IAT, consumer behaviour and the moderating role of decision-making style: An empirical study on food products

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A B S T R A C T

This article discusses the reasons why the study of consumer preferences requires indirect measures. Particularly, the research is focused on the use of the Implicit Association Test (IAT).

The main aim of the present research is to verify the usefulness of the IAT in situation of ambivalent attitudes, such as in the food domain. On the basis of the relationship between interest/motivations and visual attention, the first study explores the effect of implicit associations on consumers' visual behaviour on food labels. Moreover, the predictive and incremental validities of the IAT over traditional self-report measures on subjects' intention to buy were tested in the specific field of food purchases, where attitudes can be ambivalent. Finally, the role of preference for intuition or deliberation in the decision-making process as a moderator of the relationship between the IAT score and the intention to buy was assessed. The second and the third studies aim to verify the same moderation pattern in real behavioural choices between tasty/healthy foods and between different food brands.

Overall, the results (1) show the effect of implicit (and not explicit) associations on the way in which consumers read the information on food packaging; (2) demonstrate that the IAT enhances the understanding of consumer preference, intention to buy, and choices among different products, especially in domains where attitudes could be ambivalent; and (3) support the moderating role of the decision-making style. Overall, the research supports the employment of the IAT in consumer research.

1. Introduction

Research in consumer psychology has demonstrated that consumers often do not make a rational choice by comparing all the products available and frequently are not aware of the real motivations and attitudes that drive their purchasing decisions (Rizzolatti & Vozza, 2007). Thus, people often do not report the real reasons underlying their behaviour, of which they may be not aware of. Instead, they provide explanations that are the outcome of a rationalization and justification process (Fazio & Olson, 2003) based on stereotypes, habits, common sense and (even in some cases) mere guesswork (LeDoux, 2014). The focus of consumer behaviour research, therefore, is not only the rational evaluation based on the attributes of the product but also the consumers' spontaneous emotional reactions and the unconscious dimension underlying their choices.

The attitude towards a product is a key factor in the decision-making process, because it creates a like or dislike for a particular situation, person or object (Ajzen, 1988). The importance of attitude in generating an intention to act is recognized in psychological models of human behaviour, such as the theory of reasoned action (Ajzen & Fishbein, 1975) and the theory of planned behaviour (Ajzen, 1991). Traditional techniques employed to investigate attitudes and associations are mainly based on individual statements, asking subjects to provide a self-assessment of their opinions. This approach is called *direct* (because the respondent explicitly describes his/her attitude or the associations with the target object or concept), and has a wide tradition of use in psychological and social research. However, the application of direct measures requires three basic assumptions: the participant (1) has a definite attitude and opinion towards the object of interest; (2) is aware of these attitude and opinion, and (3) wants to accurately relay it to the researcher (Jacoby, Stephen, & Jeffrey, 1992). The answers provided by a participant may not reflect the actual emotional state against the stimulus (Marshall & Rossman, 1999) because the participants can voluntarily revise their answers to say what they believe the researcher wants to hear (Wilson & Sasse, 2000) or to preserve their self-image (Paulhus, 1984) and to manage the image projected to others (DeMaio, 1984; Edwards, 1957; Maass, Castelli, & Arcuri, 2000). The current approach of social psychology

recognizes two different processes: explicit (propositional process) that subjects are aware of and can declare, and implicit (associative process), that concerns spontaneous and unconscious beliefs. The implicit dimension is not assessed through traditional techniques of measurement because the subjects have a limited introspective capacity (Greenwald & Banaji, 1995), and direct measurements are unable to record what the subject does not perceive consciously (Banaji, 2001). This limitation of direct measures is particularly relevant when people experience ambivalent attitudes. Attitudinal ambivalence is the co-presence of positive and negative evaluations towards the same object that lead the perception of both advantages and disadvantages towards an object simultaneously, or have both positive and negative attitudes together (Riketta, 2000). This ambivalence challenges the direct methods of measurement based on a set of statements, because if the respondent has both positive and negative evaluations, he/she may agree with both end-points of the scale at the same time, often resulting in the selection of the mid-point as a compromise between the two disparate attitude components (Olsen, 1999). Over the last few decades, research in psychology has begun to make use of *indirect* measurement techniques to investigate the implicit dimension, thus obtaining more detailed information about preferences and associations of which subjects are not fully aware or those that they do not want to communicate. Indeed, indirect measurement techniques are based on the assumptions that attitudes and implicit associations systematically influence the performance of the subjects in some specific tasks and that the magnitude of the effect on the outcome is an index of the underlying phenomenon. Thus, these techniques will minimize the recourse of strategies for self-image management because the participants are unaware of the link between these indirect measurements and their implicit associations with the target object/concept. Further, these techniques allow researchers to access associations and preferences of which subjects are not aware. The most widespread and validated indirect measure of implicit association is the Implicit Association Test (IAT) (Greenwald, McGhee, & Schwartz, 1998), which measures the strength of the associative link between two concepts. The IAT has a good level of reliability and validity. Scientific literature reports Cronbach's alpha of 0.80 or higher (Asendorpf, Banse, & Muecke, 2002; Banse, Seise, & Zerbes, 2001; Cunningham, Preacher, & Banaji, 2001; Egloff & Schmukle, 2002; Greenwald & Nosek, 2001; Hofmann, Gawronski, Gschwender, Le, & Schmitt, 2005; Kuhnen et al., 2001; Steffens, 2004). From the point of view of the validity of the IAT, there is empirical evidence supporting that the effect of the IAT is robust even in case of variations in the spatial placement of response keys, and in the interval between the tasks and in the number of stimuli used (Greenwald et al., 1998). Moreover, several studies demonstrated that the IAT has a good construct validity (Ashburn-Nardo, Voils, & Monteith, 2001; Kuhnen et al., 2001; Rudman, Greenwald, Mellott, & Schwartz, 1999) and a meta-analysis on the predictive validity of the IAT conducted by Greenwald, Poehlman, Uhlmann, and Banaji (2009) on 86 independent studies showed that the IAT's effect is a significant predictor of the phenomena investigated in different areas of study. With regard to sensitive issues and uncontrollable behaviour, the IAT is more predictive than the self-report measures of preference (e.g. racism: Green et al., 2007; McConnell & Leibold, 2001; consumption of alcoholic beverages: Jajodia & Earleywine, 2003; Wiers, Van Woerden, Smulders, & de Jong, 2002; and number of cigarettes smoked in a day: Perugini, 2005). The IAT was developed in the field of social psychology, created specifically for the study of stereotypes and prejudices. However, it is now more widely employed in research on consumers' associations and behaviour. Fitzsimons et al. (2002) presented an overview of studies on consumers that highlights how purchasing decisions are not the result of conscious processes but instead are largely influenced by unconscious processes. The IAT was successfully employed in the study of the effect of persuasive messages (Dimofte & Yalch, 2007), the influence of testimonial (Brunel, Tietje, & Greenwald, 2004 study 2; Forehand & Perkins, 2005), the strength of the relationship with the brand (Brunel et al., 2004,

study 1), preference between brand and no-name products (Friese, Wänke, & Plessner, 2006) and between different brands and consumer goods (Maison, Greenwald, & Bruin, 2001, 2004).

