

HOW DO IMPLICIT/EXPLICIT ATTITUDES AND EMOTIONAL REACTIONS TO SUSTAINABLE LOGO RELATE? A NEUROPHYSIOLOGICAL STUDY

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Abstract

Food package labels can be used to influence consumers' evaluation and purchasing behaviour, fostering sustainable consumption. Therefore, it is important to understand consumers' emotional reaction to food package labels that convey sustainable information. The aim of the present research is to get a better understanding of the relation between consumers' attitudes and emotional reactions often used to measure the effectiveness of a communication. Particularly, we focused on recyclability, assessing participants' prior explicit and implicit attitudes towards recyclability and their emotional reaction to food packages featuring logos of (non-)recyclability. The emotional reaction was measured both at an explicit and at an implicit level, using direct (self-reported) and indirect (eye movement, facial expressions and pupil dilation) techniques respectively. Results showed that explicit attitudes predicted self-reported emotions, while implicit attitudes predicted the spontaneous emotional reactions, highlighting the importance to assess both explicit and implicit attitudes. Moreover, results showed that the relation between the time that people looked at the logo and the spontaneous emotional reaction was contingent upon the participant's implicit attitudes. Finally, a follow-up analysis revealed that people with positive implicit attitudes towards recyclability were faster in detecting the recyclable logo and spent more time on processing the logo, which on its turn resulted in better emotional reactions. Thus, the results suggest that implicit attitudes influence both visual attention and emotional reactions. Overall, the research contributes to a better understanding of the relation between prior attitudes and emotional reactions to food packaging, and supports the use of an approach that comprises both direct and indirect measures of attitudes and emotions.

Keywords: Implicit Association Test; eye-tracking; consumers' emotions; attitudes; visual behaviour; indirect measurement

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1. Introduction

Consumers increasingly include sustainable criteria when buying food products. To evaluate the ecological sustainability of products, consumers often use on-package labels (Bublitz, Peracchio, & Block, 2010; Rousseau, 2015). Past research suggest that package labels not only convey useful information to consumers, but also influence product expectations, evaluations, willingness to buy, and consumptions (Bublitz et al., 2010; Lee et al., 2013; Silayoi, & Spence, 2004; Verbeke, & Ward, 2006). Package labels are of particular interest for (packaged) food (Fernqvist, & Ekelund, 2014; Lee et al., 2013). Because most sensory and intrinsic food quality aspects such as taste, smell and appearance are in many circumstances only detectable after consumption, consumers have to rely on other sources of information to gain trust in the food they purchase and eat (Fernqvist, & Ekelund, 2014). This information is often communicated in the form of labels (Caswell, & Padberg, 1992). Yet the effectiveness of package labels depends on the ability to provide credible communication on the qualities that are featured on the label (Grunert, 2016) and the emotional reactions they elicit (Bloch, 1995; Liao et al., 2015; Silayoi, & Speece, 2004). Package labels have a great potential to foster sustainable consumption (Zander et al., 2015; Hoogland et al., 2007) and positive emotional reactions to package labels may drive sustainable purchase behaviour (Lee, & Holden, 1999; Brochado, 2016; Koenig-Lewis, 2014; Wang, & Wu, 2016). Previous studies recorded an important role of emotions in predicting pro-environmental purchasing behaviour in the context of ecologically responsive packaging (Koenig-Lewis, 2014; Roberts, & Bacon, 1997). To deepen our understanding of emotional reactions to sustainable information on packaging, two aspects need further consideration. First, it is key that emotions that consumers experience when confronted with (non-)sustainable information on packaging are fully and correctly measured. Emotional responses are typically measured with self-reports (Buckworth et al., 2013). Yet, consumers may not be fully aware of their emotional responses (Boca, 1996; Greenwald, & Banaji, 1995), and even when they are aware, they may be overly positive to report about them (Crosby, Bromley, & Saxe, 1980; De Maio, 1984; Maass, Castelli, & Arcuri, 2000; Paulhus, 1984; Wilson, & Sasse, 2000). These problems illustrate the importance to go beyond self-report measures to develop a fuller understanding of emotional reactions to package labels, either or not containing sustainability cues. In this study, we use both self-report measures and physiological measures to assess emotional reactions. Second, a better and more nuanced view on the antecedents of emotional reactions is needed. Prior attitudes are considered as an important determinant of emotional responses. Previous research showed that emotional reactions depend on someone's prior affective dispositions or attitudes (Cacioppo, & Petty, 1979; Cacioppo, Petty, & Marshall-Goodell,

1984; McHugo et al., 1991). Yet, the relation between prior attitudes and emotional responses to package labels has been overlooked so far. A better understanding of this relation is important because attitudes and emotional reactions are often used to assess the effectiveness of marketing and communication campaigns (De Pelsmacker et al., 2001; Forehand, & Perkins, 2005). Relying on current insights in attitude research, we distinguish between implicit and explicit attitudes. The use of this approach will result in concrete insights on how to effectively communicate sustainable product features through package labels.

1.1. On package labels & information processing.

Consumers use packaging information for their purchasing decisions (Bredahl, 2004; Mueller et al. 2010; Imm et al. 2012), thus, it is important to understand their attention on food packaging and labels. When consumers evaluate food labels, visual attention is the principal way to acquire information (LaBerge, 1995; Pieters, & Warlop, 1999) and it is related to decision making (Pieters, & Warlop, 1999; Chandon, 2002). Research has mainly used retrospective self-report measures (Verbeke, & Ward, 2006; Mackison et al, 2010), but self-report measures are poor indicators of consumers' visual attention. Indeed people are unlikely to remember exactly what they were looking at, because some information could be processed implicitly or heuristically (Smit, & Neijens, 2011) and visual attention may also operate unconsciously (Kellogg, 1980; Baddeley, 1990; Rosbergen et al, 1997). Eye movements instead are good behavioural indicators to measure visual attention and information acquisition (Russo, 1978; Rizzolatti et al., 1994). For this reason, eye-tracking allows the objective assessment of consumers' attention to food labels (Wedel, & Pieters, 2007). This technique has been applied in the field of food choice to assess perceptions of wine labels (Meillon et al. 2008), and to evaluate attention to nutrition information (Jones, & Richardson, 2007; Rawson et al., 2008; Bialkova, & van Trijp, 2011; van Herpen, & van Trijp, 2011; Graham et al., 2012; Antúnez et al., 2013). Consumers spend just a few seconds in choosing which product they will buy and they do not pay attention to all the information that is featured on the labels (Milosavljevic, & Cerf, 2008). For this reason, it is important to understand what they look at during the first seconds of exposure and how they react emotionally.

