| | **SS** | **d.f.** | **MS** | **F** | **P** |
| **Groups** | 20.83 | 1 | 20.83 | 2.17 | 0.1434 |
| **Trial** | 4.03 | 1 | 4.03 | 0.42 | 0.5182 |
| **Groups x Trial** | 50.71 | 1 | 50.71 | 5.28 | 0.0234 |
| **Error** | 1114.8 | 116 | 9.61 | | |
| **Total** | 1190.37 | 119 | | | |

The next set of analyses investigates whether the different types of film (‘Emotion’, ‘Information’ and ‘Information and Emotion’) had differential effects on the measures of both explicit and implicit attitudes, and on the behavioural measure, namely the number of low carbon choices made. There were twelve comparisons made in all and these are summarised in Table 6.33.

Table 6.33: A comparison of different types of film on explicit and implicit attitudes and low carbon choices: Only the F ratios and p values of groups x trials interaction effect are reported (a * represents a significant difference)

| **Film comparison** | **Likert** | **Thermometer Difference** | **IAT (D score)** | **Behavioural measure (low carbon choices)** |
|---|---|---|---|---|
| 'Emotion' v 'Information and Emotion' | $F = 0.75$<br>$p = 0.3833$ | $F = 0.64$<br>$p = 0.4253$ | $F = 3.61$<br>$p = 0.0599$ | $F = 7.60$<br>$p = 0.0068$* |
| 'Information' v 'Information and Emotion' | $F = 0.78$<br>$p = 0.379$ | $F = 0.02$<br>$p = 0.8878$ | $F = 6.66$<br>$p = 0.0111$* | $F = 0.54$<br>$p = 0.4639$ |
| 'Emotion' v 'Information' | $F = 2.89$<br>$p = 0.0918$ | $F = 0.43$<br>$p = 0.5133$ | $F = 0.64$<br>$p = 0.4253$ | $F = 3.69$<br>$p = 0.0572$ |

The results displayed in Table 6.33 reveal that, in the case of the measures of explicit attitude (the Likert scores and the Thermometer Difference scores), there were no significant effects comparing the various types of film against each other. However, in the case of the D score (measure of implicit attitudes), there was one significant effect when comparing 'Information' films to the 'Information and Emotion' films ($p = 0.0111$), and one effect which was bordering on significance when comparing the 'Emotion' films with the 'Information and Emotion' films ($p = 0.0599$). Table 6.34 shows that the 'Information and Emotion' films produced an increase in D score in the right direction (that is to say the D score increased after watching the films). However, the ‘Information’ film did not produce the same effect. The significant difference emerged from these two different trends. As before, notice that the mean D scores in ‘trial 1’ are all within the strong pro-low carbon group and none of the measures deviate from this group even after the change.

Table 6.34: Mean D scores for the Information group versus the Information and Emotion group before (trial 1) and after (trial 2) watching film.

| **Groups** | **Trial 1** | **Trial 2** | **Total** |
|---|---|---|---|
| **Information** | 1.47 | 0.88 | 1.18 |
| **Information and Emotion** | 0.89 | 1.15 | 1.02 |
| **Total** | 1.18 | 1.02 | 1.10 |

A similar trend can be seen in Table 6.35, which compares the effects of the ‘Emotion’ films with the ‘Information and Emotion’ films. Again, the D score in the ‘Information and Emotion’ condition goes up from ‘trial 1’ to ‘trial 2’, whereas after watching the ‘Emotion’ films the mean D score decreases. This time the interaction effect borders on significance ($p$ = 0.0599). These results suggest that in terms of the production of change in D score, the ‘information and Emotion’ films seem to be the more powerful.

Table 6.35: Mean D scores for the Emotion group versus the Information and Emotion group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Emotion** | 1.15 | 0.82 | 0.99 |
| **Information and Emotion** | 0.89 | 1.15 | 1.02 |
| **Total** | 1.02 | 0.99 | 1.00 |

In terms of behavioural measures, one interaction effect was significant ('Emotion' versus 'Information and Emotion') and one was bordering on significance ('Emotion' versus 'Information'). What is clear from Tables 6.36 and 6.37 is that participants in the 'Emotion' condition chose significantly more low carbon items in 'trial 2' compared with either the 'Information and Emotion' films (see 6.36) or the 'Information' films (see 6.37).

Table 6.36: Mean behavioural choices (low carbon) for the Emotion group versus the Information and Emotion group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Emotion** | 11.57 | 15.33 | 13.45 |
| **Information and Emotion** | 12.83 | 13.77 | 13.30 |
| **Total** | 12.20 | 14.55 | 13.38 |

Table 6.37: Mean behavioural choices (low carbon) for the Emotion group versus the Information group before (trial 1) and after (trial 2) watching film.

| Groups | Trial 1 | Trial 2 | Total |
|---|---|---|---|
| **Emotion** | 11.57 | 15.33 | 13.45 |
| **Information** | 11.67 | 13.43 | 12.55 |
| **Total** | 11.62 | 14.38 | 13.00 |

In other words, this experiment not only demonstrates that film can significantly impact on behavioural choices and the number and proportion of low carbon items chosen, but certain types of film seem to be particularly influential, namely films which impact on emotional state.

This study broke new ground in considering the possible effects of film on attitudes and on behaviour. However, what was particularly innovative about this study was that it used an *actual* behavioural task where participants had to select from pairs of items where each pair had a high and low carbon alternative. In addition to that, both implicit and explicit attitudes were measured, which made the study unique. The results were informative in many ways. The first thing that the study demonstrated conclusively was that even relatively short climate change films (of whatever type) can impact on actual low carbon choices (see Table 6.38). A comparison of the effects of any type of film ($p < 0.0001$), 'Information' films ($p = 0.0033$), 'Emotion' films ($p < 0.0001$) and 'Information and Emotion' films ($p = 0.0234$) all yielded significant interaction effects with respect to the control group.

Table 6.38: A comparison of experimental versus control condition on explicit and implicit attitudes and low carbon choices: The F ratios and p values of groups x trials interaction effects are reported (a * represents a significant effect).

| **Film comparison** | **Likert** | **Thermometer Difference** | **IAT (D score)** | **Behavioural measure (low carbon choices)** |
|---|---|---|---|---|
| Experimental (all extracts) v Control | $F = 0.73$<br>$p = 0.3938$ | $F = 3.53$<br>$p = 0.615$ | $F = 0.31$<br>$p = 0.5782$ | $F = 18.04$<br>$p = < 0.0001$* |
| 'Information' v Control | $F = 0.05$<br>$p = 0.8235$ | $F = 1.88$<br>$p = 0.173$ | $F = 2.91$<br>$p = 0.0907$ | $F = 9.00$<br>$p = 0.0033$* |
| 'Emotion' v Control | $F = 2.96$<br>$p = 0.088$ | $F = 5.03$<br>$p = 0.0268$* | $F = 0.82$<br>$p = 0.3671$ | $F = 27.23$<br>$p = < 0.0001$* |
| 'Information and Emotion' v control | $F = 0.59$<br>$p = 0.444$ | $F = 1.58$<br>$p = 0.2113$ | $F = 1.41$<br>$p = 0.2375$ | $F = 5.28$<br>$p = 0.0234$* |

In other words, low carbon choices were more common after watching *any* film. This is an important result because it suggests that, notwithstanding issues about attention to climate change stimuli (see Chapter 2), that both emotional messages and informational messages can have an impact on behaviour. However, there was only one significant interaction effect for any of the *attitude* measures and that was the effect of the 'Emotion' films on Thermometer Difference scores ($p = 0.0268$).

This means that having watched the ‘Emotion’ films, people felt warmer towards low carbon items. In other words, the films seem to be affecting behaviour without the same types of effects on measures of attitude.

However, as has already been discussed, there is one issue that needs to be addressed - the majority of participants used in this study all expressed strong explicit attitudes (and held strong implicit attitudes) to low carbon even before watching any of the films. This raises the question as to whether we can ever elevate attitudes with simple interventions when they are already so high to begin with. One way of checking this is to identify those participants who began the experiment with either *lower* explicit, or *lower* implicit attitudes to low carbon, and then to investigate the effects of the films on their attitudes and on their behaviour.

## 6.4. The identification of participants with weaker pro-low carbon attitudes on the attitudinal measures on trial 1

The next set of analyses focuses on those participants who began the experiment with lower scores on both explicit and implicit measures. In the case of the D scores of those participants assigned to the experimental conditions on ‘trial 1’, the vast majority of participants had scores higher than 0.80 on the IAT (67.78% of this group), which is traditionally taken to be the criterion for identifying people with strong pro-low carbon implicit attitudes. There were a total of 29 participants from the experimental groups identified as having D scores 0.79 or lower. The following analyses will look at the effects of film on these 29 participants. Given that the numbers were therefore smaller, it seemed appropriate to look at the effects of any type of film on this set of participants. In the case of the Likert, the analyses focuses on those individuals who had a score of 3 or less on ‘trial 1’ (3 = ‘I like products with a high carbon footprint or a low carbon footprint equally’; 2 = ‘I moderately prefer products with a high carbon footprint’ or 1 = ‘I strongly prefer products with a high carbon footprint’) which identified a set of 43 (47.78 % of the group). In the case of the Feeling Thermometer, the focus is exclusively on one dimension of the scale (low carbon) - participants who selected 3 or less on the scale (‘neutral’), which identified 29 participants (32.22% of the group) to be used in the next analyses. A paired t test was used to compare the Likert scores on ‘trial 1’ and ‘trial 2’ for these participants. This yielded a t value of 5.257 ($t(42) = 5.257$, $p < 0.00001$). In other words, the Likert scores were sufficiently elevated by the climate change films. The next analysis revealed that the number of low carbon choices made by this group also increased from 11.00 to 13.23, and again using a paired t test this yielded a t value of 5.357 ($t(42) = 5.357$, $p < 0.00001$). See Table 6.39 below.