The aim of the present study is to deeply understand some conditions in which the IAT is more useful for studying consumers' decision making. More specifically, the predictive validity of the measure on purchase decisions will be explored in situations in which consumers may have ambivalent attitudes and tendencies towards products, such as in the food domain where IAT has been used before. For instance, De Houwer and De Bruycker's (2007) measured implicit associations towards meat and vegetables, finding that vegetarians had a preference for vegetables over meat to a greater degree than the meat-eaters. Similar results were found by Barnes-Holmes, Murtagh, Barnes-Holmes, and Stewart (2010). In the current study, three experiments were conducted. In the first study, explicit evaluations and implicit associations towards high and low-energy foods were measured, assessing the relationship between the two and consumers' behaviour (visual behaviour on food packaging and intention to buy). Visual behaviour was used as indirect measure of interest for the information provided on food packaging, as people tend to look more at what they consider important (Lavie, Hirst, Fockert, & Viding, 2004) and what is related to their interests (Hoffman, 1998). Moreover, visual attention on food labels is related to decision-making (Chandon, 2002; Pieters & Warlop, 1999). Previous research mainly used self-report measures (Mackison, Wrieden, & Anderson, 2010; Verbeke & Ward, 2006). Nevertheless, when asked directly about their visual behaviour, subjects may answer in a socially desirable way (DeMaio, 1984; Edwards, 1957; Maass et al., 2000) or may have difficulty in estimating the time spent watching specific information because visual attention is not always active and conscious (Baddeley, 1990; Kellogg, 1980; Rosbergen, Pieters, & Wedel, 1997). Today, it is possible to measure visual behaviour through indirect techniques such as an eye-tracking system which allows for the continuous examination of visual attention processing. Using this technique enables to obtain more reliable information on consumer attention processing when evaluating food labels (Graham, Orquin, & Visschers, 2012). Eye-tracking systems have been used in previous research in the domain of food choices (e.g. Meillon, Mandran, Meillon, Urbano, & Schlich, 2008). Moreover, it has been applied to measure visual attention on nutrition labels (Antúnez et al., 2013; Ares et al., 2013; Bialkova & van Trijp, 2011; Graham et al., 2012; Jones & Richardson, 2007; Rawson, Janes, & Jordan, 2008; van Herpen & van Trijp, 2011). Moreover in our experiment, a potential moderator of the IAT's predictive validity (the dispositional tendency of the subject to rely on affective reactions or on deliberate reasoning in the decision-making process) was assessed. In the second study, we tested the same moderation pattern using a behavioural measure of choice. Particularly, a dual-choice task was employed, as in previous research (e.g. Karpinsky & Hilton, 2001; Perugini, 2005). In line with the associative network perspective, consumers represent a brand in their mind as network of concepts (Keller, 1993). Every experience related to the brand generates perceptions (Romaniuk & Nicholls, 2006) that are stored in consumers' mind as cues (Güse, 2011). These cues trigger cognitive and emotional processes that generate specific associations (Bhat & Reddy, 1998). Thus, in a consumer's mind, brands are cognitive structures consisting of clusters of meaning and association with several elements (John, Loken, Kim, & Monga, 2006; Keller, 2003; Krishnan, 1996). Following this view, the third study verified the same hypotheses in Studies 1 and 2 in the domain of branded food choice, because consumers may have ambivalent attitudes and different associations towards branded products.

2. Experiment 1

2.1. General overview and hypotheses

Previous research shows links between implicit attitudes or

evaluations and attention. Visual attention towards a stimulus is influenced not only by bottom-up factors related to its features, but also by top-down factors associated with the viewer's motivations (Pieters & Wedel, 2004; van Herpen & van Trijp, 2011; Yang, Dempere-Marco, Hu, & Rowe, 2002). Indeed, a top-down attentional process requires consumers to voluntarily pay attention to specific information, and this type of attentional capture depends on consumers' interests and goals when evaluating the stimulus (Koch, 2004). Mogg and colleagues (Mogg, Bradley, Field, & De Houwer, 2003), for instance, found a positive correlation between automatic evaluation of smoking cues and attentional bias to these cues. Calitri and colleagues (Calitri, Lowe, Eves, & Bennett, 2009) found an association between implicit attitude and attentional bias for exercise words. The relationship is consistent with functional models of attitude (Chen & Bargh, 1999; Roskos-Ewoldsen & Fazio, 1992), which assume that the affective system simplifies processing of information about the world, affording the ability to selectively attend to stimuli that have the potential for hedonic consequences and provides a heuristic for approach and avoidance responding. This view resonates with the considerable amount of empirical evidence about the relationship between visual behaviour and interests (Hoffman, 1998), as people will observe more of what they consider important (Lavie et al., 2004).

In the field of food products, a large body of research studied the use of labels and nutritional information based on consumers' self-reports (see Grunert & Wills, 2007). However, individuals may not be aware of which of the label's elements they looked at the most and may overestimate their use of some on-package information to appear more health-conscious (Grunert, Wills, & Fernandez-Celemin, 2010). For these reasons, eye-tracking systems are becoming common in the field of food products to objectively monitor consumers' attention on packages and labels. Eye movements are behavioural indicators of attention and information processing (Krajbich, Armel, & Rangel, 2010), that provide information on what is most relevant for the subject. For this reason, they are widely used in many different marketing areas (Fiszman, Velasco, Salgado-Montejo, & Spence, 2013) to measure interest and information processing, and to obtain insights about choice processes (Glaholt & Reingold, 2011; Pieters & Warlop, 1999; Russo & Leclerc, 1994). Previous research used eye-tracking to study visual attention on food labels. Particularly, several studies focused on attention to and effect of nutritional information in order to improve the labels by better communicating the product's features (e.g. Bialkova & van Trijp, 2011; Clement, 2007; Goldberg, Probart, & Zak, 1999; Graham & Jeffery, 2011; Jones & Richardson, 2007; Miller, 2014). Some authors correlated eye-tracking data about visual attention to labels with consumers' motivations. For instance, Visschers, Hess, and Siegrist (2010) found that consumers with a health motivation focus on nutrition information more than those with a taste motivation. Bialkova et al. (2014) found that a 'health goal' resulted in more numerous and longer fixations in comparison to a 'preference goal'. Similar results were found in a study conducted by van Herpen & van Trijp, 2011, in which consumers' health goals increased attention to and use of nutrition labels. Moreover, Turner, Skubisz, Pandya, Silverman, and Austin (2014) demonstrated that people with a motivation to shop for healthy foods (vs. a motivation to shop on the basis of taste) spent more time looking at a label's nutrition information.

We expected that:

H1: People with different implicit associations toward high- versus low-energy food show a different visual behaviour on food packaging, reflecting a different interest for the information.

Following the model based on a double dimension of mental processes (i.e. implicit/automatic/associative and explicit/deliberative/reflective, Gawronski & Bodenhausen, 2006; Strack & Deutsch, 2004; Wilson, Lindsey, & Schooler, 2000), it is important to verify the pattern of prediction that better describes the relationship between the measures assessing these two dimensions and the behaviour. Thus, it is possible to understand whether adding the indirect measure improves