1.2. Emotions and their assessment

The emotional appeal of products is becoming increasingly important to gain competitive advantage in the marketplace because products are now often similar with respect to objective

characteristics such as technical specifications, quality, and price. Also, consumers spend just a few seconds in evaluating a product, which is not sufficient to process all information thoroughly (Celsi, & Olson, 1988). Hence, consumers increasingly rely on their emotions to make choices (Garg et al., 2007; Gobé, 2001; Kotler, 1973; Schwarz, 1990). Research acknowledges that a strong and emotional appeal is also important to foster sustainable choices and may help to close the gap between the intention and actual behaviour to behave sustainable (Manzel, 2013). Previous studies suggest that the amount and the cognitive value of the information on the sustainability of the food that is displayed on packaging do not play a major role in consumers' food choices. This because consumers are sceptic about the information or the information may activate a kind of an 'eco = bad' intuition (Gadema, & Oglethorpe, 2010; Young et al., 2010). Thus to compensate this negative or weak effect of the informative and cognitive value of eco labels, it is important to understand consumers' emotional reactions to them because positive emotional responses do play an important role in predicting pro-environmentally purchasing behaviour (Koenig-Lewis, 2014; Roberts, & Bacon, 1997).

Consumers' emotional reactions comprise two different dimensions: an immediate, spontaneous response, and a reflective, cognitive evaluation of their feelings (Koenig-Lewis, 2014). Consumers may rely on their immediate emotional response or on reflective evaluations, depending on the situation, the consumers' motivations, and their available resources and time (Petty, & Cacioppo, 1986; Petty, & Wegener, 1998). Thus, both dimensions are needed to fully understand consumers' emotional reactions. Emotions can be measured with two different types of methods: direct self-report measures and autonomic, physiological measures (Larsen, Norris, & Cacioppo, 2003; Poels, & Dewitte, 2006). The first type reflects the introspective reasoning about experienced emotions, while the latter reveals automatic and bodily changes related to emotions, focusing on continuous emotional reactions that are not affected by higher cognitive processes (Poels, & Dewitte, 2006). The study of consumers' emotional responses to labels relied predominantly on direct techniques, such as interviews and questionnaires, which are not expensive, easy and quick to administer (Poels, & Dewitte, 2006). Next to likert type of scales (e.g. the Pleasure Arousal Dominance scale, Mehrabian, 1996), emotions are often assessed by means of non-verbal pictorial scales. These non-verbal pictorial scales have multiple advantages. First, the lack of "straight" translations for many emotional words causes problems when comparing different cultures (Desmet, 2003). Non-verbal scales, can be used with people from different cultures without translation problems and avoid potential distortions related to different interpretations of semantic categories and numbers (Bradley, Greenwald, & Hamm, 1993; Morris, Bradley, & Wei, 1994). In addition, pictorial scales can also be used with people that have language difficulties as children,

illiterate or aphasic people (Bradley, & Lang, 1994). The “Self-Assessment Manikin” (SAM, Lang, 1980; Hodes, Cook, & Lang, 1985) is one of these measures. SAM comprises different scales representing the three major affective dimensions: valence, arousal and dominance, as a sequence of manikins that visually express them (Figure 1). Subjects have to indicate which one of the figures represents their feeling.

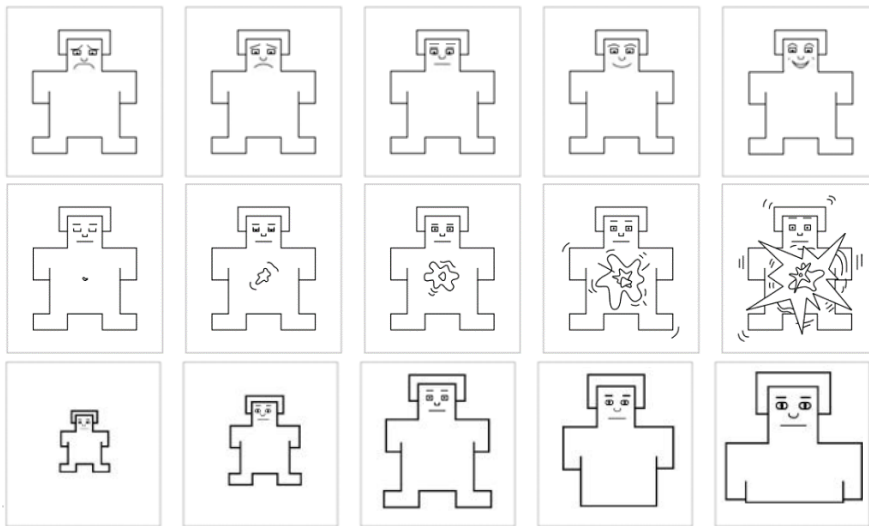


Fig. 1. SAM scales: valence (top panel), arousal (central panel), and dominance (bottom panel)

SAM has been widely used because it is easy to understand, language-free and culture-free (Bradley, Greenwald, & Hamm, 1993; Morris, Bradley, & Wei, 1994) and has good psychometric properties (Hodes, Cook, & Lang, 1985). This measure has been also used to study emotional reaction to packaging (e.g. Liao et al., 2015). Contrary to self-report measures, autonomic measures allow to assess the more spontaneous, less conscious or automatic part of a response, focusing on continuous emotional reactions that are not affected by higher cognitive processes. Among these measures (Cacioppo, & Tassinary, 1990; Lang et al., 1993; Mauss, & Robinson, 2009; Scherer, 2005), pupil dilation and facial expressions are good indicators of consumers’ emotional reactions.