Table 6.39: The effects of film on Likert score and low carbon choices for those participants with a weaker initial pro-low carbon explicit attitudes.

| | Trial 1 | Trial 2 |
|---|---|---|
| Likert score | 2.74 | 3.28 |
| Number of low carbon choices | 11.00 | 13.23 |

The Feeling Thermometer (low carbon) scores also significantly increased after watching the climate change films. On 'trial 1', the mean Feeling Thermometer score was 2.97 compared to 3.59 on 'trial 2' and this was a significant increase ($t(28) = 4.3116$, $p = 0.000181$). Watching the films also impacted upon the number of low carbon choices made by this group, which increased from 10.66 on 'trial 1' compared to 12.62 on 'trial 2' ($t(28) = 3.365$, $p = 0.002233$) see Table 6.40.

Table 6.40: The effects of film on Feeling Thermometer low score and low carbon choices for those participants with a weaker pro-low carbon explicit attitudes.

| | **Trial 1** | **Trial 2** |
|---|---|---|
| **Feeling Thermometer (low carbon) score** | 2.97 | 3.59 |
| **Number of low carbon choices** | 10.66 | 12.62 |

The next analyses focused on the D scores of the particular set of participants with an initial D score of 0.79 or below. The mean D score for these individuals was 0.28 on ‘trial 1’ and the films elevated this mean D score to 0.86 (t (28) = 3.523, *p* = 0.001485). There was also a significant rise in the number of low carbon choices made by this set of participants from ‘trial 1’ (*M* = 12.69) to ‘trial 2’ (*M* = 15.07) t (28) = 5.099, *p* = 0.000021.

Table 6.41: The effects of film on D score and low carbon choices for those participants with a weaker pro-low carbon implicit attitude.

| | **Trial 1** | **Trial 2** |
|---|---|---|
| **D score** | 0.28 | 0.86 |
| **Number of low carbon choices** | 12.69 | 15.07 |

In the case of the overall results there did not appear to be a connection between attitude change and the significant changes in behaviour. However, when we focus our attention exclusively on those participants who have lower *initial* levels of either explicit or implicit attitudes, there is a significant increase in pro-low carbon attitudes and this seems to be associated with a significant increase in pro-low carbon behaviour.

The overall conclusion from this study is that when film is sufficiently informative and sufficiently emotional (as many extracts from the Al Gore film ‘An Inconvenient Truth’ are), then this can have a major effect, not just on social cognitions and mood, which was demonstrated in earlier research, but it also impacts on attitudes (both implicit and explicit) *and* on behaviour.

However, the question still remains as to what extent any such changes are maintained across time. This formed the basis for the next set of analyses.

## 6.5. Are any differences maintained across time from trial 2 to trial 3 for those not approaching celling level on the initial measures?

In the next stage of the study, it should be noted that only 29 out of the original 90 participants from the experimental conditions returned to take part on trial 3, which took place between four and six weeks after the initial experiment. As in 'trial 1' and 'trial 2', participants completed a Likert scale, a Feeling Thermometer and an IAT. A behavioural measure was also taken where participants had to choose between the 40 high carbon and 40 low carbon stimuli (in matched pairs), originally used in 'trial 1' and 'trial 2'. Therefore, for the next analyses, the numbers of low carbon choices made at each trial ('trial 1', 'trial 2' and 'trial 3') are expressed as a percentage of total choices made. The theoretical questions asked here is whether any changes in explicit or implicit attitudes are maintained across time, and whether any behavioural changes are maintained for the subset of these participants that were not approaching ceiling level on the initial measures (‘3’ or less on the Likert: n = 20; ‘3’ or less on the Feeling Thermometer: n = 13; 0.79 or less on D score: n = 16).

The effects of the film on explicit attitudes across the three trials for those participants who scored 3 or less on the Likert are displayed in Figures 6.1. The percentages of low carbon choices (over all choices) across the 3 trials made by these individuals are shown in Figure 6.2.

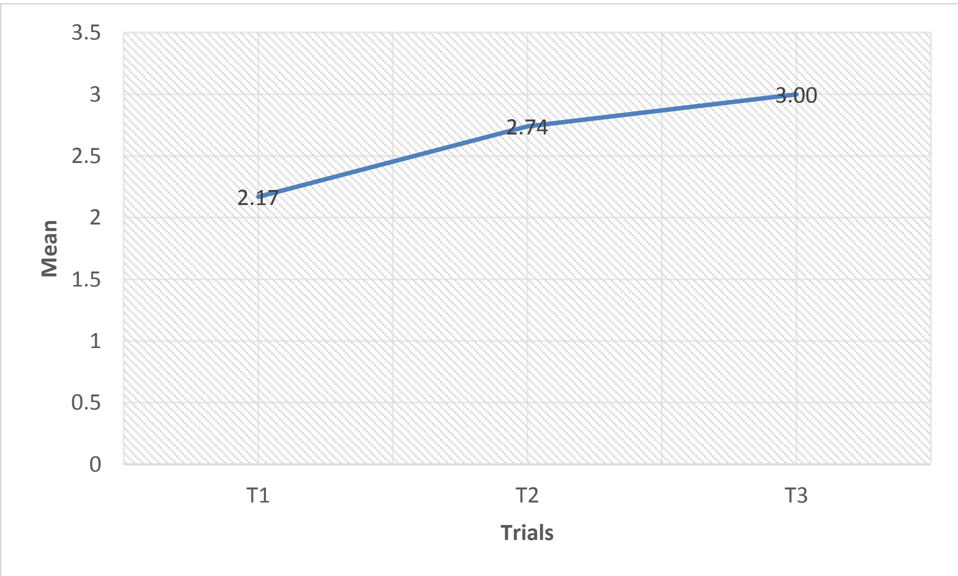



Figure 6.1: Mean Likert scores on trial 1 (T1), trial 2 (T2) and trial 3 (T3) for those participants with an initial Likert score of 3 or below.

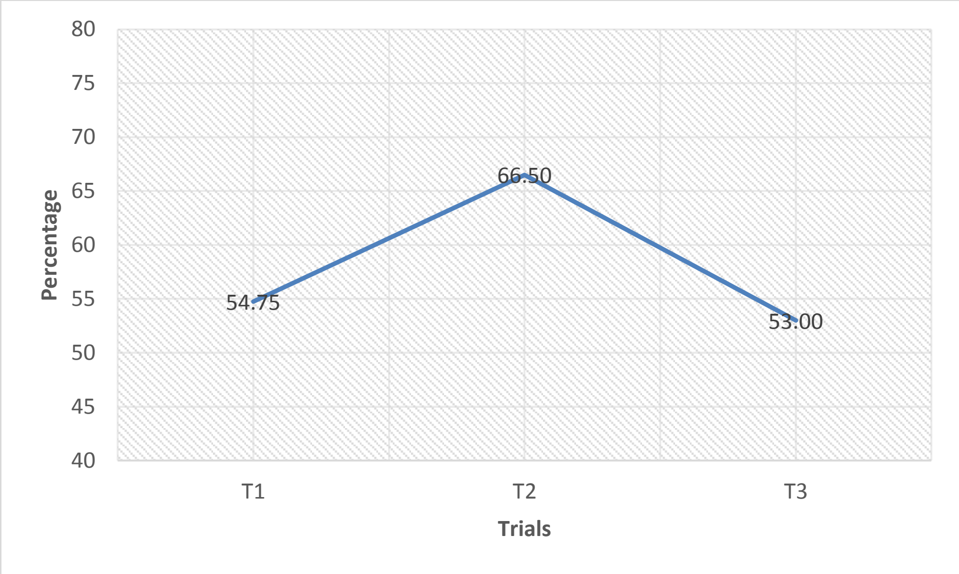



Figure 6.2: Percentages of low carbon choices on trial 1 (T1), trial 2 (T2) and trial 3 (T3) for those participants with an initial Likert score of 3 or below.

Figure 6.3 show the effects of film across the three trials on the Feeling Thermometer (low carbon) for those participants who scored 3 or below. Figure 6.4 shows the effects of the films on percentage of low carbon choices made by these participants across the three trials.