the explanation of a subject's choice. On the basis of the research discussed above, indirect measures and especially the IAT, allow us to access subjects' unconscious preferences and associations that could provide useful information in situations where the subjects' explicit beliefs and implicit dispositions towards certain characteristics of a target object are inconsistent; consequently, the behaviour may follow one but not the other. Moreover, literature reports ample evidence that positive and negative evaluations can coexist (e.g. Cacioppo, Gardner, & Berntson, 1997, 1999), determining ambivalence about the same attitude object (Thompson, Zanna, & Griffin, 1995). In order to investigate the predictive validity of the IAT in this kind of situation, we chose the particular domain of food, in which subjects could have ambivalent attitudes and associations with positive and negative evaluations, and in which IAT has been used before (e.g. Conner, Perugini, O'Gorman, Ayres, & Prestwich, 2007; Friese, Hofmann, & Wänke, 2008; Hofmann & Friese, 2008; Perugini, 2005; Richetin, Perugini, Prestwich, & O'Garman, 2007), demonstrating its usefulness (Raghunathan, Naylor, & Hoyer, 2006), its relation with food decision-making (Ayres, Prestwich, Conner, & Smith, 2011; Mai, Hoffmann, Hoppert, Schwarz, & Rohm, 2015; Prestwich, Hurling, & Baker, 2011) and incremental validity over explicit measures (Mai & Hoffmann, 2015). Implicit measures have been used to measure the attitude towards food products such as snacks and fruit (Richetin, Perugini, Prestwich, & O'Garman, 2007), fruit juices and sodas (Maison et al., 2001), mayonnaise and ketchup (Dimofte & Yalch, 2007), healthy and unhealthy foods (Ayres et al., 2011; Conner et al., 2007; Dube, 2007; Prestwich et al., 2011), high- and low-calorie products (Maison et al., 2001) and fast food restaurants (Maison et al., 2001). Attitudes towards food are often ambivalent, and subjects may associate the same food with positive and negative valence because in the evaluation of food products (and consequently in the food choice), there are two dimensions that may conflict with each other: taste (Grunert, 2005; Hoppert, Mai, Zahn, Hoffmann, & Rohm, 2012) and healthiness (Michaelidou, Christodoulides, & Torova, 2012; Vyth et al., 2010). Presently, on the one hand, the increased attention given to follow a healthy lifestyle results in a particular appreciation for low-energy food, while, on the other hand, high-energy foods are generally perceived as tastier, as well as more pleasing and gratifying (Cleobury & Tapper, 2013; Drewnowski, 1991; Drewnowski & Greenwood, 1983; Raghunathan et al., 2006). This could lead to ambivalent feelings for high- and low-energy food and to an approach-avoidance conflict (Chandon & Wansink, 2007; Laran, 2010; Percy & Lautman, 1994; Shiv & Fedorikhin, 1999). For this reason, we expected ambivalent attitudes with positive and negative associations at the same time. For instance, high-energy foods could be perceived as tasty and appealing, but people may feel guilty after eating them, while low-energy foods could be perceived as good for health, safe but less appetizing. This ambivalence could be unconscious and the IAT results may be predictive of consumers' choices. Indeed, it has already been demonstrated that the IAT is a good predictor of consumer behaviour that can reveal aspects not captured by explicit measures (e.g. Brunel et al., 2004; Vantomme, Geuens, De Houwer, & De Pelsmacker, 2005). Implicit processes are relevant in the case of food choices (Köster, 2009; Marteau, Hollands, & Fletcher, 2012), and previous studies found correlations between positive implicit association toward healthy food and choices of healthy (vs. unhealthy) foods, actual purchase of healthy foods and intake of healthy (vs. unhealthy) foods (Ayres et al., 2011; Conner et al., 2007; Dube, 2007; Prestwich et al., 2011). Moreover, previous research found an incremental validity of the IAT over explicit measures (Friese et al., 2006; Maison et al., 2004; Richetin et al., 2007; Wanke, Plessner, Gartner, & Friese, 2002; Wilson et al., 2000) and in the prediction of food choices (Ayres et al., 2011; Mai & Hoffmann, 2015).

Our hypothesis was as follows:

H2: The IAT has incremental validity over explicit measures of intention to buy. Adding the IAT measure, reflecting implicit association toward high- vs. low-energy food, predicts consumers' choices among

high- vs. low-energy products more than the exclusive use of the explicit measure of attitudes.

A recent direction of research examines which factors may influence the predictive validity of indirect measures (as IAT), including several personal moderators (Perugini, Richetin, & Zogmaister, 2010). For instance, in the food domain, Shiv and Fedorikhin (1999) found that an individual's mood influences how he/she solves the trade-off between the enjoyment and the health benefits of the food on offer. Ayres and colleagues (Ayres et al., 2011) found that the relationship between implicit measures of attitude and associations, and the consumption of sweet foods is moderated by the emotional eating style. More recently, Haynes and colleagues (Haynes, Kemps, Moffitt, & Mohr, 2015) demonstrated the moderating role of temptation on the relationship between implicit evaluation of unhealthy food and food consumption. Knowing the situations in which the IAT is more related to behaviour is important for improving the predictive validity and the usefulness of the measure. As we argued, people can process information with two different systems (associative and reflective) that operate synergistically or antagonistically, and the relative dominance of one of the two is determined by several factors that moderate the predictive validities of direct and indirect measures on the behaviour (Lane, Banaji, Nosek, & Greenwald, 2007). Some of these moderators are related to individual differences in processing style, such as the motivation to control prejudiced reactions (Gawronski, Geschke, & Banse, 2003) or the need for cognition (Florack, Scarabis, & Bless, 2001). It has been shown that when people focus on their emotional reactions instead of thinking rationally, impulsive processes have a greater influence in driving behaviour. While explicit attitudes and associations guide deliberate behaviour, implicit ones are related to spontaneous responses (Choen & Reed, 2006; Fazio, 1990; Fazio & Towles-Schwen, 1999; Petty, 2006; Wilson et al., 2000); therefore, indirect measures should be more predictive when people use the associative/intuitive system (Shiv & Fedorikhin, 2002; Wilson & Schooler, 1991). Some people have a dispositional tendency to rely mostly on affective reactions in the decision-making process: which is to say, they have a 'preference for intuition' (Epstein, Pacini, Denes-Raj, & Heier, 1996). Individuals with a strong preference for intuition tend to rely more on the affective dimension when making their choices. This affective reaction is strongly associated with associative properties and experiences and could therefore be considered an intuitive process, while a more rational evaluation (e.g. healthiness) should require the deliberative system. Consequently, indirect measures should be more predictive of the behaviour for individuals with a preference for intuition. Our further hypotheses therefore were as follows:

H3a: The preference for intuition or deliberation is a moderator of the predictive validity of the IAT score on consumers' intention to buy;

H3b: The effect posited in H2 (the increasing of prediction of consumers' choice with the adding of IAT measure) would be higher for the subjects with a preference for intuition than for the subjects with a preference for deliberation.

2.2. Participants

A total of 60 persons participated in the study (38 women, 22 men), M_{age} = 32 years, age range: 21–45 years. All participants were experimentally naïve, recruited from the staff of an Italian university based on their interest in participating in the studies, and students (in exchange for course credit).

2.3. Stimuli and procedure

Each participant conducted the study individually. To prevent the participants from giving answers distorted by social desirability bias, they completed all the questionnaires alone. Moreover, they were informed before the beginning of the experiment that they would be identified with a code, so that their name would not appear in the
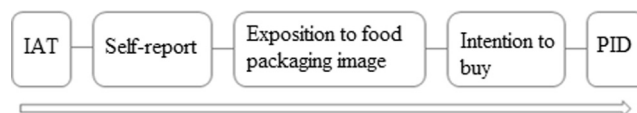

Fig. 1. Schematic of the experimental procedure.

results. When the interviewer's presence is avoided and anonymity is ensured, data are less influenced by social desirability (Nederhof, 1984; Wiseman, 1972). The procedure of the experiment is illustrated in Fig. 1. A set of ten images was used, five representing high-energy (chocolate cake, candy bars and salty or sweet snacks) and five low-energy (fruits; vegetables; salads and light yogurt) food products. The stimuli were chosen based on a pilot study on the perception of the food products' light/caloric characterization. All the pictures are shown in Appendix A. A second set of images consisting of ten pictures of food packaging was used. All the stimuli represented sweets and snacks (e.g. "light"; "− 30% fat") to show that the packaging information about the products flavour and fat content could be relevant to the consumers. An example of pictures is provided in Appendix B.