The pupil dilates when the subject looks at an interesting (Hess, 1975; Seeber, & Kerzel, 2011) or emotionally appealing stimulus (Krugman, 1964; Miller, 1967). Pupil dilation is related to many consumer reactions (for an overview, see Wang and Minor, 2008). For example, pupil dilation is related to sales leads (Van Bortel, 1968), actual sales (Hess, 1968), risky choices (Fiedler, & Glöckner, 2012), choice behaviour (de Gee et al., 2014), consumer attitudes and interests (Wedel, & Pieters, 2008, King 1972) and may outperform the predictive power of self-report measures of emotions (Krugman, 1965). This measure has been used to evaluate consumers’ responses to

packaging (Hess, 1968; Krugman, 1966). Next to pupil dilation, also facial expressions are related to emotional responses. The analysis of facial expressions to evaluate emotional responses originates from Charles Darwin's idea that facial expressions are outward manifestations of an inner state (Darwin, 1965). Starting from this point, Paul Ekman demonstrated the existence of prototypical facial expressions for six basic emotions: rage, fear, disgust, happiness, joy, surprise and sadness (Ekman, & Friesen, 1971; Ekman, Soreson, & Friesen, 1969). Other evidences that facial expressions are valid and reliable indicators of the emotional state of an individual were provided by Russel (1994) and Mauss and colleagues (2005). In particular, Mauss found high and significant correlations between the emotional value of the stimuli and the facial behaviour of the subjects. Today software can automatically identify facial expressions using algorithms that track and use the facial muscles movements to recognize the emotions, analysing the type of emotion, the level of arousal and the valence of the affective reactions (Lewinski et al., 2014). Facial expressions have been used to measure emotional reactions to food packaging (Pentus, 2014).

1.3. Attitudes and their assessment

Current insights in psychology distinguish between two different types of attitudes: explicit and implicit attitudes. Explicit attitudes represent a person's conscious view towards people, objects, or concepts of which people are fully aware of. Implicit attitudes are evaluations that occur automatically or without conscious awareness. The relational strength between implicit and explicit attitudes depends on the attitude domain with strong correspondence for insignificant topics such as attitudes towards consumer goods and weak correspondence for (socially) sensitive topics. Because attitudes towards sustainability are sensitive to socially desirable responding (DeMaio, 1984; Edwards, 1957; Maass, Castelli, & Arcuri, 2000), correlations between explicit and explicit attitudes towards different aspects of sustainability are typically weak (Beattie, & Sales, 2009 and 2011; Beattie, 2010). This makes the urge to assess both the implicit and explicit part of sustainability attitudes necessary. Yet, unlike explicit attitudes, implicit attitudes are less accessible through introspection (Fazio, 1990; Gawronski, & Bodenhausen, 2006; Strack, & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000; Zogmaister, & Castelli, 2006). Hence implicit attitudes require different measurement procedures (De Houwer, 2005; Kraus, & Piqueras-Fizman, 2016). As people are fully aware of their explicit¹ attitudes, they can easily be assessed with self-reports,

¹ In this paper, we will follow De Houwer and colleagues' recommendation, using the term "implicit" (vs. "explicit") for the features of psychological constructs, and the term "indirect" (vs. "direct") to describe the characteristics of the specific measurement procedures (De Houwer et al., 2009).

unequivocally asking participants to what extent a certain attitude is relevant for them. However, because people may not be fully aware of their implicit attitudes, they are traditionally assessed indirectly (Banaji, 2001; Kitawaki, & Nagabuchi, 1998). In addition, indirect measures also allow the assessment of information that people do not want to communicate (Bargh, 2002; Greenwald, & Banaji, 1995). The Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998) is by far the most widespread and validated indirect measure of attitudes. The IAT is a computerized response latency task that is assumed to measure the relative strengths of associations amongst two pairs of contrasted concepts (e.g. ‘positive–negative’ and ‘recyclable – non-recyclable’). Many researchers consider the IAT to be the most reliable measure of implicit attitudes currently available (e.g. De Houwer, & De Bruycker, 2007; Nosek, Greenwald, & Banaji, 2007). The usefulness of the IAT has especially been proven in research assessing attitudes towards sensitive topics (McConnell, & Leibold, 2001; Green, Carney, Pallin, Ngo, Raymond, Iezzoni, & Banaji, 2007), research predicting impulsive and compulsive behaviours (Jajodia, & Earleywine, 2003; Wiers, Van Woerden, Smulders, & de Jong, 2002), and research in which people may exhibit ambivalent feelings (Röös, & Tjärnemo, 2011). In these domains, the predictive validity of IAT measures significantly exceeded those of self-report measures. The IAT has also demonstrated to be a good predictor of impulsive or unhealthy food choices (Conner, Perugini, O’Gorman, Ayres, & Prestwich, 2007; Craeynest et al., 2007; Friese, Hofmann, & Wanke, 2008; Hofmann, & Friese, 2008; Kraus et al., 2016; Perugini, 2005; Richetin et al., 2007; Werle et al., 2013) and of pro-environmental preferences (Beatty, & McGuire, 2015; Slabbinck et al., 2011; Vantomme, 2005).

1.4. The present research

Nowadays, a wide variety of sustainability-related food information schemes is featured on food packages aiming to promote sustainable consumption (European Commission, 2012). Yet, previous studies suggest that the amount and the cognitive value of the information on the sustainability of the food that is displayed on packaging do not play a major role in consumers’ food choices (Bray et al., 2011; Chatzidokis et al., 2007; De Boer et al., 2009; Dutra de Barcelas et al., 2011; Krystallis et al., 2009). For this reason, it is important to understand consumers’ emotional reaction to them, as emotional responses do play an important role in predicting pro-environmentally purchasing behaviour (Koenig-Lewis, 2014; Roberts, & Bacon, 1997). Moreover, as emotional responses depend on someone’s prior attitudes (Brenner et al., 2013), it is important to assess both the consumers’ attitudes and emotional responses.

Past research already investigated the relation between implicit attitudes and visual attention to information on sustainability on packaging (Beatty, & McGuire, 2015) and between implicit pro-environmental attitudes and pro-environmental consumer behaviour (e.g. Vantomme et al., 2005). However, the relation between attitudes and consumers' emotional reactions to package labels has not yet been investigated. Recent studies found that different packaging features generate effects on different emotional responses measured by self-report and physiological measures respectively. For instance, Liao and colleagues (2015) investigated consumers' emotional responses to three food packaging elements: colour, typefaces and images. Results of their study suggest that while typefaces generate a conscious response that can be measured by self-report measures, images elicit an emotional response that can best be measured by means of physiological measures. The authors assert that the use of both kinds of measures can provide a wider and more complete interpretation of consumers' emotional responses to food packaging elements. Thus, in line with Liao et al. (2015) we assess both automatic, spontaneous emotional responses as well as self-reported, reflective evaluations of emotions. Yet, we add to this stream of research by focussing on an important antecedent of emotional reactions, namely prior attitudes, and distinguish between implicit and explicit attitudes. Because both implicit attitudes and spontaneous emotional reactions are not or less controllable (Fazio, 1990; Gawronski, & Bodenhausen, 2006; McGhee, & Schwartz, 1998; Strack, & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000; Zogmaister, & Castelli, 2006), we expect that implicit attitudes are related to spontaneous emotional reactions. Similarly, because explicit attitudes as well as self-reported emotions are the result of cognitive evaluations (Banaji, 2001; Jacoby, Stephen, & Jeffrey, 1992; Kitawaki, & Nagabuchi, 1998; Greenwald, & Banaji, 1995) we further expect that explicit attitudes are related to self-reported emotions. In addition, by monitoring eye movements, we test the idea that package labels need to capture the attention of the potential consumers in the first few seconds after exposure to elicit positive emotional reactions (Milosavljevic, & Cerf, 2008). To test our expectations, we measured both implicit and explicit attitudes towards recycling and presented the participants food packages featuring either or not logos of (non-)recyclability. Emotional responses were recorded during exposure of the food packages and evaluated by means of self-reported emotions immediately after exposure of the food packages.