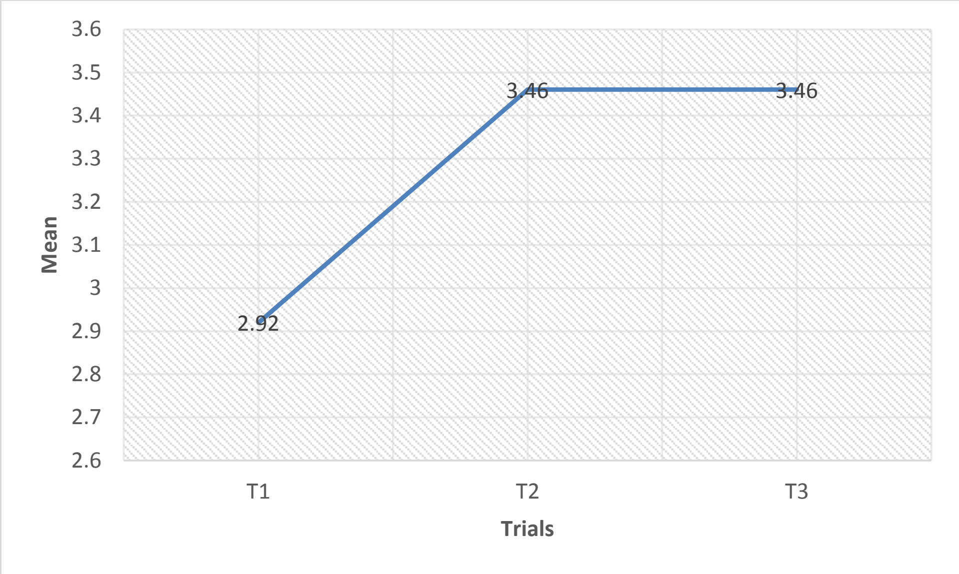



Figure 6.3: Mean Feeling Thermometer (low carbon) scores on trial 1 (T1), trial 2 (T2) and trial 3 (T3) for those participants with an initial score of 3 or below.

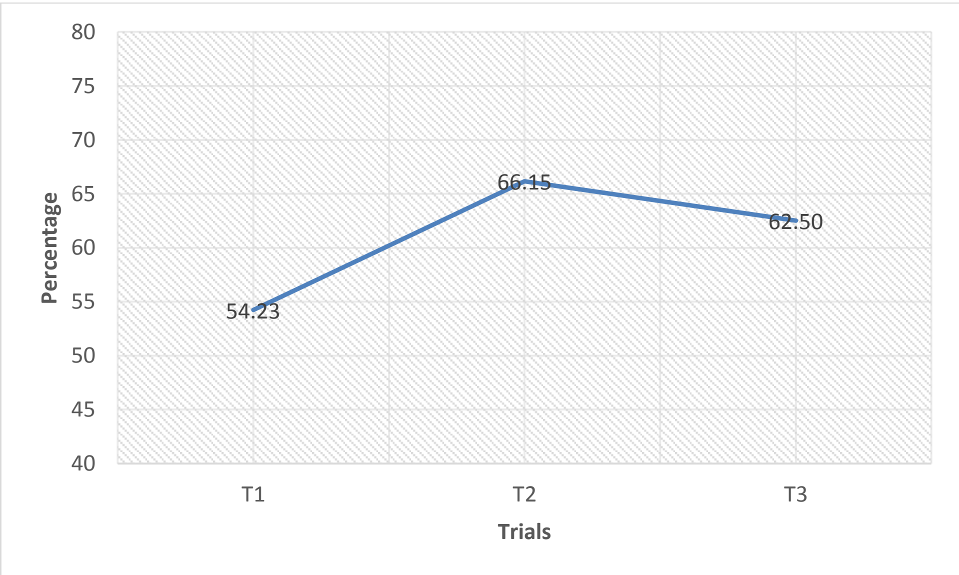



Figure 6.4: Percentages of low carbon choices on trial 1 (T1), trial 2 (T2) and trial 3 (T3) for those participants with an initial Feeling Thermometer (low carbon) score of 3 or below.

Figure 6.5 show the effects of the films on D score across the three trials for those participants who had a D score of 0.79 or below on trial 1. Figure 6.6 shows the effects the films had on percentage of low carbon choices for this set of participants.

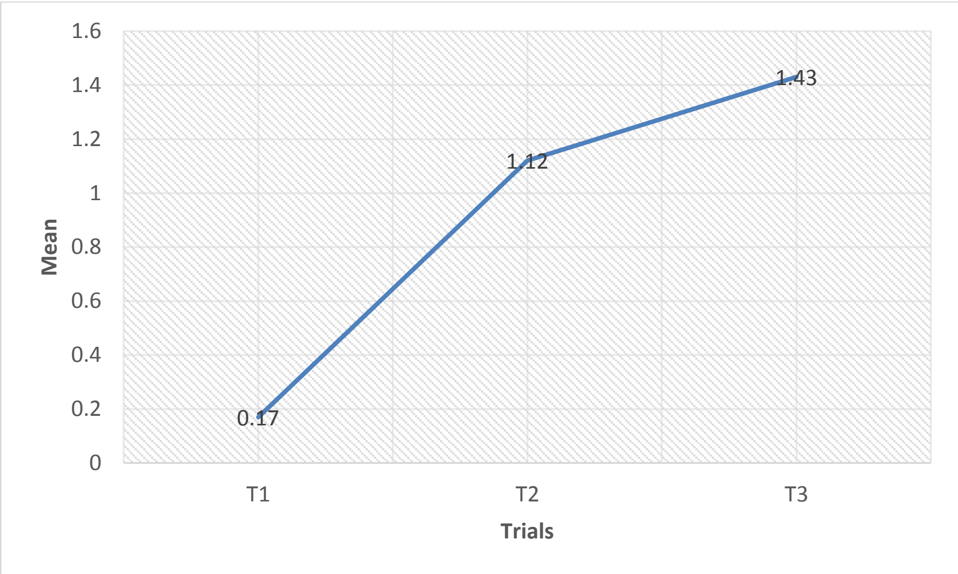



Figure 6.5: Mean D score on trial 1(T1), trial 2 (T2) and trial 3 (T3) for those participants with an initial D score of 0.79 or below.

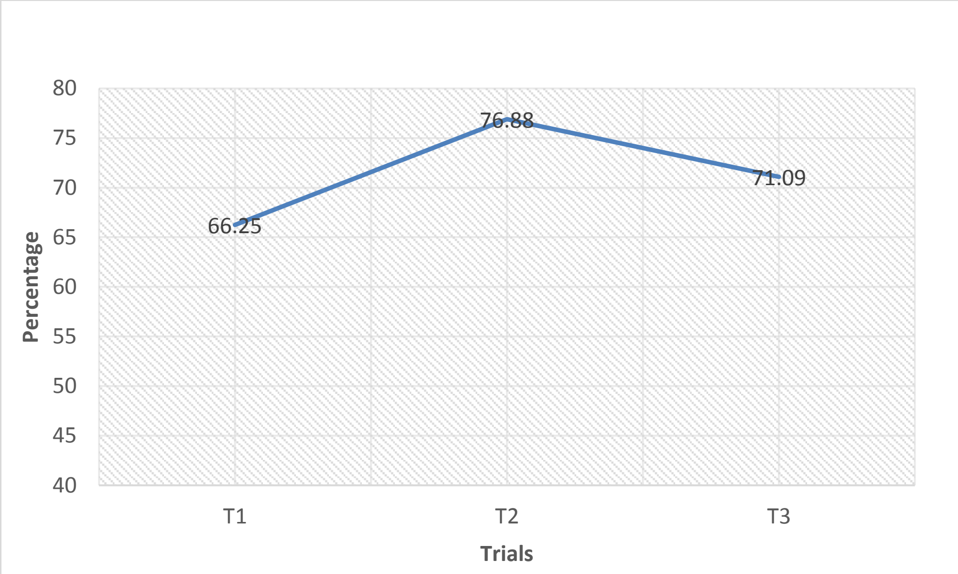



Figure 6.6: Percentages of low carbon choices on trial 1 (T1), trial 2(T2) and trial 3 (T3) for those participants with an initial D score of 0.79 or below.

So how did the attitudes and behaviour of those participants with weaker pro-low carbon attitudes, at the outset of the study, vary across trials? The first analysis focuses on the comparison of attitudes and behaviour in 'trial 1' and 'trial 2' for this smaller set of participants. In the case of the Likert scores, the mean Likert score for this set of participants increased after watching the films from 2.75 to 3.15; this result was significant ($t\ (19) = 2.990$, $p = 0.008$). Interestingly, there was also a significant rise in percentage of low carbon choices made for this particular group from a mean of 54.75 to 66.50 ($t\ (19) = 3.284$, $p = 0.004$).

Table 6.42: Likert scores and behavioural choice at trial 1 and trial 2 for those participants who reported 3 or below on the Likert scale on trial 1.

| | **Trial 1** | **Trial 2** |
|---|---|---|
| **Likert** | 2.75 | 3.15 |
| **Percentage of low carbon choices** | 54.75 | 66.50 |

In the case of the Feeling Thermometer (low carbon), the mean score for these participants went up from 2.92 on ‘trial 1’ to 3.46 on ‘trial 2’ (t (12) = 2.942, $p$ = 0.012). The percentage of low carbon choices also increased from 54.23 in ‘trial 1’ to 66.16 in ‘trial 2’. However, this was not significant (t (12) = 2.143, $p$ = 0.053).

Table 6.43: Feeling Thermometer scores and behavioural choice on trial 1 and trial 2 for those participants who reported 3 or below on the Feeling Thermometer (low carbon) scale on trial 1.

| | **Trial 1** | **Trial 2** |
|---|---|---|
| **Feeling Thermometer (low carbon)** | 2.92 | 3.46 |
| **Percentage of low carbon choices** | 54.23 | 66.16 |

The mean D score for this set of participants increased from 0.70 on ‘trial 1’ to 1.12 on ‘trial 2’, which was the most dramatic result in this particular set of analyses. This rise was highly significant (t (15) = 4.527, $p$ = 0.0004). In terms of the behaviour of this group, the mean percentage of low carbon choices more than doubled from 33.75 on ‘trial 1’ to 76.88 on ‘trial 2’ (t (15) = 4.189, $p$ = 0.00079).