2.3.1. Implicit measure

An IAT was used to compare high- and low-energy foods. The test was composed of five classification tasks in which stimuli were shown sequentially on a screen: (1) – categorization of the two target concepts (high/low-energy foods, 20 trials); (2) – categorization of the attributes (positive/negative, 20 trials); (3) – combined categorization task – practice and critical trials (low energy foods and positive/high-energy food and negative, 20 trials practice and 40 critical); (4) – categorization of the target concept (as for block/classification task 1) but with reversal of the answer keys with respect to the first block (20 trials); (5) – combined categorization task – practice and critical trials (as for block/classification task 3) but reversed categorization of target categories (high-energy foods and positive/low-energy foods and negative; 20 trials practice and 40 critical). Participants had to use two key buttons to categorize the stimuli based on the instructions. Half of the participants performed the tasks in the order outlined above, while for the other half of the sample, task 3 was interchanged with task 5. Only the data from tasks 3 and 5 were used for analysis. The test was completed on PC-type desktop computers on which e-Prime software (version 2.0, Psychology Software Tools, Inc.) was installed. The lists of positive and negative words were in Italian and created based on a list of English stimuli used in previous experiments (Greenwald et al., 1998). The original set of stimuli was modified to control the length of the words (mean of positive words: 6 letters; mean of negative words: 7 letters) and the frequency of use (according to the frequency count from the Italian institute of Computational Linguistics, ILC-CNR)[1]. The list of the words used in the IAT is reported in Appendix C.

2.3.2. Explicit measures

After completing the IAT, the participants were exposed to the same images of food employed in the previous task, and they had to evaluate them on a 7-point bipolar dimension ranging from absolutely negative to absolutely positive. Then, the participants had to indicate for each image whether or not they would buy the food. To encourage them to provide true answers, the participants were told that one of them will win the products he/she chooses. At the end of the experiment, the participants completed a Preference for Intuition or Deliberation (PID) Scale. The PID (Betsch, 2004) scale was developed to assess preferences in making intuitive or deliberative decisions. The measurement consists of 18 questions on a 5-point Likert scale: 9 items assessing the habitual preference for deliberation (PID-D) and 9 items assessing preference for intuition (PID-I). The two subscales showed good reliabilities (PID-D

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[1] http://www.ge.ilc.cnr.it/lessico.php.

Cronbach's α = 0.79; PID-I Cronbach's α = 0.77), temporal stability (PID–I = 0.76 and PID–D = 0.74 after 6 months, Betsch, 2004) and predictive validity (Schunk & Betsch, 2006). In this study, the Italian version of the PID scale was employed (Iannello, 2008, 2010). The Italian PID scale used and the English version are given in Appendix D.

2.3.3. Visual behaviour measure

The participants were seated 60 cm away from the computer display (a Dell 17.3-inch monitor) embedded with the SMI-RED250 eye movement recording system. This technology allows recording and analyses of the subjects' visual attention (Laubrock, Engbert, Rolfs, & Kliegl, 2007), accurately determining the gaze path for any visual stimulus. The system is equipped with a digital video camera that records the image of the eye, determining the exact gaze position on the stimulus by using an integrated infrared light that creates a corneal reflex recorded by a sensor. The processing of gaze position is done in real time. Before starting the recording of eye movements, a 5-point calibration was carried out using SMI iViewX software. After the calibration, the subject was asked to watch the images of food products in a supermarket. Each image remained on the screen for ten seconds. Two indexes from the eye-tracking measurement were used: 'time to first fixation' and 'dwell time'. The former indicates the amount of time it takes the respondents on average to look at a specific area from stimulus onset. The latter is the amount of time that respondents have spent on the area.

2.4. Results

The IAT score for each participant was calculated using the improved algorithm developed by Greenwald, Nosek, and Banaji (2003). No participants were excluded from the analyses. Higher positive scores for the IAT effect revealed a stronger implicit association between high-energy foods (than low-energy foods) and 'positive'; thus, an analogue index was calculated for the explicit measure, based on the evaluation of the subjects: the mean scores for high-energy foods minus the mean scores for low-energy foods. Therefore, both for implicit and explicit measures, a higher positive score indicated a more favourable evaluation of high-energy foods. The intention to buy for the two categories of food was calculated as the sum of the number of products that the subject indicated that he/she would buy for each of the categories (high and low-energy foods). The PID scales had a satisfactory level of reliability (PID-D Cronbach's α = 0.73; PID-I Cronbach's α = 0.79). Participants above the median of PID-intuition and below the median of PID-deliberation were classified as 'more intuitive'. Conversely, those participants who scored high on PID-deliberation and low on PID-intuition were classified as 'less intuitive' (see Betsch, 2004). For the visual behaviour, two areas of interest (AOIs) were defined, corresponding to the information about the taste and the fat content. An average value of the fixation time of the two AOIs was computed separately for subjects with an implicit preference for low-energy and high-energy foods respectively. The same was done for another visual behaviour parameter: time to first fixation, the time required from the presentation of the stimulus to see the AOI.

In the explicit questionnaire, the participants rated low-energy foods (lef) more positively than high energy (hef) ones (mean$_{lef}$ evaluation = 5.45; mean$_{hef}$ evaluation = 4.17; t(150.2) = 3.93, p < 0.01). This preference is confirmed in both the sub-samples of men (mean$_{lef}$ = 5.48; mean$_{hef}$ = 4.28; t(40.95) = 2.08, p < 0.05) and women (mean$_{lef}$ = 5.43; mean$_{hef}$ = 4.1; t(68.89) = 3.34, p < 0.01). Moreover, the participants declared a higher intention to buy lef than hef (mean$_{lef}$ = 3.93; mean$_{hef}$ = 3.15; t(113.1) = 2.87, p < 0.01).

Regarding the IAT results, the subjects were, on average, faster in the task in which lef were paired with positive words (RT = 894.38 ms), as compared with the task of the pairing of hef with positive words (RT = 1381.28 ms) (Fig. 2). This difference was statistically significant, t(97.96) = 6.39, p < 0.01 and indicates that the
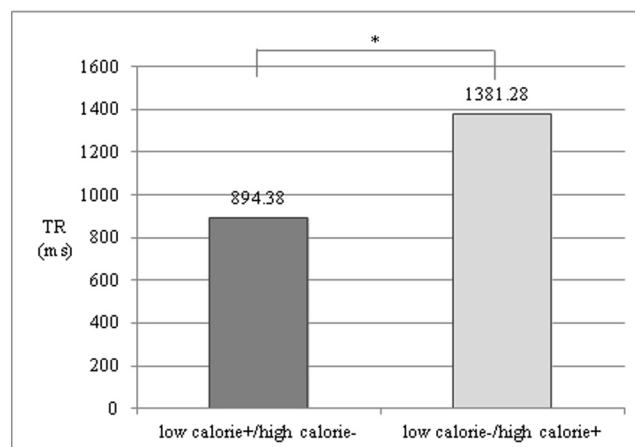

Fig. 2. Average response times in the double categorization blocks.

subjects, on average, had more positive implicit association for lef than for hef. Both the measures employed (direct and indirect) show a general preference for lef, consistent with the subjects' food choices. The explicit and implicit measures were moderately correlated (r = 0.34; p < 0.01).

On average, participants observed the indication about the fat content before the indication about the taste (first fixation$_{fat}$ = 2738; first fixation$_{taste}$ = 4135; t(111.08) = 3.73, p < 0.01), and for a longer time (fixation time$_{fat}$ = 839.56; fixation time$_{taste}$ = 614.76; t (116.67) = −6.23, p < 0.01).