2. Materials and methods

2.1. Participants

Eighty-nine students (67% female) of a large continental European university in Ghent (Belgium) participated in this study in turn for course credits ($M_{\text{age}} = 22$ years, $\text{range}_{\text{age}} = 20\text{-}25$ years). All participants gave their informed consent prior to participation.

2.2. Design and procedure

Participants were first welcomed and informed that they will take part in an eye-tracking experiment that will require them to perform some tasks on a desktop computer, including the evaluation of some pictures. They were informed neither on the specific aim nor on the specific topic of the research. The experiment started with the assessment of participants' attitudes towards recyclability, measured by means of an Implicit Association Test and a self-report measure. They then were presented with 6 food product images of six different food products while an eye-tracking and a webcam recorded their visual attention and the emotional reactions to the stimuli. Each food product featured either a 'recyclable logo', a 'non-recyclable logo' or 'no logo'. Both the order and the type of the logo were randomized within subjects, resulting in a 6 (picture) X 3 (logo) within-subjects design. Thus, each participant was confronted in a random order with 6 images of different food products, varying in type of label. After each exposure to a food product image, participants also expressed their feelings towards that image using a self-report scale.

Figure 2 illustrates the overall procedure.

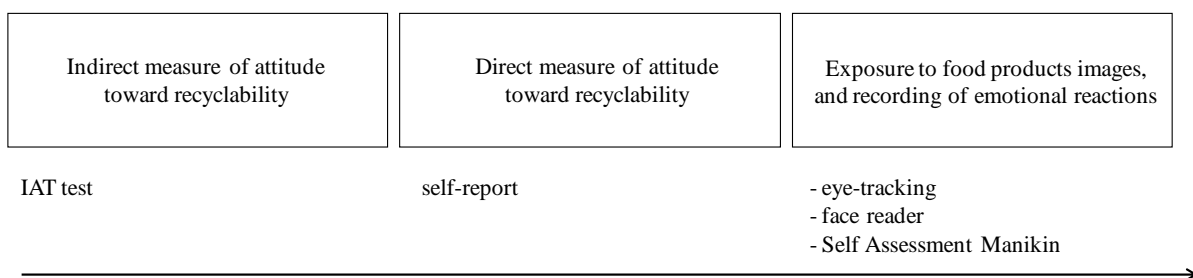


Fig. 2. Experimental procedure

2.3. Materials

2.3.1. Experimental manipulation

For each of the six products we used, we created a set of images representing the same food products in three different versions: 6 product images featured a “recyclable” logo, 6 pictures featured a “non-recyclable” logo, and 6 product pictures without logos. The images had a size comparable to real products and were shown on a Dell 17.3-inch monitor. Participants were seated 60 cm away from the computer display, so they could identify the logo. Fig. 3 shows the different images.

Recyclable	Non-recyclable	Without logos
		
		
		
		
		
		

Fig. 3. Illustration of the food products used.

2.3.2. *Indirect attitude measurement procedure*

Participants were asked to complete an Implicit Association Test (IAT, Greenwald et al. 1998), measuring their implicit attitudes towards recyclability. The IAT consisted of five blocks of trials in which participants were instructed to categorize words or pictures as quickly as possible into different categories by pressing a left (E) or right (I) key on an AZERTY keyboard. Each word or picture was presented equally often and in a random order. In Block 1 (20 trials) participants had to sort recyclable and non-recyclable related pictures into the 'Recyclable' and 'Non-Recyclable' categories. Figure 4 shows the pictures that we used for each category. For half of the participants, the label 'Recyclable' was presented on the upper left corner of the computer screen and 'Non-recyclable' was presented on the upper right corner of the computer screen. Thus, these participants had to press the 'E' key whenever a picture of the recyclable category was presented and the 'I' key whenever a picture of the non-recyclable category was presented. The other half of the participants started with the category labels in reversed position and, consequently, had to press the 'E' key for pictures of the non-recyclable category and the 'I' key for pictures of the recyclable category. Block 2 (20 trials), required participants to distinguish words representing pleasant or unpleasant concepts. The 'Pleasant' category was assigned to the left key and the 'Unpleasant' category to the right key for all participants. Stimuli representing the 'Pleasant' (aangenaam) category were Dutch translations of 'nice' (leuk), 'friendly' (aardig), 'pleasant' (plezant), 'fine' (fijn), 'lovely' (prettig) and 'great' (tof). Stimuli for the unpleasant category were 'creepy' (akelig), 'unpleasant' (onprettig), 'nasty' (lastig), 'unfavourable' (ongunstig), 'annoying' (ambetant) and 'undesired' (ongewenst). Block 3 (60 trials) combined the 'Recyclable–Non-recyclable' categorization and the 'Pleasant–Unpleasant' categorization. The position of the categories and their assignment to response keys were identical to those in Blocks 1 and 2. Block 4 (20 trials) was identical to Block 1, except that the positions of the 'Recyclable' and 'Not-recyclable' categories and their corresponding response keys were reversed. Finally, Block 5 (60 trials) was identical to Block 3 except for the reversed position of the 'Recyclable' and 'Not-recyclable' categories and their assignment to the response keys. Stimuli were presented in the centre of the screen. Category labels were displayed on the upper right and left corner of the white screen. Inter-stimulus interval was 200 ms. False responses were followed by an error message that disappeared only after participants pressed the correct response. Figure 4 shows the images.