Table 6.44: D scores and behavioural choice on trial 1 and trial 2 for those participants who held a D score of 0.79 or below on trial 1.

| | **Trial 1** | **Trial 2** |
|---|---|---|
| **D score** | 0.17 | 1.12 |
| **Percentage of low carbon choices** | 33.75 | 76.88 |

The next set of analyses focuses on what happens to these attitudinal and behavioural measures from ‘trial 2’ to ‘trial 3’. In the case of the Likert scores, the mean for these participants decreased slightly from 3.15 on ‘trial 2’ to 3.00 on ‘trial 3’, which was not a significant fall (t (19) = -0.567, $p$ = 0.577). There was also an associated drop of 13.5% in percentage of low carbon choices. This again, was not significant (t (19) = -1.548, $p$ = 0.138).

Table 6.45: Likert scores and behavioural choice on trial 2 and trial 3 for those participants who reported 3 or below on the Likert scale on trial 1.

| | **Trial 2** | **Trial 3** |
|---|---|---|
| **Likert** | 3.15 | 3.00 |
| **Number of low carbon choices** | 66.50 | 53.00 |

In the case of the Feeling Thermometer (low carbon) score, there was no change as to how warm or cold the participants in this group felt towards low carbon on 'trial 2' compared to 'trial 3' (t (12) = 0.000, $p$ =1.000). There was a very small drop in terms of the in percentage of low carbon choices made from 66.15 on 'trial 1' to 62.50 on 'trial 2', again this was not significant ( t (12) = -1.185, $p$ = 0.259).

Table 6.46: Feeling Thermometer scores and percentage of low carbon choices on trials 2 and 3 for those participants who reported 3 or below on the Feeling Thermometer (low carbon) scale on trial 1.

| | **Trial 2** | **Trial 3** |
|---|---|---|
| **Feeling Thermometer (low carbon)** | 3.46 | 3.46 |
| **Percentage of low carbon choices** | 66.15 | 62.50 |

Interestingly, the D score was more positive on 'trial 3' ($M$ = 1.43) compared to 'trial 2' ($M$ = 1.12), but this rise of 0.31 was not significant (t (15) = 1.177, $p$ = 0.257). There was, however, a *drop* in terms of percentage of low carbon items chosen from 'trial 2' ($M$ = 76.88) to 'trial 3' ($M$ = 71.09). Again, this was not significant (t (15) = -1.906, $p$ = 0.076).

Table 6.47: D scores and behavioural choice on trial 1 and trial 2 for those participants who held a D score of 0.79 or below on trial 1.

| | **Trial 2** | **Trial 3** |
|---|---|---|
| **D score** | 1.12 | 1.43 |
| **Percentage of low carbon choices** | 76.88 | 71.09 |

The final set of comparisons considers the measures of attitudes and behaviours on ‘trial 3’ compared with the baseline trial (trial 1) for the set of participants with weaker pro-low carbon attitudes at initial testing. In the case of the Likert score, the mean did rise from 2.75 on ‘trial 1’ to 3.00 on ‘trial 3’, but this difference was not significant (t (19) = 1.09, $p$ = 0.287). However, when it came to the behavioural choices made by this particular group, there was a significant change, however, this was in the opposite direction to that anticipated, and the percentage of low carbon choices made actually decreased from 54.75 on ‘trial 1’ to 53.00 on ‘trial 3’ (t (19) = 2.689, $p$ = 0.015).

Table 6.48: Likert scores and behavioural choice on trial 1 and trial 3 for those participants who reported 3 or below on the Likert scale on trial 1.

| | **Trial 1** | **Trial 3** |
|---|---|---|
| **Likert** | 2.75 | 3.00 |
| **Percentage of low carbon choices** | 54.75 | 53.00 |

In terms of Feeling Thermometer, there was an increase from ‘trial 1’ ($M$ = 2.92) to ‘trial 3’ ($M$ = 3.46) for this set of participants, and this difference was significant (t (12) = 2.501, $p$ = 0.028). There was also an increase in the percentage of low carbon choices made from ‘trial 1’ ($M$ = 54.23) to ‘trial 3’ ($M$ = 62.50), a mean rise of 8.27%, but this was not significant (t (12) = 1.807, $p$ = 0.096).

Table 6.49: Feeling Thermometer scores and behavioural choice on trial 1 and trial 3 for those participants who reported 3 or below on the on the Feeling Thermometer (low carbon) scale on trial 1.

| | **Trial 1** | **Trial 3** |
|---|---|---|
| **Feeling Thermometer (low carbon)** | 2.92 | 3.46 |
| **Percentage of low carbon choices** | 54.23 | 62.50 |

In the case of the D score, there was a dramatic increase from 'trial 1' (*M* = 0.17) to 'trial 3' (*M* = 1.43), and this increase was highly significant (t (15) = 4.623, *p* = 0.0003). There was also an associated rise in the percentage of low carbon choices made rising from 'trial 1' (*M* = 66.25) to 'trial 3' (*M* = 77.09), but this difference was not significant (t (15) = 1.488, *p* = 0.157).

Table 6.50: D scores and behavioural choice on trial 1 and trial 3 for those participants who held a D score of 0.79 or below on trial 1.

| | **Trial 1** | **Trial 3** |
|---|---|---|
| **D score** | 0.17 | 1.43 |
| **Percentage of low carbon choices** | 66.25 | 71.09 |

## 6.6. Discussion

The analyses reported in this chapter sought to investigate the effects of different types of climate change film on both explicit and implicit attitudes and behavioural choices. It differed from previous research by considering the possibility of film influencing *implicit* as well as explicit attitudes, as well as the effects on behaviour (participants were required to make a series of choices between high and low carbon alternatives). Previous research has suggested that film can significantly influence explicit attitudes to climate change and environmental features (Howell, 2011), but here it was found that there was no significant impact of climate change film excerpts (of whatever type) on explicit attitudes to carbon, as measured by the Likert scale. Specifically, there were no significant interaction effects between groups and trials on the Likert scores in any of the particular comparisons made. In terms of the other explicit measure of attitudes to high and low carbon, the Thermometer Difference, one significant interaction effect did emerge - the climate change film clips high in emotion did have a significant effect on how 'warm' participants felt towards low carbon items.

In the case of the measure of implicit attitudes, the climate change film clips had no statistically *significant* influence on underlying implicit attitudes. However, there were a number of interaction effects here that *approached* significance, which suggested that climate change films containing both information and emotion *together* seem to have a greater effect on underlying implicit attitudes, than those clips focusing on just emotion *or* information.

However, this study also showed that climate change film clips can change the preponderance of low carbon choices. In the case of all the climate change films combined, when compared with the control group who watched the neutral film, there was a highly significant interaction effect (at the 0.0001 level), with significantly more low carbon items chosen on trial 2 (i.e. immediately after watching the film clips), compared to trial 1. The number of low carbon choices went up from 12.02 on trial 1 to 14.18 on trial 2 for the experimental group, and down from 13.30 to 11.63 for the control group (see Table 6.7). The analyses revealed that the climate change 'information' film clips considered separately also produced a significant interaction effect for the number of low carbon choices (see Table 6.16), as did the 'emotion' films (see Table 6.24) and the 'information and emotion' films (see Table 6.32). In other words, each of the different types of climate change film clips, although they had little or no statistical effect on underlying attitudes (except in very particular cases), seem nevertheless to be having a major impact on behaviour.

However, there is an important additional consideration underpinning these results. Given the nature of the sample used throughout this research and throughout the vast majority of research on this topic (mainly university staff and students), the baseline attitudes to low carbon were very positive to begin with, so this does make the job of elevating these scores, through whatever means, much harder. That was why there needed to be a focus on a subset of participants who were not approaching ceiling level (operationally defined as '3' or less on the Likert and Feeling Thermometer; 0.79 and less in D score) for a separate analysis and a follow-up six weeks later on trial 3). These criteria (including the criterion of returning for trial 3, given that less than a third of the experimental group returned) identified subsets of 20 (for the Likert), 13 for the Feeling Thermometer and 16 for the D score. Given the low numbers, all of the climate change film clips were combined into a single category. So how did climate change film clips influence these participants? The answer is that there was now a very significant trials effect for both explicit and implicit attitudes and behaviour, with significant rises from trial 1 to trial 2 for all attitudinal measures and for percentage of low carbon choices (except in the case of the Feeling Thermometer comparison). The Likert scores fell after a six-week interval but not quite back to baseline, but the Feeling Thermometer and D scores remained significantly higher (in the case of the trial 1 versus trial 3 comparisons). The behavioural changes, however, did not endure and the percentage of low carbon choices were not significantly higher after the climate change film intervention, after the approximate six-week delay (trial 3 versus trial 1).

In other words, climate change film clips can significantly impact on explicit and implicit attitudes and carbon choice behaviour, but only in the short-term. How we make such an intervention more long lasting in the future is of enormous theoretical and practical concern to us all, and this issue will be returned to in the general discussion.