To test the first hypothesis, the mean fixation time of the information about taste and of the information about fat content was compared between subjects with stronger lef-positive association and subjects with a stronger hef-positive association (Fig. 3). Results indicate that subjects who have a stronger hef-positive implicit association (36 subjects) look at the information about taste more than the other subjects, while those with the opposite implicit association (24 subjects) look the information about fat content more than the other participants. The difference is significant both for the information about the taste (t = 3.38, df = 7.76, p < 0.05), and the information about the fat content (t = −3.55, df = 10.45, p < 0.01), supporting the hypothesis that implicit associations influence visual behaviour on food packaging. Results about time to first fixation are in line with the prevision, as participants with a stronger lef-positive implicit association looked at the information about the fat content before the information about the taste (first fixation$_{fat}$ = 2643; first fixation$_{taste}$ = 4348; t = 4.47, df = 108.58, p < 0.01). The participants with a stronger hef-positive implicit association tend to look at the information about the taste before the information about the fat content, but the difference did not reach statistical significance (first fixation$_{fat}$ = 3358; first
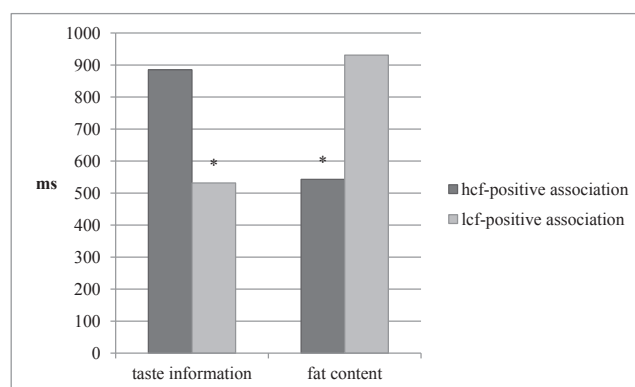

Fig. 3. Fixation time on information (Comparison based on IAT scores).

Table 1
Results of multiple regression analysis.

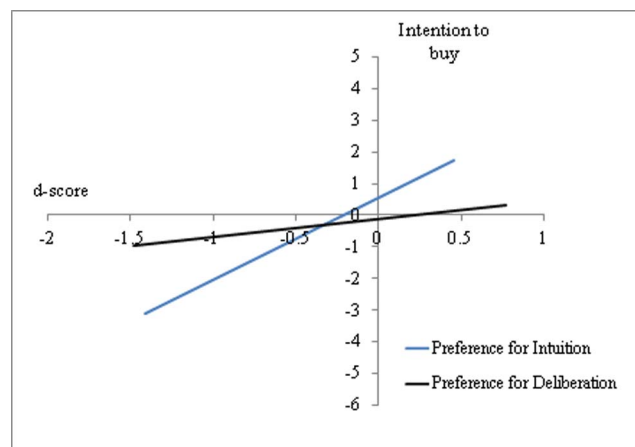|		Intention to buy			
		b	std. Error	t value	Pr(> |t|)
Independents	(Intercept)	0.406	0.317	1.281	0.205
	Self-report	0.500	0.084	5.940	1.8e − 07***
	IAT score	0.849	0.407	2.086	0.041*

* Significant at the 0.05 level (2-tailed).

*** Significant at the 0.001 level (2-tailed).

fixation$_{taste}$ = 2748; t = −0.53, df = 117.89, p > 0.05). We also compared the time spent watching the information about taste and fat content by splitting the sample based on explicit preference for hef or lef. The results did not show significant differences between the two groups, neither for taste information (m$_{prefLef}$ = 568.3 ms, m$_{prefHef}$ = 583.95 ms; t(23.41) = −0.24 p > 0.05) nor for fat content (m$_{prefLef}$ = 821.8 ms, m$_{prefHef}$ = 907.77 ms; t(22.12) = −1.22 p > 0.05).

To test the second hypothesis of the study, a new index ('intention to buy') was calculated by the subtraction of the number of low-energy foods that the participant stated that he/she would buy from the number of high-energy foods that the subject stated he/she would buy (number of hef – lef chosen). Thus, a positive value indicates a tendency to buy hef rather than lef. We compared the goodness of the two models with the intention to buy as the criterion: the first model comprises only the explicit measure as a predictor, while the second one includes both the explicit and the implicit measures as independent variables. The IAT score remained a significant predictor even in the model that also comprised the explicit measure (b = 0.85, p < 0.05). Results of multiple regressions are shown in Table 1. The multiple R-squared of the first model was 0.44, while the multiple R-squared of the second model was 0.49. To test whether this difference is significant, a partial F-test was performed (F = 4.35, p < 0.05). The test was significant, and it can be concluded that the adding of the IAT score as an explanatory variable lead to an increase in the percentage of explained variance. The results supported the hypothesis of an additive pattern between implicit and explicit measures that implied a better explanation of the Intention to buy, taking even the IAT measure into account.

The sample had a higher preference for deliberation than for intuition decision style (PID-Deliberation = 3.88, sd = 0.58, PID-Intuition = 3.66, sd = 0.56, t[117.93] = 2.27, p < 0.05). There were no gender differences.

The current study's third hypothesis focused on the influence of preference for Intuition or Deliberation on IAT predictive power. We defined two specific hypotheses. The first one posited that the preference for intuition or deliberation is a moderator of the predictive validity of the IAT score on consumers' intention to buy. A regression analysis on Intention to buy was undertaken by using the PID Intuition score (the mean of all items in the PID–Intuition scale, cfr. Betsch, 2004) and the IAT score as independent variables. Results showed a significant interaction between the two predictors (p < 0.05). The table of the regression is presented in Appendix F. The PID score was coded as a dummy variable (code: 0 = 'Less Intuitive': 34 subjects; 1 = 'More Intuitive': 26 subjects) following Betsch (2004). A regression analysis was performed using the Intention to buy as a criterion. The IAT score centred around zero, and the PID-coded score and the interaction between the two were used as predictors. The presence of a significant positive interaction (b = 2.03; p < 0.05) indicated that the effect of the IAT score on the response variable was not the same for different values of the PID score. In Fig. 4, the regression lines are shown. A simple slope analysis was conducted to determine whether the gradient of one or both the lines differs from 0 (the horizontal plane). Results confirmed that the IAT was more strongly related to the intention to buy if subjects are 'More Intuitive' (b = 2.58, p < 0.01) than 'Less Intuitive' (b = 0.55, p < 0.05) in the decision-making style.

Fig. 4. Higher/Lower Intuition as a moderating variable in the relationship between IAT score and respondents' purchase intention.

This means that for subjects with more intuitive decision making (blue line), the increasing of the Intention to buy at the increasing of the IAT score is higher than the effect in the sub-sample of subjects with less intuitive decision making (black line). Indeed, for this group, the purchase intention is less affected by the IAT score. The results confirmed the H3a hypothesis.

To verify H3b, we compared the goodness of two models with the Intention to buy as a criterion. The analysis was conducted separately for the two sub samples: 'More Intuitive' and 'Less Intuitive' subjects. For the group with a higher preference for intuition, the adding of the IAT score in the model led to a significant increase in the multiple R-squared (ΔR^2 = 0.14; F = 11.51, p < 0.01), thus the adding of the IAT score as an explanatory variable led to an increase in the percentage of explained variance. In the sub-sample of 'Less Intuitive' subjects, even if there was a small increase in the multiple R-squared (ΔR^2 = 0.03), this was not statistically significant (F = 1.10, p > 0.05). The results support the third hypothesis of an additive pattern between implicit and explicit measures being more remarkable for subjects with a higher preference for intuition in decision-making.

3. Experiment 2

3.1. General overview and hypotheses

In the first study, the hypothesis on the predictive validity of the IAT on the intention to buy and the moderating role of the preference for a more or less intuitive decision-making style was verified. The intention to buy is closely related to purchase behaviour, but there are other intervenient variables. Moreover, asking participants if they would buy something provides a measure that may suffer from the same limitations of the explicit measure of attitudes, associations and preferences. For these reasons, we conducted a second study aiming to confirm the moderation pattern by using a behavioural measure of choice.

3.2. Participants

A total of 80 persons participated in the study (44 women, 36 men), M_{age} = 28 years, age range: 21–36 years. All participants were experimentally naïve. A part of the sample was recruited from the staff of an Italian university based on their interest in participating in the studies. The other subjects were students who participated in exchange for course credit.