Recyclable	Non-recyclable
	
	
	
	
	
	

Fig. 4. Stimuli used for the IAT test

Table 1 – Implicit Association Test: Task sequence

<i>Sequence</i>	<i>N° of trials</i>	<i>Task</i>	<i>Response key assignment</i>	
			<i>Left key (E)</i>	<i>Right key (I)</i>
1	20	Target discrimination	Recyclable(*)	Non-recyclable(*)
2	20	Attribute discrimination	Pleasant	Unpleasant
3	60	First combined task	Recyclable/Pleasant(*)	Non-rec/Unpleasant(*)
4	20	Reversed target discrimination	Non-recyclable(*)	Recyclable(*)
5	60	Reversed combined task	Non-rec/Pleasant(*)	Recyclable/Unpleasant(*)

(*) the positions of recyclable and non-recyclable were reversed for half of the participants.

2.3.3. *Self-reported measure of attitude towards recyclability*

A self-reported scale was used to measure explicit attitude towards recyclability. Participants had to indicate the answer that better described their attitude on a 5-points Likert scale (“I like products with a recyclable packaging more than products with a non-recyclable packaging”) ranging from 1 (“I totally disagree”) to 5 (“I totally agree”). Higher values indicated a stronger preference for products with a recyclable than a non-recyclable packaging, reflecting a positive attitude towards recyclability.

2.3.4. *Emotional reactions to food product images*

Each food product image was presented in the middle of a computer screen for six seconds. During the image presentation, participants’ eye movements and pupil dilations were recorded through a SMI-RED250 eye-tracker. In addition, the valence of their facial reactions to each image was automatically tracked and analysed by means of face recoding software (Noldus FaceReader5). After each image, participants expressed their feelings towards the image using the 5-point Self-Assessment Manikin valence scale (SAM, Bradley, & Lang, 1994; Hodes, Cook, & Lang, 1985; Lang, 1980).

2.4. *Data preparation and preliminary analyses*

2.4.1. *Indirect and direct attitudes towards recyclability*

IAT scores were computed using the improved scoring algorithm of Greenwald et al. (2003). Positive values indicated a positive attitude towards recyclability. Consistent with the IAT score, higher scores on the self-report measure indicated a positive attitude towards recyclability.

2.4.2. *Emotional reactions: facial expressions, pupil dilation and self-reported scores*

Pupil diameter during the observation of “recyclable” and “non-recyclable” logos was standardized using the participant’s pupil diameter during the exposure to images without logos as the baseline. This procedure allows the assessment of the modification in pupil diameter that is only

due to the specific information that is displayed (i.e. the logo), while controlling for the different basal pupil diameter of the participants (Beatty, 1982) and for the luminance or the brightness of the images (Hess, 1972). For the same reasons, a similar procedure was applied to the facial expression data. In particular, individual facial expression scores were based on the valence metric that is provided by the Noldus Software. This metric is based on the facial movements that are related to both positive and negative emotions and includes a calibration procedure that corrects for possible person-specific biases. Particularly, the valence is calculated as the intensity of ‘Happy’ minus the intensity of the negative emotion with the highest intensity.

The measurements were taken for the total exposition time (6 seconds) and averaged . We calculated separate facial expression indices for the images with and without logo. The facial expression indices of “recyclable” and “non-recyclable” logos were standardized using the participant’s facial expression score during the exposure to images without logos as the baseline. This allowed us to have facial expression scores that only reflect emotional responses to the specific logo on the package. The self-reported SAM scores did not require any further data preparation.

To facilitate the interpretation and to increase the robustness of our findings, we averaged the scores across the logo conditions for each measure separately. By doing so, we obtained for each participant individual scores for the “recyclable” and the “non-recyclable” images as we did for the facial expression measure, the pupil dilation measure, and the SAM measure.

The aim of our study is to investigate the relation between prior attitudes and emotional responses. However, because the IAT integrates two different target categories (Recyclable vs. Not-Recyclable), the IAT yields relative scores². Accordingly, to maximize the methodological correspondence and hence the interpretability of our results, we also computed relative scores for our emotional reactions. Thus, the differences between standardized pupil dilation, the standardized facial expressions, and the SAM scores for “recyclable” and “non-recyclable” logos were calculated for each participant, resulting in a “Pupil difference”, a “Facial Expression difference”, and a “SAM difference” score respectively. For each measure, higher scores indicated a more positive emotional reaction towards the recyclable than towards the non-recyclable logos. Table 2 shows the mean and the standard deviation of all measures.

² This is, an IAT score of zero indicates no difference in the associative strength between “recyclable”-positive, and “non-recyclable”-positive

Table 2 – Descriptive statistics

	<i>mean</i>	<i>standard deviation</i>	<i>range</i>
IAT score	1.02	.21	-2/2
Likert score	3.35	.70	1/5
SAM difference	.97	.73	-4/4
Pupil difference	.34	.41	-
Facial expression difference	.02	.01	-

3. Results

3.1. Attitudes

A one sample t-test revealed the IAT differed significantly from zero-point, indicating that participants had a positive implicit attitude towards recyclability ($M_{IAT} = 1.02$; $SD_{IAT} = .21$; $t = 44.06$, $p < .001$). Results further showed that the explicit attitude towards recyclability ($M_{SelfReport} = 3.35$; $SD_{SelfReport} = .7$) differed significantly from the central point of the scale ($t = 4.71$, $p < .01$), indicating that participants had also a positive explicit attitude towards recycling.

The two measures were not significantly correlated ($r = .08$, $p > .05$).

3.2. Emotional reaction

A series of one sample t-tests revealed that participants evaluated the packages with a recyclable logo as more positive than the packages with a non-recyclable logo. All the difference scores were positive (Table 2) and significantly different from the zero-point (representing no difference between recyclable and non-recyclable evaluations), indicating that facial expressions ($t = 4.3$, $p < .001$), pupil diameter ($t = 7.46$, $p < .001$) as well as the self-reported evaluations ($t = 12.35$, $p < .001$) were more positive for packages with a recyclable logo than for packages with a non-recyclable logo.

3.3. *Relation between attitudes and emotional reaction*

To investigate the relation between participants' attitudes towards recycling and their reactions to product packages featuring (non-)recycling logos, three OLS regression analyses were performed, using respectively: (1) the "Pupil difference", (2) the "Facial Expression difference", and (3) the "SAM difference" as criterion. The IAT and the self-reported attitude scores were used as independent variables.