# Chapter 7: General discussion

In this thesis, an attempted has been made to investigate a fundamental and major global issue, and that is why we, the public, are not doing more as consumers to change our underlying patterns of consumption, in the face of the threat posed by climate change. Despite numerous attempt by various government and multinationals to change our patterns of consumption through various initiatives (including carbon labelling) in order to make our consumption more sustainable, our patterns of consumption have seemed to change in only very limited ways (see Beattie, 2010). This has been somewhat puzzling and unexpected to many agencies (including both retailers and government organisations like Defra), given that numerous market research surveys, some commissioned by these same government departments and retailers, have consistently indicated that the public have very positive attitudes to sustainable products (British Social Attitudes survey, 2012; Downing & Ballantyne, 2007; Department of Energy and Climate Change, 2016; Ipsos MORI, 2008). In addition, these market research surveys have concluded that the public consistently *report* that they are prepared to change their behaviour to ameliorate the effects of climate change. In their response to the various questions put to them, the public have (in many people's eyes) effectively 'requested' carbon footprint information to be included on products to allow them to choose between consumer products on the basis of their environmental impact. But these initiatives have not had the desired effects, which is even more surprising given that there are a number of precedents for this kind of product labelling (especially food labelling) having a direct and fairly immediate impact on behaviour. The most obvious of these is the inclusion of nutritional information on food products (including calories and fat content), which led to dramatic shifts in consumer preference on a timescale of months rather than years (see, for example, Beattie, 2012). Various governments and retailers then worked in conjunction to provide the public with carbon information to allow them to make the same sorts of informed and appropriate choices with respect to environmental issues. But clearly there was a problem, and this issue has been the subject of the research reported here.

Background research in this area had demonstrated that there is actually minimal visual attention to carbon labels on certain products, where eye-tracking was used to monitor the moment-by-moment gaze fixations of participants in the laboratory (Beattie, McGuire & Sale, 2010). This is obviously a potentially serious issue that unfortunately (and rather surprisingly) had not been explored before the various carbon labelling initiatives were introduced in the U.K. in 2008. But there still were a number of uncontrolled variables in the 'naturalistic' study in

Beattie, McGuire and Sale (2010), including the size and positioning of the carbon labels that would need to be rectified to allow firmer conclusions. However, the question remained in the light of this earlier research as to whether this kind of scheme might work with *certain sections* of the population, and if so, how might we identify them? Furthermore, could we identify what proportion of the general population such receptive individual might constitute, and could measures of attitude ('predispositions to act'), however defined, help us predict who they might be? These were some of the issues that this thesis sought to address.

A starting assumption for this PhD was that self-reported attitudes to carbon footprint alone were unlikely to hold the key here because that was what the numerous market research surveys had measured, and, of course, they did seem to suggest a very positive general attitude to the environment/carbon footprint across a wide range of sampling populations. But these measures often highlighted the 'value-action' gap that people were not behaving in accordance with their underlying values. Therefore, following the pioneering work of Anthony Greenwald and others, the concept of implicit attitude was considered in terms of whether this might be a more useful measure to prove some insight into consumer behaviour, where an 'implicit' attitude was considered to be 'evaluations that occur without conscious awareness towards an object or construct'. Implicit attitudes seem to be formed on the basis of an underlying patterns of associations, rooted in System 1 (Kahneman, 2011), and not based on 'conscious, reflexive, rational and slow decision-making' (see Beattie, 2010, p.56). The possible relationship between attitudes to carbon footprint (both implicit and explicit) and different forms of behaviour was explored in this thesis, the behaviours included visual attention to carbon labels, choice between different products based on environmental features compared with brand information, price, value etc. in a simulated shopping task, simulated consumer choice when 'shopping' in the presence of others and alone, choice between alternative products and services differing in carbon footprint (food items, energy sources, modes of transportation etc.). Self-reports of behaviour were also considered to allow some understanding of the extant literature on this subject. In addition, the question of how we might change both types of attitudes was explored, on the understanding that both implicit and explicit attitudes could potentially be important in this broad quest.

## 7.1. Review and discussion of findings

Thus, in Chapter 2, the possible relationship between implicit attitudes and explicit attitudes, and how these attitudes may or may not direct visual attention to carbon labels, was explored using eye-tracking. Four different non-branded packages were created which included muesli, cake mix, ice lollies and detergent. On each product there were six features including product name, product image, carbon footprint, price, energy value and a bar code. The information labels for three attributes (carbon footprint, price, energy/calories) were always the same size and colour. Price and carbon footprint information were systematically varied yielding four combinations of price and carbon footprint per product. Other information such as energy value, bar code, product name and image were all kept constant.

It was discovered that participants spent significantly more time looking at carbon footprint than they did at price across the sixteen stimuli, but not significantly more time looking at carbon footprint than energy value. These were promising results, in some ways, suggesting that carbon footprint is intrinsically salient when the size of the label is carefully matched with other labels and when the information is represented on the front of the product. However, the value of the carbon footprint, and specifically whether it was high or low, had no significant effect on level of fixation.

Next, the predictive validity of the various measures of attitude for behaviour was tested. When comparing those participants with a strong positive explicit attitude and those with neutral or negative explicit attitude, there was no significant difference in time spent looking at the carbon label on these products. There was also no significant relationship between implicit attitudes and level of fixation on carbon footprint.

However, when comparing those participants with the most positive implicit attitude to participants with the least positive implicit attitude to low carbon - those with the highest positive implicit attitudes were more likely to fixate *first* on carbon footprint information than those with more negative implicit attitudes. This did not occur with explicit attitude. These results suggested that implicit attitude do impact upon unconscious gaze fixation and that carbon footprint information might have some effect on those individuals who hold the right underlying attitude to the environment.

Of course, there are limitations to this study - in a real shopping scenario price is likely to be significantly more important than it was in this particular experiment where no actual purchase had to be made. All participants were required to do was to look at products without even having to choose one (let alone buy one!). In addition, in real products in supermarkets, not all labels are the same size or similar in how they look. Food labels are not always displayed on the front of packages (as they were in this study; this might well be a critical issue going forward) and are usually on the back or the sides. Carbon footprint information is not always as obvious on the packaging of items in real consumer contexts, as they were in this study.

With some of these issues in mind, Chapter 3 explored the relationship between attitudes (both explicit and implicit), *self-reported* environmental behaviour (as is typically measured in research in this area), as well as *actual* behaviour in a shopping task (an attempt to simulated real life shopping in the lab). Time pressure was also systematically varied to simulate the time constraints of much of everyday supermarket shopping. The stimuli used in this study were somewhat different to those used in Chapter 2 in that the images in this experiment were images of *real* products available in supermarkets. These images were displayed on laminated flash cards. The amount of information provided on each item varied across each product which is typical of products sold in supermarkets. There were four variants of each product – luxury brand, well-known brand, organic/Eco brand and value brand. The actual price of the individual items and the carbon footprint value of the items were superimposed onto the front of the product. Unlike the study in Chapter 2, the carbon footprint was colour coded in green (representing low carbon) and black (representing high carbon) as well as having the numerical value of the carbon footprint in the centre of the footprint. Participants' explicit attitudes to carbon footprint were measured using a Likert scale and Thermometer Difference scale and implicit attitudes were measured using the Implicit Association Test pioneered by Greenwald.

The results revealed that there does appear to be a significant relationship between *self-reported* attitudes and *self-reported* behaviours (in line with much of the previous research). However, there was no significant relationship between implicit attitudes and self-reported behaviours. When it came to behavioural choice, there was a tendency for people with a positive explicit attitude towards low carbon to select more low carbon items when not under time pressure, but this was not significant. In terms of implicit attitudes there was also a tendency for people with a positive implicit attitude towards low carbon to select more low carbon items, but again, this failed to reach significance either under no time pressure or time pressure. In this study, colour-coded carbon labels were competing with a whole series of other product features such as brand and price, as would happen in any regular visit to the supermarket. It was found that these other features were significant in guiding the choice of the experimental participants. It was also found that the choices of the low carbon alternatives were more frequent than the choice of the high carbon alternatives, but this was not reliably associated with either measure of attitude.