3.3. Stimuli and procedure

The same IAT from the first study was used. For the final

behavioural choice, we used fruits and snacks. The procedure was identical to the one used in study 1, except for the behavioural choice. After the implicit measure, the participants were presented with two boxes, one contained several fruits, while the other contained a selection of snacks. The participants were asked to choose one free fruit or snack as a thank-you for their participation. The aim was to obtain a measure of behavioural choice (cfr. Karpinsky & Hilton, 2001 study 2). We used products that are considered prototypically healthy (fruit) or unhealthy (snacks), offering different types of fruit and snacks (cfr. Perugini, 2005) to avoid the effect of the specific product. Moreover, we put many items in each box to prevent participants from guessing that their choice would be recorded. Indeed, more products in the box reflects a more realistic situation of a choice of a free product as a thank-you. Indeed, if we presented a simple dichotomous choice with one fruit and one snack, the participants might conclude that the researcher would check the product they choose.

3.4. Results

The PID scales showed quite good levels of reliability (PID-D Cronbach's α = 0.72; PID-I Cronbach's α = 0.77), and the participants were classified as 'Less Intuitive' (38 subjects) and 'More Intuitive' (42 subjects) as in the first study. To verify the moderation pattern, a logistic regression analysis was performed using the behavioural choice as the criterion (0 = 'Snack': 36 subjects; 1 = 'Fruit': 44 subjects). The IAT score centred around zero, and the PID score and the interaction between the two were used as predictors. A significant interaction term was found (b = 1.31, p < 0.05). This result confirms H1, as the effect of the IAT score on food choice is different for different PID scores. Table 2 shows regression analyses results comparing 'Less Intuitive' and 'More Intuitive' subjects. The IAT was more predictive of the intention to buy if subjects decision-making style was 'More Intuitive' than 'Less Intuitive'. Indeed, for subjects with more intuitive decision-making, the IAT was a significant predictor of the food choice (b = 2.33, p < 0.05), while for subjects with less intuitive decision-making, the choice was less affected by the IAT score because the measure approached but did not achieve statistical significance (b = 1.34, p = 0.058). The Hosmer–Lemeshow test was used to check the goodness of fit of the model for the two samples ('Less Intuitive' and 'More Intuitive'). The non-significant p-value indicates no evidence of poor fit for the 'More Intuitive' sample.

4. Experiment 3

4.1. General overview and hypotheses

Studies 1 and 2 confirmed the predictive validity of the IAT on the intention to buy and on participants' choice in the field of healthy versus tasty food. Moreover, the moderating role of the preference for a more or less intuitive decision-making style was verified for the same type of products. The aim of the third study is to extend the findings on food choice situations that consist of different brands instead of a tasty versus healthy choice. Indeed, as discussed, brands are represented in consumers' minds as clusters of meaning and are associated with several different elements (John et al., 2006; Keller, 2003; Krishnan,

1996). Like the first two studies, food products were used, following the idea that consumers may have ambivalent attitudes and different associations towards these kinds of products. Particularly, two soft drinks were chosen because we wanted to have two different sources of information that could affect participants' preferences: taste and brand.

4.2. Participants

A total of 60 persons participated in the study (31 women, 29 men), M_{age} = 23 years, age range: 19–34 years. All participants were experimentally naïve, recruited as in studies 1 and 2.

4.3. Stimuli and procedure

A set of ten images as stimuli were used: five representing Pepsi and five representing Coke products (logo, bottles, cans). All the images are provided in Appendix A. For the final behavioural choice, we used cans of Pepsi and Coke.

4.3.1. Implicit measure

Subjects completed an IAT about Pepsi and Coke on a PC-type desktop computer with the e-Prime software (version 2.0, Psychology Software Tools, Inc.). The Italian words were the same as those used in the first study.

4.3.2. Explicit measures

After the IAT, the subjects completed a self-report questionnaire, evaluating the two soft drinks on four different scales: tastiness, healthiness, goodness and general acceptability. All measures were rated on a 7-point Likert scale ranging from 1 = not at all (tasty/healthy…) to 7 = very (tasty/healthy…) as Van der Laan, De Ridder, Viergever, & Smeets (2012). The questionnaire is provided in Appendix E. Then, participants completed the PID scale.

4.3.3. Behavioural choice

Similar to the second study, the participants were presented with two boxes at the end of the experiment: one contained several Coke cans and the other several Pepsi cans. Subjects were informed that in addition to the standard fee, they could choose one free soft drink as a thank-you for their participation. Even in this case, many items were presented to prevent participants from guessing that their choice would be recorded.

4.4. Results

The IAT score for each participant was computed using the improved algorithm provided by Greenwald et al. (2003). No participants were excluded from the analysis. The score given by the participants in the scale of 'goodness' was used as a measure of the explicit attitudes toward Pepsi and Coke, because the term in Italian has the same meaning as 'positive' (used as label in the IAT test). The behavioural choice was coded as 0 (if the participant chose Pepsi, 33 subjects) and 1 (if the participant chose Coke, 27 subjects). Higher positive scores for the IAT effect revealed stronger implicit Coke-positive than Pepsi-positive association; thus, for the explicit measure, an analogue index

Table 2
Impact of IAT score on product choice.

Independent Variable	Sample	B	Std. Error	Sig.	Exp (B)	Hosmer-Lemeshow test		
						χ^2	Df	$p < |\chi 2|$
IAT score	Less Intuitive	1.347	0.713	0.058	3.846	16.937	8	0.031
	More Intuitive	2.334	0.931	0.012[*]	10.324	10.873	8	0.209

[*] Significant at the 0.05 level (2-tailed).

('Explicit preference C') was calculated based on the evaluation of the subjects: explicit attitudes towards Coke minus explicit attitudes towards Pepsi. Therefore, both for implicit and explicit measures, a higher positive score indicates a more favourable evaluation of Coke versus Pepsi. Regarding the IAT, subjects were, on average, faster in the task in which Pepsi images were paired with positive words (RT = 901.66 ms), compared to the task with the pairing of Coke images with positive words (RT = 1014.35 ms). This difference was statistically significant (t[121.99] = −2.03, p < 0.05) indicating that the subjects, on average, had stronger a Pepsi-positive (than Coke-positive) implicit association. Subjects rated Coke slightly more positive than Pepsi, with a mean evaluation of 4.38 (sd = 1.42) vs. 4.32 (sd = 1.28). However, the difference was not statistically significant. Explicit attitudes towards Coke and explicit preference for Coke were highly correlated (r = 0.75; p < 0.001); therefore, only the explicit preference measure was used in the analyses to have a measure of relative evaluation (Coke vs. Pepsi) and an IAT score. The IAT score and the explicit measure showed different results about participants' preferences, and the two measures did not correlate (p > 0.05). A logistic regression was conducted, with the IAT score as the predictor and the dichotomous behavioural choice (Pepsi or Coke) as the outcome. The IAT predicted the participants' behaviour (p < 0.01). Results suggest that subjects with positive IAT scores (a stronger Coke-positive implicit association) were more likely to choose this soft drink than Pepsi. In contrast, the explicit measure of preference failed to predict the participants' choice. A regression model with the IAT score as a predictor of choice revealed to be a good fit, while the model with the self-report measure as a predictor was not a good fit. Results of regression analysis are shown in Table 3.

Because neither the explicit attitude nor the explicit preference for Coke were significant predictors of participants' product choice, the additive model was not tested.

The PID scale showed a good level of reliability (Cronbach's α PID-D = 0.74; PID-I = 0.72). The subjects did not show a significant preference for a decision-making style (PID-Deliberation = 3.77, sd = 0.61, PID-Intuition = 3.87, sd = 0.59, t[117.95] = 0.83, p > 0.05). A regression analysis on the behavioural choice was undertaken by using the PID Intuition score (mean of all items of the PID–Intuition scale, cfr. Betsch, 2004) and the IAT score as independent variables. Results showed a significant interaction between the two predictors (p < 0.05). The sample was split on the basis of the PID results, and a regression model with participants' behavioural choice as criterion, and the IAT score as an independent variable was built separately on the sub-sample of participants who showed a higher preference for Intuition/Deliberation. Table 4 shows the results. The IAT score was a better explanatory variable of the behavioural choice for the subjects who tended to rely more on intuition in decision-making.