Table 3 shows the results of the regression analyses indicating that implicit attitudes towards recyclability predict spontaneous emotional reactions towards packages featuring recycling logos ("Pupil difference" and "Facial difference") whereas self-reported attitudes predict explicit product evaluations ("SAM difference"). Positive implicit (explicit) attitudes translate in positive spontaneous (reflective) emotional reactions towards products that are packed in recyclable packages. These results are in line with research showing that implicit and explicit attitudes may predict different types of reactions (Asendorf et al., 2002; Chen, & Bargh, 1997; Dovidio, Kawakami, & Gaernter, 2002; Dovidio et al., 1997; Fazio et al., 1995; Petty, 2006; Wilson et al, 2000; Zinkernagel, 2011).

Table 3 – Impact of attitudes on reaction to food products

	<i>SAM</i>		<i>Pupil difference</i>		<i>Facial difference</i>	
	<i>b</i>	<i>R</i> ²	<i>b</i>	<i>R</i> ²	<i>b</i>	<i>R</i> ²
IAT	n.s		.48**	.23	.37**	.13
Self-Reported	.45**	.2	n.s		n.s	

*. Significant at the .05 level (2-tailed).

** . Significant at the .01 level (2-tailed).

Because some participants may not have noticed the logo to process the information about recyclability, we also tested an OLS model in which the facial valence score for products with a recyclable packaging were regressed on the total time that participants looked at the recyclable logo (i.e. fixation level), the IAT score, and their interaction. The significant and positive interaction ($\beta = .23$; $p < .05$) indicates that the relation between the IAT score and the facial reaction depends on the time that participants looked at the logo. To facilitate the interpretation, we plotted the interaction and performed a simple slopes analysis. Figure 2 shows the regression lines for different fixation

time levels (Low = Mean – 1 SD, Medium = Mean, and High = Mean + 1 SD). A simple slopes analysis shows that for low levels of fixation on the recyclable logo, the model is not significant ($p > .05$), so the participants' implicit attitudes are not related to the emotional reactions to the depicted logo. Yet, as fixation levels increase, the relation becomes marginally significant at medium fixation levels ($\beta = .31$; $p = .059$), and significant at high fixation levels ($\beta = .55$; $p = .02$). These results indicate that when logos are not noticed, implicit attitudes do not predict facial expressions. Furthermore, a higher fixation time strengthens the predictive nature of implicit attitudes: when people fixate more on the label, a high positive implicit attitude indicates more positive facial expressions than when people fixate less on the label.

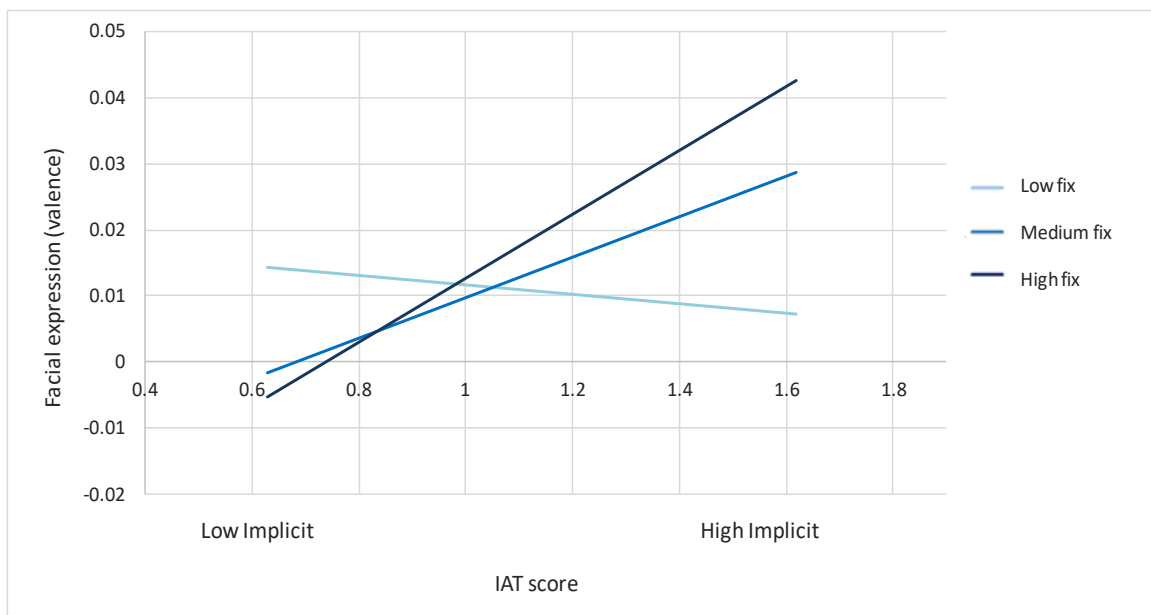


Fig. 5. Relation between IAT score and Facial expression during the exposition to products with a “recyclable logo”, at different levels of time spent watching the logo

We verified whether a similar moderation pattern illustrates the relation between the explicit attitude score and the explicit evaluation of products with a recyclable packaging. In particular, we tested an OLS model in which the SAM score for products with a recyclable packaging was regressed on the total time that participants looked at the recyclable logo (i.e. fixation level), the explicit score, and their interaction. The interaction was not significant ($\beta = .13$; $p > .05$), indicating that the relation between the explicit attitude score towards recyclability and the explicit emotional evaluation of the products with recyclable packaging did not depend on the time spent watching the logo.

We investigated the relation between the implicit attitude score and the facial valence score for products with a non-recyclable packaging using an OLS regression model. In this model the facial valence score for products with a non-recyclable packaging was regressed on the total time that participants looked at the recyclable logo (i.e. fixation level), the IAT score, and their interaction. The interaction was not significant ($\beta = .11$; $p > .05$) indicating that the relation between the IAT score and the facial reaction for non-recyclable packaging did not depend on the time that participants looked at the logo.

A follow up analysis was performed to verify the relation between attitudes and visual attention, because in previous research the attitude (and particularly the implicit attitude) towards sustainable features of products was related to visual behaviour (Beatty, & McGuire, 2012; 2015). An OLS regression analysis was performed, using the time to first fixation of the recyclable logo as dependent variable. The time to first fixation indicates the time in seconds from the stimulus (image of packaging) onset until the start of the first fixation in the specific area of interest (recyclable logo). The IAT and the self-reported attitude scores were used as independent variables. Table 4 shows the results of this regression analysis, indicating that implicit attitudes towards recyclability predict the time to the first fixation on the recyclable logo, whereas explicit attitudes did not. Particularly, when people have a more positive implicit attitude towards recyclability, they need less time between the onset of the image and the detection of the logo. We conducted a similar analysis on the non-recyclable logo, but neither the IAT, nor the self-reported attitude reached significance. Apparently, attitudes towards recyclability do not translate into the speed with which non-recyclable logos are detected.