In Chapter 4 the issue of attitudes and choice of low carbon footprint items was considered in much finer detail, focusing on the frequency of choice of low carbon products when competing with different brands consumers are faced with in supermarkets. The issue of time constraints was also considered in detail (shopping under time pressure versus no time pressure) and the extent to which implicit attitudes influence the choice of low carbon footprint products under both time conditions was also considered. The stimuli used in this study was identical to those products used in Chapter 3, with the price superimposed on the front of the products along with the colour-coded carbon footprint. The results from this study revealed that under time pressure people were more likely to choose well-known brands compared to organic/eco brands. Participants were also significantly more likely to choose luxury brands and significantly less likely to choose organic/eco brands. Participants with a positive implicit attitude to carbon footprint were guided to some extent by the colour-coded carbon footprints but *not* by the numerical values within the carbon footprints themselves. In the case of the measures of explicit attitude, for example, the Likert scale, both under no time pressure and under time pressure, there was little discriminatory power for predicting actual behaviour. When under no time pressure, the weak explicit attitude group did display a low carbon preference; the strong group did not. However, in the case of the implicit IAT measure, when participants were under time pressure those with a strong implicit attitude to low carbon were more likely to shop in a sustainable way (at least in terms of the proportion of low carbon choices). Measures of both types of attitude to low carbon also significantly predicted the choice of organic/eco products, but here only when choices were made with no time pressure suggesting that people may need more time to process the label and/or reflect on the nature of their choices. These results give us some insight into the variables that affect consumer choice and point towards the attitudinal measures that may help us predict consumer behaviour that is more sustainable. Organic/eco brands are clearly not the first choice option, particularly under time pressure. Some individuals, however, with a strong positive explicit or implicit attitude towards low carbon are more sensitive to these brands, but only those with a strong positive implicit attitude are sensitive to carbon footprint information in choices under time pressure. This latter observation is consonant with previous research which suggests that the IAT is indeed a better predictor of behaviour when under time pressure (Beattie, 2010; 2012; Dovidio, Kawakami & Gaertner, 2002; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Fazio, Jackson, Dunton & Williams, 1995). The advantage of this implicit measure is that it is not subject to social desirability biases unlike self-report measures where 'green' responses may be exaggerated somewhat in order for respondents to appear greener than they really are. The results from this study also highlight the impact advertising has on our consumer choices. People do seem to be influenced by advertising and tend choose products that they have been taught to value, for example, the big brands that signal status and economical brands that we are told save money, rather than environmental brands.

Chapter 5 sought to investigate whether environmentally-friendly products could perhaps have the similar impact on consumer choices when shopping with friends and family, where more social considerations come into play. For example, to signal to others that they care for the environment thus having all of the characteristics that go with this – 'considerate', 'caring', 'thoughtful' etc. In this chapter, the effects of the presence of others, whilst shopping, on the choice of more sustainable products (when products are labelled in terms of their environmental consequences) was investigated. Previous research had suggested that selecting environmentally-friendly options or low carbon products, whilst in the presence of others, allows people to present their concerns about the environment and climate change, and potentially elevate their social status in the group through this public display of 'environmental awareness' (Griskevicius, Tybur & Van den Bergh, 2010). However, 'costly signalling theory' (from evolutionary psychology) would suggest that big brands might be more significant in the presence of others.

Using the same basic stimuli used in Chapters 3 and 4, participants were asked to choose ten items under two different conditions – shopping alone and shopping with friends. This study found that shopping with friends has a significant effect on consumer choice. When shopping alone, well-known branded products were the most popular (like Heinz, Kelloggs), followed by the value brand, followed by the organic/eco brand

and lastly the luxury brand. When shopping with friends, the well-known brands became even more popular. Organic/eco and luxury brands were also selected significantly more frequently when shopping with friends. Value brands were, however, selected much less frequently when shopping with friends compared to when shopping alone.

These results emphasised, again, the power of advertising for well-known brands in that these brands are immediately recognisable and accessible under both conditions. It also demonstrated that value brands are selected much less frequently when shopping with friends. However, the luxury, the well-known and the organic/eco brands were all selected more frequently when shopping with friends compared to when shopping alone, suggesting that when we change the social context of consumer choice, it does influence consumer behaviour and that some brands become more popular and some, (particularly the value brand in this experiment), become much less popular, which makes sense from a 'costly signalling theory' perspective – by purchasing these well-known and luxury brands we signal to our friends/family that we have the resource to purchase these kinds of items. By choosing organic/eco brands we signal our pro-social orientation.

However, the choice of low carbon items showed the *reverse* pattern to that shown by organic/eco products in that low carbon items were selected *more often* when shopping alone whereas the high carbon footprint products were chosen *less frequently* than when shopping with friends. These results raise the (difficult) issue that perhaps carbon labels are not obvious enough to allow for social signalling, or perhaps people think that others around them will not be able to evaluate carbon footprint properly (Upham et al., 2011). Therefore, the individual consumer selecting low carbon products whilst shopping with friends will not acquire the elevation in social status that they desire. This social dimension is clearly an issue for the future in terms of both public policy and cultural awareness when it comes to carbon labels.

If carbon labels do work to some extent with those with a positive implicit attitude towards low carbon (as in Chapter 4), the next obvious question is whether we can change people's implicit attitudes. This was the focus of Chapter 6. In this chapter, the effects of different types of film on both explicit and implicit attitudes to high and low carbon and on behavioural choices linked to carbon footprint was investigated. Previous research has suggested that film can influence some explicit attitudes to climate change and other environmental features (Beattie, Sale & McGuire, 2011; Howell, 2011, 2014), although attitudes specifically to carbon had not been tested. In addition, no previous study had set out to test the impact of such films on *implicit* attitudes, or *actual* behaviour in this domain. By selecting clips from the Nobel Prize-winning film on climate change (Al Gore's 'An Inconvenient Truth'), based on their emotion content or information content (or both), it was possible to test whether film could influence attitudes, and, in addition, which type of film would have the most significant effect in terms of changes in attitudes (implicit and explicit) and carbon behaviour. Six clips were selected for the experimental groups (two 'emotion' clips, two 'information' clips and two clips which were both highly emotional and rich in information). There was also a control group to allow for a comparison. Measures were taken immediately after watching the film excerpts and also four to six weeks later.

This study found that in terms of the Likert score, there was a slight increase in mean Likert scores immediately after participants had watched the 'emotion' film clips and after watching the 'information/emotion' film clips, but none of the increases here were significant. The information excerpts had even less effect on Likert scores. In terms of the second self-report attitudinal measure, the Feeling Thermometer, there was one significant effect. The 'emotion' film clips did have an effect on how warm participants felt towards low carbon items - the ratings increased having watched the clips. However, none of the film clips had any significant effect on the IAT scores. In terms of the measures of actual behaviour (choice from matched pairs of high and low carbon items, which included products, sources of energy, means of transportation etc.), the film clips did have a significant impact on behaviour in all conditions, compared to the control condition. When individual comparisons between types of film was carried out, the results suggested that the ‘emotion’ clips were particularly powerful in influencing behaviour.

So this presents something of a conundrum. Various measures of attitude to low carbon have been taken, but there was little systematic change in any of these measures, despite the demonstrable impact of the films on carbon choice. How might this be explained? Are the attitudinal measures simply of no value in this domain? Or is there some other issue? One possibility is that the participants in this study (mainly university students, as in the vast majority of psychological studies, see Sears, 1986) had very positive explicit and implicit attitudinal scores on the baseline trial, and perhaps were approaching something of a ceiling effect. So the question remains - what would happen if you considered separately those participants who were not above 3 on the Likert scores (n=43), not above 3 on the Feeling Thermometer on the low carbon sub-scale (n=29) and 0.79 or below on the IAT, i.e. not strong pro-low carbon (n=29)? It should be noted that the specific criteria used were identified on the basis of partitioning a certain proportion of the sample. There was a significant rise in explicit attitudes when focussing on those participants with lower Likert scores in the baseline trial (scoring 3 or less). The mean Likert score for this group increased from 2.74 on ‘trial 1’ to 3.28 on ‘trial 2’. This was accompanied by a significant increase in the number of low carbon choices from 11.00 on ‘trial 1’ to 13.32 on ‘trial 2’. The Feeling Thermometer scores for those participants who scored 3 or below in initial testing, similarly significantly increased after watching the film clips rising from 2.97 on ‘trial 1’ to 3.59 on ‘trial 2’. Again, there was a significant increase in low carbon choices made from 10.66 on ‘trial 1’ to 12.62 on ‘trial 2’. When focussing solely on those participants with D scores of 0.79 or below, the film clips did have a significant effect on the D scores (the films were not separated by category because the Ns in each group would have been too small: 29/3 film types etc.). Indeed, for this sample, the mean D score increased from 0.28 on ‘trial 1’ to 0.86 on ‘trial 2’, having watched the film clips. This elevation was accompanied by a significant rise in the number of low carbon choices made from ‘trial 1’ ($M$ = 12.69) to ‘trial 2’ ($M$ = 15.07). These results demonstrate quite clearly that film can have a major impact on both explicit and implicit attitudes as well as on behaviour, when we restrict our analyses to those not approaching ceiling level.

In terms of longer-term impact of the film clips on attitudes and behaviour (i.e. 6 weeks after the film clips were viewed), the analyses revealed that in the case of the Likert (n=20), the mean score dropped from 3.15 in ‘trial 2’ to 3.00 in ‘trial 3’ which was accompanied by a fall in the percentage of low carbon choices from 66.50% on ‘trial 2’ to 53.00% on ‘trial 3’. Neither the decrease in Likert score nor the decrease in behaviour was significant. When it came to the Feeling Thermometer (low carbon) score (n=13), there was no change from ‘trial 2’ to ‘trial 3’; the mean score remained at 3.46. There was a slight decrease in the percentage of low carbon choices made from ‘trial 2’ (*M* = 66.15%) to ‘trial 3’ (*M* = 62.50%), but this was not a significant decrease. There was a slight non-significant increase in D score (n=16) from ‘trial 2’ (*M* = 1.12) to ‘trial 3’ (*M* = 1.43), but accompanied by a non-significant drop in percentage of low carbon choices made from ‘trial 2’ (*M* = 76.88) to ‘trial 3’ (*M* = 71.09).