5. General discussion, limitation and future research

Previous research in the field of food choices relied mostly on direct measurements, which are unable to record what the subject does not consciously perceive (Banaji, 2001). When people have ambivalent attitudes towards a specific object, the direct measures are strongly challenged. This is because when there are both positive and negative associations, they may agree with both endpoints of the scale simultaneously. This could result in choosing the midpoint as a compromise between the two different attitude components (Olsen, 1999). To overcome this limitation, *indirect* measurement techniques are now widespread in the study of consumer psychology. Particularly, the IAT is one of the most valid and reliable techniques to indirectly assess consumers' implicit associations toward an attitude object. To provide further evidence supporting the usefulness of the IAT to predict consumers' choices especially in the food domain in which subjects could have ambivalent attitude, in the first study, we measured implicit associations, explicit attitudes, and the intention to buy toward two kinds of foods: high-energy product (perceived as tasty), and low-energy ones (perceived as healthier but less palatable). Moreover, based on the literature showing that interests and motivation have a strong effect on visual attention, we measured the time that the participants spent looking at information related to the taste and to the fat content of the food available on the package.

Explicit self-report questionnaire and IAT were significantly correlated, but the value of correlation was not extremely high. This is consistent with the idea that explicit and implicit measures assess constructs that are related but distinct, because explicit measures mainly reflect the cognitive part of the attitude, while implicit measures reflect the more spontaneous and less aware dimension (Greenwald & Banaji, 1995). Our results confirmed the additive pattern between self-report and IAT scores. Moreover, participants with a higher IAT score (i.e. a stronger 'high-energy foods-positive' implicit association) tend to look more at the information about the taste than participants with a lower IAT score. Contrariwise, participants with a stronger implicit association between low-energy foods and 'positive' are more likely to look at the information about the fat content, confirming that visual behaviour is affected by implicit associations measured through the IAT. The same results were not found when dividing the subjects on the basis of their explicit preferences, providing further evidence that an IAT test allows us to obtain information not captured by explicit measures, especially concerning behaviour not under subjects' control, such as visual behaviour.

Although the IAT has proven to be predictive of intentions and behaviour in several studies, some factors can affect its efficacy. Knowing the situations in which the IAT is more related to the behaviour is important to improve the predictive validity and usefulness of the measure (Perugini et al., 2010). To contribute to this research field, we tested an individual's preference for Intuition or Deliberation in the decision-making process as a personal moderator of the predictive validity of the IAT on consumers' behaviour. Particularly, we hypothesized that the IAT prediction of intention to buy is higher if the subject has a stronger preference for an intuitive decision-making process, which implies a greater reliance on spontaneous reaction than on rational thinking. The score of a validated scale that detects the preference for intuition or deliberation (the PID scale) was used as a moderator variable of the IAT effect. For the participants with a higher preference for an intuitive decision style, results showed a significant increase in the intention to purchase when the IAT score was higher, while for participants with a less intuitive decision-making style, the choices were less influenced by implicit processes; therefore, the IAT was less predictive of the intention to buy in this sub-sample.

A limitation of the first study is that even if the intention to buy is closely related to purchase behaviour, there are still other intervening variables. Moreover, the intention to buy was assessed by a direct question to the subjects, and thus, this measure may suffer from the same limitations of the explicit measure of attitude and preferences. For all these reasons, a second study was conducted to confirm the usefulness of the IAT to predict a behavioural choice, more similar to the real purchase behaviour. The pattern with the PID as a moderator of the relationship between the IAT score and the behavioural choice was also confirmed in real choices. In the third study, we extended the findings

Table 3
Impact of explicit and implicit measures on product choice.

Independent Variables	B	Std. Err.	Sig.	Exp (B)	Hosmer-Lemeshow test		
					χ^2	Df	$p < |\chi^2|$
IAT score	1.823	0.668	0.006[**]	6.221	6.298	8	0.614
Explicit preference C	0.004	0.236	0.985	1.004	9.331	8	0.097

[**] Significant at the 0.01 level (2-tailed).

Table 4
Impact of IAT score on product choice.

Independent Variables	Sample	B	St. Err.	Sig.	Exp (B)	Hosmer-Lemeshow test		
						χ^2	Df	$p < |\chi^2|$
IAT score	Less Intuitive	0.963	0.087	0.031[*]	2.62	13.298	8	0.084
	More Intuitive	2.817	1.07	0.008[**]	16.73	10.768	8	0.215

[*] Significant at the 0.05 level (2-tailed).
[**] Significant at the 0.01 level (2-tailed).

in food choice situations that featured different brands instead of a tasty/healthy choice. We used two famous soft drinks. Even in this case, we expected ambivalent attitudes towards the two products, as the subjects have different possible sources of attitudes and preferences, like taste and brand (thoughts, social influences, packaging and communication), and the brand itself is a cognitive structure in consumers' mind, consisting of clusters of meaning and associations (positive or negative) with several elements (John et al., 2006; Keller, 2003; Krishnan, 1996). Explicit and implicit measures were not significantly correlated. The IAT scores were shown to be predictive of the participants' choice, while the two explicit measures were not. We attribute these results to the choice task being a more spontaneous behaviour, where an implicit—as opposed to explicit—measure may be more predictive (Mai & Hoffmann, 2015). The predictive validity of the IAT score was particularly high for participants with a higher preference for Intuition in the decision-making style. This study has some limitations which must be pointed out. First, in study 1, we used the measure of participants' intention to buy as the independent variable. This measure, as explained, is a self-report answer that may suffer from the aforementioned limitations. Indeed, in the first study, explicit attitudes were more predictive of the intention to buy than the IAT score. Nevertheless, the IAT score showed an incremental validity over the self-report measure. To overcome the limitations of the first study, in the second study, the predictive validity of the IAT was tested on participants' real behavioural choices. A limitation of study 3 is that it is impossible to control all the intervenient variables that can affect the choice. We tried to avoid variables extraneous to the aim of the study, by using a dichotomous choice already used in the literature, with two products that have about the same price (wholesale price: € 0.36 vs. € 0.37 each can[2]). Furthermore, the relative position of the two cans (right or left) was counterbalanced. However, we are aware that there are other possible intervenient variables; for instance, implicit preference towards food has been found to be sensitive to bodily need states, such as hunger (e.g. Seibt, Häfner, & Deutsch, 2007). Thus, further research should assess the time elapsed since the last meal was eaten. Moreover, there is the possibility that the results are valid only for the specific kinds of food used. It could be useful to extend the research by using other types of food to verify if the same results will be found. Although previous studies demonstrated the order of presentation does not affect the relationship between implicit and explicit measures (Hofmann et al., 2005; Nosek, Greenwald, & Banaji, 2005),

another potential limitation of the study regards the order of presentation of the implicit and explicit measures, which was not counterbalanced. As the sample size was not large, we chose to make the participants complete the IAT first and the self-reported measure second. The reason was that the objective of the explicit measure, in comparison to the implicit ones, is easier for the subjects to understand. Therefore, using the explicit measure first could give a clue about what the researchers are interested in, thereby affecting the subsequent answers. Conversely, the objective of the implicit measures is difficult to guess; thus, this measure is less likely to affect the explicit one. Nevertheless, a counter-balanced presentation of the two measures could add additional strength to future replications of these studies. Finally, a possible direction for future research could be the assessing of the predictive validity of IAT score and the moderating role of the preferred decision-making style on food consumption over a longer time period.