Table 4 – Impact of attitudes on the time to the first fixation on the logos

	<i>Time to first fixation</i>			
	<i>b</i>	<i>Std. Error</i>	β	<i>Sign.</i>
Self-Reported	- 114.39	157.44	-.077	.47
IAT	- 1363.69	506.14	-.286	.01**

*. Significant at the .05 level (2-tailed).

** . Significant at the .01 level (2-tailed).

4. Discussion and Conclusions

The aim of the present research was to get a better understanding of the relation between prior attitudes and consumers' reactions to food packages featuring logos of (non-)recyclability. Our findings are in line with past research about the role of packaging in consumers' product evaluations and product expectations (Bublitz, Perrachio, & Block, 2010; Lee et al. 2013; Verbeke, & Ward, 2006) by showing that the information on packaging influences consumers' emotional reactions to the product. Yet, while previous research relied mainly on self-reports to measure emotional responses to packaging information, our research deepened the understanding of emotional reactions to sustainable information on packaging by assessing both self-reported emotional evaluations, as well as automatically recorded neurophysiological responses (i.e. facial expressions, eye movements and pupil dilation). Unlike self-reports, neurophysiological measures allow the recording of spontaneous emotional responses that people are not fully aware of. Our results show that participants had both more positive self-reported and neurophysiological emotional reactions to packages with recyclable logos than to packages with non-recyclable logos. Moreover, we also investigated the effect of consumers' prior explicit and implicit attitudes on emotional responses to package labels because this relation has been overlooked so far. As expected, explicit attitudes predict self-reported emotions, while spontaneous emotional reactions were predicted by implicit attitudes. The results highlight the importance of using both implicit and explicit measures, because they assess related but distinct attitude constructs (Nosek, & Smyth, 2007) that are related to different types of emotional responses (Chen, & Bargh, 1997; Dovidio, Kawakami, & Gaernter, 2002; Dovidio et al., 1997; Fazio et al., 1995; Petty, 2006; Wilson et al, 2000).

Our results corroborate insights from dual processing models. These models distinguish automatic processes which are faster and less conscious, from reflective processes which are slower and more aware (Gawronski, & Bodenhausen, 2006; Strack, & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000). Decisions under time pressure may then be driven by implicit emotional reactions making both implicit attitudes and neuro-physiological measures of emotions more predictive of behaviour (Dijker, & Koomen, 1996). On the other hand, a lack of time pressure can render higher importance to explicit attitudes and reflective emotional evaluations in determining behaviour (Friese, Wanke, & Plessner, 2006). For this reason, it is important to understand both the immediate spontaneous emotional reactions, that drive fast or impulsive choices, and the more reflective

emotional reactions, that drive slower and more conscious and rational choices (Kahneman, 2011; Lee, & Kacen, 2007; Ochsner, & Phelps, 2008).

Interestingly, results showed that the relation between the IAT score and the facial reaction depends on the total time that participants looked at the logo, while the relation between the explicit attitude score and the explicit evaluation of the products does not depend on the time spent watching the logo. Positive implicit attitudes generate higher positive emotional reactions when fixation time increases. These results suggest that implicit attitudes may drive immediate emotional reactions whereas explicit attitudes do not. Since time spent watching on a logo does not affect explicit emotional evaluation, this may indicate that this explicit emotional evaluation rather reflects previously acquired emotions than immediate evaluations. Also results suggest that packaging labels especially influence emotional evaluations for people who already have positive attitudes towards the topic (in this case sustainability) that is promoted by the label. However, as labels do not foster positive emotions in people with negative emotions towards recyclability, it seems that labels are inappropriate tools to turn negative attitudes into positive attitudes. Yet, this needs to be confirmed in future research as previous studies found that emotions elicited by communication did influence attitudes (Janis, 1967; Holbrook, & Batra, 1987).

Our results also show that that the relation between implicit attitudes towards recyclability and the emotional facial reactions depends on the time that participants looked at the logo. That is, the longer that people fixate at the recyclable logo, the stronger the relation between implicit attitudes and spontaneous emotional reactions. Or put differently: implicit attitudes towards recyclability are important predictors of spontaneous emotional reactions, but only for (relatively) easy to detect logos of recyclability. This relation was not found for non-recyclable logos. Indeed, the relation between previous implicit attitudes toward non-recyclability and emotional reaction to non-recyclable packaging was not moderated by the time that participants spent watching the non-recyclable logo. A possible explanation could be that people who are not positive toward recyclability do not consider recyclability as a priority or a crucial topic (Hansmann et al., 2006), and hence, neglect or don't spend time on information on recyclability. Interestingly, a follow up analysis showed that people who have a positive implicit attitude towards recyclability, were also faster in detecting the recyclable logo. Apparently, our implicit attitudes do not only predict how we react emotionally, but they also steer our visual attention, consistently with previous studies (Songa, & Russo, 2017). This is in line with research that suggests that people search for external stimuli in line with their own implicit attitudes (Perugini & Prestwich, 2007).

Overall, at a theoretic level our results contribute to better understand the relation between prior attitudes and emotional reactions to food packaging. Furthermore, the research supports the use of an integrated approach that comprises both direct and indirect measures of attitudes and emotions. Indeed, the research underscores the importance of implicit measures of attitudes that reveal unconscious associations that affects consumers' spontaneous emotional reactions, and the usefulness of psychophysiological measures to assess consumers' true feelings that are not revealed through self-report measures. Our results provide insights in consumers' emotional response to packaging labels without considering the consequences of these emotional responses such as buying intentions or behaviour.