When considering the various measures of attitudes and behaviours on ‘trial 3’ and comparing them with the baseline trial (trial 1), again just for those not approaching ceiling level at initial testing, the analyses revealed that in the case of the Likert score, the mean did rise from 2.75 on ‘trial 1’ to 3.00 on ‘trial 3’, but this difference was not significant. However, when it came to the behavioural choices made by this particular group, there was a significant change, but in the *opposite* direction to that predicted, with the percentage of low carbon choices actually decreasing from 54.75% on ‘trial 1’ to 53.00% on ‘trial 3’.

In terms of Feeling Thermometer, there was a significant increase from 'trial 1' ($M = 2.92$) to 'trial 3' ($M = 3.46$). There was also an increase in the percentage of low carbon choices made from 'trial 1' to 'trial 3' by 8.27% but this was not significant. Finally, in terms of D score, there was a dramatic and significant increase from 'trial 1' ($M = 0.17$) to 'trial 3' ($M = 1.43$) which was accompanied by a rise in the percentage of low carbon choices made, rising from 'trial 1' ($M = 66.25$) to 'trial 3' ($M = 77.09$), although this increase in low carbon behavioural choice failed to reach significance.

This final study in the thesis thus presents a slightly more optimistic view of how we might encourage low carbon behaviour. Climate change films can affect behavioural choices across the range of participants (and irrespective of their baseline attitudinal measures) but these film clips have little impact on the attitudinal scores partly because many are already very high. When we focus exclusively on those participants with lower baseline attitudinal scores, we find that climate change films can affect both attitudes and behaviour, making them significantly more pro-low carbon, at least immediately after watching the film. The longer-term effects, on behaviour even six weeks after initial testing, do not, however, endure, although there is an interesting elevation of D score.

## 7.2. Some core considerations going forward

What this thesis as a whole has demonstrated is that if we are to genuinely do something about climate change, then we need to refine and develop our measures of attitudes and the public's 'pre-disposition to act'. For too long psychologists have been reporting significant 'value-action' gaps but continuing on the same basic course with the same basic measures. This thesis suggests that self-report measures may not just be inadequate in certain domains like sustainability (subject to intense social desirability pressures), they may actually lull us into a false sense of security as they do predict *self-reports* of behaviour, but they predict little else. Some attempt to measure implicit attitudes, not subject to social desirability issues to the same extent, could well be important going forward, but clearly, the current IAT needs to be developed in many ways. It is perhaps naive to assume that we can develop an IAT to 'low carbon', which, after all is an incredibly broad category, which could predict behaviour towards each instantiation of the construct (low carbon food products versus modes of travel versus energy sources versus recycling etc.). When it comes to sustainability, people often tend to be inconsistent in their behaviours, for example, somebody may be conscientious when it comes to recycling waste products but when it comes to transport they may choose to drive a fast car with a huge engine that uses a lot of petrol (Steg & Vlek, 2009). Some people may like to buy locally sourced fruit and vegetables, but when it comes to holidays, they may like to travel abroad every year to a hotter climate. Some psychologists and economists have developed a hypothesis of 'moral licensing' to explain this (Panzone, Wossink & Southerton, 2012). The fact that you do recycle means that you think that the very high carbon holiday is not just appropriate, but *morally* justified. We may well need to develop separate and specific IATs to measure implicit attitudes to low carbon products/travel/energy in each of these different domains, in order to understand how they correlate, and whether the concept of 'moral licensing' is justified. Alternatively, the disparity in different behaviours may reflect a genuine divergence in more specific implicit attitudes. More specific attitudinal measures (when properly developed) may predict behaviour better within each of these different domains.

Throughout this thesis, the goal has been to test some hypotheses about the possible role of different measures and types of attitudes in predicting low carbon *behaviour*. The behavioural focus has been in particular on visual attention to carbon labels and 'consumer choice'. The method for measuring the latter behaviour was to use a 'simulation' of actual everyday consumer choice in contexts like supermarkets, where consumers have to choose between competing products varying on a number of relevant dimensions including brand, price, value, environmental labels, and carbon information. There was an attempt to simulate this process in the lab. This simulation does offer a considerable simplification of some of the processes involved, whilst maintaining some of the complexities in actual decision-making. An obvious extension of this research is to test the relationship between scores on this behavioural simulation task and actual everyday consumer behaviour. This would be possible in the future by developing new research links with retailers like Tesco who use a club-card scheme to record all of the purchases made by their customers. We could then attempt to validate any of our lab-based measures. However, to investigate this properly, as indicated in Chapter 3, one would have to contact a sample of the individual consumers to determine where else they bought their groceries, fuel etc. in order to obtain a more accurate and complete picture of their weekly shop. There is always the possibility that they buy their greener products in local markets etc. This would, of course, need to be empirically verified, but this is clearly something that could be of significant value in future research.

The attempt in the present thesis to change both attitudes and behaviour in many ways worked much better than anticipated, despite the fact that any changes produced in the short-term (in the case of those who were not approaching ceiling level on the baseline trial), were not maintained across time. Film clips can significantly impact on both attitudes and behaviour, but the effects, as demonstrated in this thesis, are short-lived. My own personal understanding, based on this research programme, is that longer-term implicit attitude change will be necessary to produce a change in underlying values to low carbon and this will necessitate a much more sustained intervention programme aimed at young children. This will be essential because it can be assumed that implicit attitudes develop when we are young and over a much longer period (Baron and Banaji, 2006; Bryant & Hungerford, 1977). In the final part of this discussion, a systematic programme of activity will be mapped out. This is being done for one simple reason - this is the next urgent step in this most difficult of global challenges.

## 7.3. The development of an intervention aimed at school-children

### *7.3.1. Background research*

In the past, environmental education has focused on communicating information about the problem and rather less on the identification and encouragement of specific pro-environmental behaviours (Tsevreni, 2011). However, there is little correlation between abstract environmental knowledge, scientific knowledge and pro-environmental behaviour (Kollmuss & Agyeman, 2002; Finger, 1994). A possible mechanism to encourage pro-environmental behaviour is to focus on the empowerment of children, informing them of what actions they can *personally* take to assist in this process. Tsevreni (2011) took such an approach in educating children in Athens about the environment, putting emphasis on children's willingness to engage and participate in a pro-environmental community. The participants consisted of 60 children aged between 9 and 12. He used methods such as storytelling, photography and drama as a way to explore pro-environmental behaviour in order for children to communicate their own experiences and perceptions with regard to the environment. In doing this, children were encouraged to address issues partly through the expression of emotion in storytelling. At the start of the study, the children did not display much concern for the environment nor did they display significant motivation to engage in such pro-environmental behaviour. However, after taking part in these activities, children were able to express more concerns with regard to future plans for their own environment. The intervention increased their feelings of self-efficacy. Many of the children expressed negative thoughts about their environment and pessimism about what the future may hold for their home town. Many of them referred to pollution coming from cars and that they would like to see 'less cars and more flowers and trees'. The main conclusions, and perhaps the most optimistic results to come out of this study, were that it is indeed possible to increase self-efficacy and empowerment in children when it comes to issues to do with the environment.

But there is another important point - if children feel a sense of empowerment and are more confident in expressing their opinions regarding their environment, they can then influence the people around them and encourage change at home 'As children learn about sustainability at school, they sometimes bring new ideas and actions to live more sustainably at home' (Desjardins & Wakkary, 2011, p.3). Damerell, Howe and Milner-Gulland (2013) found that children who were educated about the environment went on to share their knowledge with others, which successfully encouraged positive changes in pro-environmental behaviour in the home. The researchers collected data from seven schools, all of which had undertaken environmental education learning activities outdoors on wetlands in the Seychelles. They compared data to eight other schools who had undertaken work on alternative projects. All sets of pupils completed questionnaires, as did the parents of pupils from both groups. The children completed their questionnaires, addressing issues regarding 'wetlands' whilst they were in school and then took a slightly different version of the questionnaire home to their parents. Children who had been involved in the environmental education programme scored higher on the questionnaire than those children who had studied alternative subjects. Parents whose children had engaged in the environmental education programme also scored higher than the parents of the children who studied alternative subjects.

Interestingly, when interviewed, parents were not necessarily aware that they had acquired this knowledge from their children. However, the most surprising result was that the children who had undertaken the environmental education course had a positive influence on water use at home.

However, both of these educational initiatives have only measured change through self-reported questionnaires whereby people 'report' on their behaviour or on their explicitly held attitudes. All such reports are subject to issues of social desirability. What about implicit attitudes – attitudes that people are not necessarily consciously aware of?

As previously mentioned, the IAT has now been adapted to measure the implicit attitudes of children (Baron & Banaji, 2006; Cvencek, Meltzoff & Greenwald, 2011; Dunham, Baron & Banaji, 2006; Rutland, Cameron, Milne & McGeorge, 2005; Steffens, Jelenec & Noack, 2010). Bruni and Schultz (2010) developed FlexiTwins (a game version of the IAT) to measure children's implicit connectedness to nature, which was described in detail in the introduction. FlexiTwins is a colourful, animated game designed to be fun and easily used across a wide range of ages. Bruni, Winter, Schultz, Omoto and Tabanico (2015) used the FlexiTwins game to measure children's implicit connectedness to nature before and after children engaged in a creative arts contest. They formed a Creative Arts Contest designed to encourage children to be more connected with nature through the use of creative arts. Children were required to 'gather inspiration from the outdoors…and incorporate them into mixed media projects' (2015, p.4). The children's creations included photographs, drawing, collages, and stories. The idea behind the contest was to determine if using the arts to explore nature, and participating in a Creative Arts Contest, had an effect on children's implicit connectedness to nature. Bruni and colleagues recruited students aged between 8 and 11 to take part in the study. All students were pre- and post-tested on the game FlexiTwins to measure their implicit connectedness to nature.