6. Conclusions

The results confirmed that the IAT score has incremental validity over self-report measures to predict consumers' intention to buy. Moreover, in our study, the IAT was a better predictor of the real choice than the self-report scores. The study also demonstrated that implicit associations measured by the IAT have an important effect on the way in which consumers look at food packaging, and this is particularly relevant for packaging design strategies. Finally, the positive effect of adding the IAT score in the model that uses self-report scores to explain the consumers' behaviour was greater for subjects with a higher preference for intuition in decision-making.

In conclusion, our results support the usefulness of the employment of IAT to predict both the consumers' intention to buy and their real choices, particularly in case of ambivalent attitudes exemplified in the field of food consumption and branded food choices. We garnered evidence about the role of consumers' decision-making style, based on the intuitive or deliberative dimension. More broadly, our studies suggest that it might be beneficial to take some individual differences into account that could influence the relationship between implicit and explicit measures and the relationship of these two measures of behaviour. Particularly, the PID results could provide advice for applying the IAT to consumer behaviour research that must take moderating variables of the predictive validity of the measure into account.

Appendix A

Appendix A1. Pictures of food products used as stimuli

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[2] Price verified at the time of the data collection.

High energy foods
picture 1

picture 2

picture 3

picture 4

picture 5

Low energy foods
picture 6

picture 7

picture 8

picture 9

picture 10

Appendix A2. Pictures of Coke and Pepsi used as IAT stimuli

Coke
picture 1

picture 2

picture 3

Pepsi
picture 6

picture 7

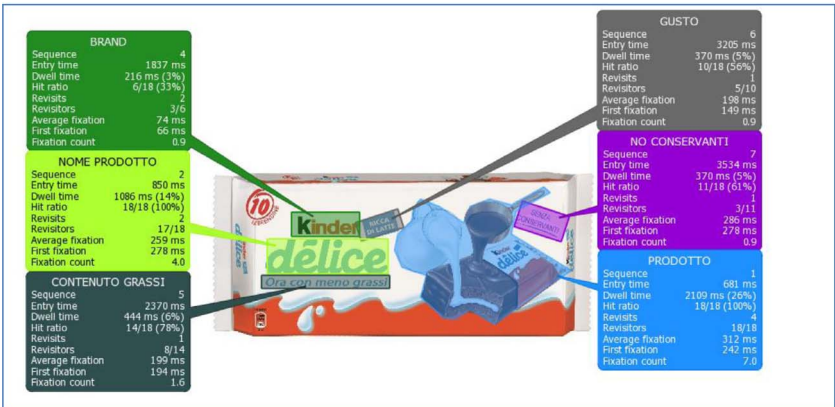picture 8

picture 4

picture 9

picture 5

picture 10

Appendix B1. Example of food packaging images

Appendix B2. Example of AOI (Areas of Interest) on food packaging images

Appendix C. List of the words used in the IAT

Valence	Word	Frequency
Negative	Guerra (war)	227.30
	Morte (death)	197.95
	Malattia (illness)	85.49
	Tristezza (sadness)	10.42
	Dolore (pain)	74.07
mean		119.04
Positive	Gioia (joy)	54.18
	Amore (love)	258.96
	Amicizia (friendship)	47.37
	Pace (peace)	87.53

Bene (good)	136.26
mean	116.86

Appendix D. PID scale

PID – Betsch, 2004 (English version)

1. Before making decisions I first think them through (D)
2. I listen carefully to my deepest feelings (I)
3. Before making decisions I usually think about the goals I want to achieve (D)
4. With most decisions it makes sense to completely rely on your feelings (I)
5. I do not like situations that require me to rely on my intuition (reversed item) (I)
6. I think about myself (D)
7. I prefer making detailed plans rather than leaving things to chance (D)
8. I prefer drawing conclusions based on my feelings, my knowledge of human nature, and my experience of life (I)
9. My feelings play an important role in my decisions (I)
10. I am a perfectionist (D)
11. I think about a decision particularly carefully if I have to justify it (D)
12. When it comes to trusting people, I can usually rely on my gut feelings (I)
13. When I have a problem I first analyse the facts and details before I decide (D)
14. I think before I act (D)
15. I prefer emotional people (I)
16. I think more about my plans and goals than other people do (D)
17. I am a very intuitive person (I)
18. I like emotional situations, discussions and movies (I)

PID – Betsch, 2004 (Italian translation, Iannello, 2008, 2010)

1. Rifletto molto bene prima di prendere decisioni (D)
2. Presto molta attenzione alle mie sensazioni profonde (I)
3. Prima di prendere decisioni solitamente penso agli obiettivi che intendo raggiungere (D)
4. Nella maggioranza delle decisioni è bene affidarsi completamente alle proprie sensazioni (I)
5. Non mi piacciono le situazioni che richiedono di basarsi sul proprio intuito (I)
6. Rifletto riguardo a me stesso (D)
7. Preferisco fare progetti in maniera dettagliata piuttosto che lasciare tutto al caso (D)
8. Preferisco trarre conclusioni basandomi sulle mie sensazioni, sulla mia conoscenza della natura umana e sulla mia esperienza di vita (I)
9. Le mie sensazioni hanno un ruolo importante nelle mie decisioni (I)
10. Sono un perfezionista (D)
11. Rifletto attentamente su una decisione se poi devo rendere conto di essa (D)
12. Di solito mi baso sulle mie sensazioni quando si tratta di fidarsi delle persone (I)
13. Se ho un problema per prima cosa analizzo i fatti e i dettagli della situazione prima di prendere una decisione (D)
14. Rifletto prima di agire (D)
15. Mi piacciono le persone emotive (I)
16. Penso ai miei progetti e ai miei obiettivi più di quanto facciano le altre persone (D)
17. Sono una persona molto intuitiva (I)
18. Mi piacciono le situazioni, le discussioni e i film che suscitano emozioni (I)

Appendix E

Self-report questionnaire (experiment 3).
"Indica quanto consideri Coca:" ["Please indicate the extent to which you consider Coke:" (7 point response scale with endpoints labelled as "1 = not at all" and "7 = very much")]

- Gustosa
- Sana
- Buona
- Soddisfacente

Appendix F1

Table of regression H3a

Independents		Intention to buy			
		b	std. Error	t value	Pr(> |t|)
Independents	(Intercept)	0.116	0.435	0.267	0.79
	IAT score	1.463	0.504	2.903	0.005**
	PID Intuition	0.765	0.642	1.191	0.23
	IAT * PID	1.141	0.752	1.529	0.03*

***Significant at the 0.001 level (2-tailed).
**Significant at the 0.01 level (2-tailed).
*Significant at the 0.05 level (2-tailed).

Appendix F2

Table of regression H3b
"More intuitive" sample

	Independents	Intention to buy			
		b	std. Error	t value	Pr(> |t|)
1	(Intercept)	0.022	0.297	0.076	0.94
	Self-report	0.615	0.101	6.057	3.94e − 07***
2	(Intercept)	0.808	0.381	2.116	0.067
	Self-report	0.532	0.097	5.480	2.73e − 06***
	IAT score	1.492	0.508	2.935	0.0055**

***Significant at the 0.001 level (2-tailed).
**Significant at the 0.01 level (2-tailed).
*Significant at the 0.05 level (2-tailed).
"Less intuitive" sample.

	Independents	Intention to buy			
		b	std. Error	t value	Pr(> |t|)
1	(Intercept)	− 0.318	0.316	− 1.008	0.328
	Self-report	0.383	0.125	3.040	0.007**
2	(Intercept)	− 0.530	0.494	− 1.074	0.299
	Self-report	0.425	0.149	2.853	0.012*
	IAT score	0.346	0.610	0.567	0.057

***Significant at the 0.001 level (2-tailed).
**Significant at the 0.01 level (2-tailed).
*Significant at the 0.05 level (2-tailed).

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