We applied the IAT as conceptualized by Greenwald and colleagues (1998) for the assessment of implicit motives. Even though the validity of this variant has been intensively investigated and many researchers consider this variant as one of the most reliable implicit measures (Bar-Anan, & Nosek, 2014; Gawronski, & De Houwer, 2014), it certainly has its limitations. We address three of them. First, the features of the IAT impose the use of relative measures. Further research could also assess the willingness to pay for products showing (non)-recyclable labels to see whether emotional reactions drive consumers' purchase behaviour. The relative nature of our measures was imposed by the features of IAT. The use of relative measures can be justified by the fact that the human thinking has a relative nature (e.g. Azar, 2007), and that many decisions in everyday life add up to weighing two or a limited number of options (Greenwald et al., 1998). However, inclusion of other, absolute implicit measures may be useful to disentangle different effects and separate underlying processes for positive (e.g. recyclable) and negative (e.g. non-recyclable) logos. Second, people may have used spontaneous or strategic simplifications in one of the two combined categorization tasks in the IAT (i.e. Block 3 and Block 5 of the IAT procedure). This phenomenon is known as 'recoding' and may cause method variance in the IAT score (Rothermund et al., 2009). Even though we cannot exclude that our IAT scores reflect also recoding variance next to attitudinal variance, we believe that our results are most likely conservative estimates of the true correlation between implicit attitude measures and the behavioural responses, assuming that recoding may have impacted both explicit measures and the IAT, but not the spontaneous emotional reactions and gaze behaviour. However, to minimize method variance in IAT scores, future research may benefit from alternative IAT procedures. Noteworthy in this context is the recoding free IAT (IAT-RF: Rothermund et al., 2009) that is especially constructed to eliminate strategically recoding. Lastly, we used affective attribute categories (i.e. pleasant versus unpleasant). Instead, we could also have used general evaluative attribute categories (i.e. positive versus negative). Even though different conceptualizations of attitudes are mostly highly interrelated (Delage et al., 2016), results could

have been different if we used different attribute categories. Yet, it remains for future research to establish the distinct roles that different operationalization of attitudes may play in predicting behavioural outcomes.

Another possible limitation of the study is the explicit measure of attitude toward recyclability. The question “I like products with a recyclable packaging more than products with a non-recyclable packaging” was chosen to maximize the structural correspondence with the IAT measure, because the question was framed to reflect the relative nature of the IAT. Nevertheless, the measure put a strong emphasis on the product (‘I like products ...’) and may refer to either brands or the content. For this reason it could be that the implicit and explicit measures assessed two different concepts. To test this alternative hypothesis, we ran an additional study in which we assessed attitudes towards recycling with exactly the same measures as in the initial study, together with a ‘real’, validated attitude towards recycling measure. A sample of 75 students (35 males; 40 females) from the same University of the first study participated in exchange of a course credit (mean age: 22 years; SD = 1.31). The participants performed the same IAT and one-question measure as we used in the main study. Moreover, we added a 3-item measure of a validated attitude towards recycling scale: “I believe that my recycling behaviour will help reduce wasteful use of landfills”; “I believe that my recycling behaviour will help conserve natural resources”; “I feel good about myself when I recycle” (Ahmad et al., 2016; do Valle et al., 2005; Ramayah et al., 2012; Sidique et al., 2010). A principal components analysis of all attitude measures (IAT and all direct measures) with subsequent varimax rotation yielded a two-factor solution according to the Eigenvalue > 1 criterion and the scree-test. The two factors accounted for 51.67% and 20.11% of variance. All the four direct attitudes measures comprised the first factor (loadings > .68, cross-loadings < .07) and the IAT measure fully covered the second factor (loading = .99, cross-loading = .018). A Cronbach’s alpha analysis further revealed that all four direct measures were internally consistent ($\alpha = .81$) and this coefficient could not be substantially improved by deleting the one-question attitude measure that we used in our initial study ($\alpha = .82$ if the one-question is deleted). Finally, the Pearson correlations among all attitude measures illustrate that the IAT score is not correlated with any direct attitude measure whereas all direct attitude measures are highly correlate with each other. We report the correlations in Table 5 in the Appendix. We believe that these results provide sufficient evidence that the one-item attitude measure that we used in our initial study reflects the participants’ direct/conscious attitude towards recycling, excluding that the results of the main study are due to the fact that the implicit (IAT) and explicit (self-reports) assess two different concepts.

One of the measures used to assess participants’ emotional response was the pupil dilation. This measure could be affected by several variables as the luminance (de Groot and Gebhard, 1952)

and the stress due to cognitive events (Kahneman & Beatty, 1966; Kahneman, 2011). We took under control both the effect of the different basal pupil diameter of the participants (Beatty, 1982) and of the luminance or the brightness of the images (Hess, 1972) by standardizing the pupil diameter during the observation of the logos using the participant's pupil diameter during the exposure to images without logos as the baseline. All the features of the packaging with recyclable and non-recyclable logos were taken identical in order to avoid that other information could affect the pupillary (or other autonomic) responses. The fact that the pupil dilation results are in line with the facial expressions supports the interpretation of pupil dilation as index of emotional response, consistently with previous research (Hess, 1975; Seeber, & Kerzel, 2011; Krugman, 1964; Miller, 1967) also in the study of consumers' attitudes and interests (see Wedel, & Pieters, 2008; King 1972) and consumers' responses to packaging (Hess, 1968; Krugman, 1966). Nevertheless, in future research could be useful to add a measure of stress to take under control the possibility that the pupil dilation was affected by this variable.

The research was focused on a specific feature (recyclability) in a specific field of food products. Even though our results seem promising, they need to be replicated with other products and different product features to verify whether the same patterns of prediction will emerge. Moreover, all research participants were students. Thus future studies are needed to determine the generalizability of our findings to different age groups, cultures or other socio-demographic variables.

Finally, the study is conducted in a research lab environment, far from real-life situations. Due to the exploratory nature of the research and the sensitivity of the psychophysiological measures to external factors (e.g. light and brightness), we chose to use a research environment in which luminance, dimensions and brightness of all the pictures and logos could be controlled. Yet, presenting product on a computer screen is different from being confronted with products in a retail environment. Thus, a possible direction for future research is to extend the study to an ecologically more valid environment such as real supermarkets.

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Appendix

Table 5 – Correlation

IAT measure		1. "I like products with a recyclable packaging more than products with a non-recyclable packaging"	2. "I believe that my recycling behaviour will help reduce wasteful use of landfills"	3. "I believe that my recycling behaviour will help conserve natural resources"	4. "I feel good about myself when I recycle"	
IAT measure	Pearson correlation	1	.031	-.029	.076	.030
1	Pearson correlation	.031	1	.452**	.324**	.521**
2	Pearson correlation	-.029	.452**	1	.804**	.542**
3	Pearson correlation	.076	.324**	.804**	1	.488**
4	Pearson correlation	.030	.521**	.542**	.488**	1

** . Significant at the .01 level (2-tailed).