There was a 30-day gap between the pre- and post-test where all of the children attended nature trips. Only some students took part in the Creative Arts Contest (n= 65). The other 74 students did not engage in the contest. They found that those who engaged in the Creative Arts Contest significantly increased their implicit connectedness to nature compared to those who did not engage in the contest. However, it was only implicit attitudes that were measured and only *immediately* after the contest was over. It would have been interesting to return to the school two or three months later and assess their attitudes to determine if engaging on such programme had a lasting effect on their implicit connectedness to nature.

## 7.4. The development of a new approach

In the future, an urgent goal is to devise an education intervention aimed at school-children. The idea is to provide all pupils with more background as to what high and low carbon lifestyles consist of through different initiatives. The children will be taught about the effects of high carbon lifestyles on the environment and what the future will be like if people do not start to change their behaviour. It will be stressed that they are the generation that can make a difference, and that they are *the future* and that it is not too late to save the planet. There will be three conditions - a structured education condition where the sessions will focus on educating the pupils, providing them with information about how they can change their behaviour and the behaviour of others (parents/guardians/siblings). There will be a second condition where drama and the arts will be used to target pupils' implicit attitudes through exploration and experience. The goal is to get pupils to *feel* a sense of pride in their environment, to feel a responsibility to care for the environment and to nurture it. The pupils will explore different scenarios, for example, what the future of the planet might be like if people do not change their behaviour and start to care for the planet. Pupils will also be given various tasks to do, for example, design a poster to encourage pro-environmental behaviour around the school, write a short poem about climate change. The third condition will combine the educational programme and the arts-based initiative. It is important to note that each of the initiatives will last for the same period of time.

## 7.5. Educational Campaign

There will be three different conditions to the initiative (condition 1 and 2 will consist of four 1- hour lessons over the period of four weeks with approximately 1 week in between each lesson, condition 3 is a control condition with testing to take place approximately 4 - 6 weeks apart).

**Condition 1:** This will be a very structured knowledge-based condition where the sessions will focus on educating the pupils about climate change in a classroom setting, providing them with information about how they can change their behaviour and the behaviour of others (parents/guardians/siblings).

**Condition 2:** In this condition, a creative arts programme will be used to educate the pupils. For example, the pupils will explore different scenarios through drama. They will also be given various tasks to do, such as design a poster to encourage pro-environmental behaviour around the school or write a short poem about climate change.

**Condition 3:** This condition is the control condition. Pupils will just complete the pre-test and post-test procedures with no initiative in between (see below for details). The basic structure is as follows:

**<u>Pre-test:</u>** <u>*(to be completed by pupils in conditions 1, 2 and 3)*</u>

Pupils will be required to complete 2 short questionnaires, along with a behavioural choice task and a computerised sustainability game. They will also be asked to take two short questionnaires home for their parent/guardian to complete. The pre-test should take approximately 30 minutes and can be completed immediately before Lesson 1. ***Questionnaire 1a:*** This will be a short multiple-choice questionnaire assessing general knowledge about climate change before starting the initiative. There will be approximately 10 questions including: What is renewable energy? How can you help to slow climate change? What is a carbon footprint?

***Questionnaire 2a:*** This questionnaire is designed to assess the child's sustainable behaviour in everyday life. Children will be asked to report their behaviour on a scale of 'always', 'often', 'sometimes', 'rarely' or 'never'. Items on this questionnaire will include: Do you usually walk or cycle to school? Do you recycle as much as you can? Do you turn off the lights when you leave a room? Again, there will be approximately 10 questions.

***Behavioural choice task:*** Here pupils will be presented with various behavioural choice tasks. These choices will consist of scenarios and product choices where the pupil has to make a decision between ‘A’ or ‘B’ (high carbon versus low carbon).

***Implicit attitude measure:*** Pupils will be asked to play a fun computerised sustainability sorting game. This game is adapted from FlexiTwins (Bruni & Schultz, 2010).

***Questionnaire 3a:*** This short questionnaire is for the pupil to take home to their parent or guardian. The parent/guardian will be required to report their own personal sustainable behaviour at home. This questionnaire will include items such as: Do you turn off the TV when you are not using it? Do you only boil the amount of water you need in the kettle? When it is cold, do you put on a jumper instead of turning the heating up?

***Questionnaire 4a:*** Again, this will be a short questionnaire where the parent or guardian will report on their child’s sustainable behaviour around the home.

The following lessons are to be completed by pupils in condition 1 and 2. The aims of the lessons for both conditions will be the same. However, in condition 1 pupils will be learning in a very structured environment. In condition 2 pupils will be learning through creative arts.

**Lesson 1: Climate Change**

The aim of this lesson is to build awareness of climate change. Pupils will be taught about the effects of climate change and the consequences climate change is having on our planet. The focus will be on the adverse weather conditions threatening different countries and its consequences. Pupils will also consider how climate change is affecting people in different parts of the worlds.

**Lesson 2: Energy.**

The aim of this lesson is for the pupils to gain a better understanding of what energy is, where energy comes from, how we use energy and how we waste energy (especially at home). By the end of the lesson, pupils will be able to recognise the link between energy and climate change, how they can save energy themselves and how they can encourage others to save energy.

**Lesson 3: Carbon footprint.**

The aim of this lesson is to explain what a carbon footprint actually is. By the end of this lesson pupils will have a better understanding of how their individual carbon footprint contributes to climate change. They will have a better understanding of how they can reduce their carbon footprint and how reducing carbon footprint has other benefits such as a healthier lifestyle.

**<u>Lesson 4: Reduce, Reuse, Recycle.</u>**

By the end of this session, pupils will understand what recycling is and how they can 'reduce', 'reuse' and 'recycle'. They will have a better understanding of the benefits of 'reducing' 'reusing' and 'recycling'.

**<u>Post-test:</u>** *<u>(to be completed by pupils in conditions 1, 2 and 3)</u>*

As in the pre-test, pupils will complete 2 short questionnaires along with a behavioural choice task and the computerised sustainability game. They will also be asked to take two more questionnaires home for their parent/guardian to complete.

***Questionnaire 1b:*** This questionnaire will the same as 1a. Once the pupils have completed this questionnaire a comparison to questionnaire 1a will be made in order to assess the impact this initiative has had on their knowledge about climate change.

***Questionnaire 2b:*** This questionnaire will be exactly the same as questionnaire 2a. Once questionnaire 2b has been completed a comparison to questionnaire 2a will be made to compare reported sustainable behaviour before and after the initiative in order to assess whether it actually had an impact on their reported sustainable behaviour.

***Behavioural choice task:*** Like before, pupils will be presented with various behavioural choices (high carbon versus low carbon). By comparing choices made before the pupils took part in the initiative to the choices they make once they have completed the initiative an assessment can be made to determine which condition had more of an impact on their behavioural choices.

***Implicit measure:*** Pupils will play the sustainability sorting game. By comparing their scores from before they started the initiative and once they completed the initiative, an assessment can be made as to whether this initiative had an impact on their underlying attitudes to climate change.

***Questionnaire 3b:*** This questionnaire is for the parent or guardian to report their own sustainable behaviour at home. The items in this questionnaire will be the same as in questionnaire 3a. Once the parent/guardian has completed this, an assessment can be made to see if, by having their child engage in an environmental initiative, it has impacted upon sustainable behaviour at home.

***Questionnaire 4b:*** Here the parent or guardian will report on their child's sustainable behaviour around the home. This will determine if the initiative had an effect on their child's behaviour.

My view is that it will only be campaigns of this type which, when properly evaluated, will allow us to determine the efficacy of initiatives that are capable of changing behaviour by influencing both knowledge and attitudes, *both* explicit and implicit.

**Conclusion**

In summary, the research reported in this thesis suggests that we need new and radical approaches if we are ever to overcome the ‘value-action’ gap when it comes to sustainability. A broader consideration of the concept of attitudes, to include the measurement and assessment of implicit attitudes in addition to explicit attitudes, has been proposed. The thesis has highlighted the critical importance of measuring actual behaviour (or actual consumer choice), as well as mere self-reports of behaviour or choice. The predominant focus on self-reports of behaviour in the past may have lulled us into a false sense of security when it comes to the environment, sustainability and climate change. Self-reports of behaviour may be easy to obtain but they are subject to all of the biases of the conscious mind through the processes of social desirability. The thesis has suggested how this research on consumer choice could be expanded into a broader consideration of more everyday consumer habits. The research reported in this thesis has also suggested that attitudes and behaviour, including implicit attitudes, can be changed using film extracts of specific types. To produce enduring attitudinal and behavioural change, however, we will need new initiatives aimed at children because it has been shown that implicit attitudes develop slowly over time, and they develop early on in our lives. It is clear that we need to target the young in new and creative ways, if we are ever to promote genuine, long-lasting behavioural change in this area, with the development of new consumer habits and preferences with much lower carbon footprints.

I want to finish this thesis on a personal note, by reiterating my strong belief that new initiatives and new approaches to the question of attitudes and behaviour, are *extremely urgent* in this area of climate change, for us all, but especially for our children. We owe it to them.

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