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Distinguishing the affective and cognitive bases of implicit attitudes to improve prediction of food choices

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ABSTRACT

Eating behaviors largely result from automatic processes. Yet, in existing research, automatic or implicit attitudes toward food often fail to predict eating behaviors. Applying findings in cognitive neuroscience research, we propose and find that a central reason why implicit attitudes toward food are not good predictors of eating behaviors is that implicit attitudes are driven by two distinct constructs that often have diverging evaluative consequences: the automatic affective reactions to food (e.g., tastiness; the affective basis of implicit attitudes) and the automatic cognitive reactions to food (e.g., healthiness; the cognitive basis of implicit attitudes). More importantly, we find that the affective and cognitive bases of implicit attitudes directly and uniquely influence actual food choices under different conditions. While the affective basis of implicit attitude is the main driver of food choices, it is the only driver when cognitive resources during choice are limited. The cognitive basis of implicit attitudes uniquely influences food choices when cognitive resources during choice are plentiful but only for participants low in impulsivity. Researchers interested in automatic processes in eating behaviors could thus benefit by distinguishing between the affective and cognitive bases of implicit attitudes.

1. Introduction

Human behaviors in general, and eating behaviors, in particular, are largely influenced by automatic processes (Bargh, 1997; Rangel, 2013; Strack & Deutsch, 2004; Wiers et al., 2010). Imagine having to choose between an apple and a chocolate bar for dessert. The associations that spontaneously come to your mind for each food item are likely to influence your decision (Raghunathan, Naylor, & Hoyer, 2006; Strack & Deutsch, 2004; Stroebe, Mensink, Aarts, Schut, & Kruglanski, 2008). However, although implicit attitudes toward food (i.e., the automatic evaluative reaction toward the item) are shown to sometimes influence food choices and behaviors (e.g., Friese, Hofmann, & Wänke, 2008), implicit attitudes often fail to predict eating behaviors (for a review see Roefs et al., 2011). In particular, implicit attitudes fail to predict the behavior of obese people (Craeynest, Crombez, Haerens, & De Bourdeaudhuij, 2007; Roefs, Stapert et al., 2005; Roefs & Jansen, 2002) and restrained eaters (e.g., Papies, Stroebe, & Aarts, 2009; Roefs, Herman, Macleod, Smulders, & Jansen, 2005).

In this article, we argue that one central reason why implicit attitudes are not always good predictors of eating behaviors is because they are not only driven by the automatic hedonic or affective reactions to food (e.g., tastiness) but also by the automatic utilitarian or cognitive reactions to food (e.g., healthiness). And these automatic affective and cognitive reactions to food often do not have the same evaluative consequences. A piece of chocolate cake will usually be perceived as tasty (which has a positive evaluative outcome) and, at the same time, as unhealthy (which has a negative evaluative outcome). Automatic perceived tastiness and healthiness can even be negatively correlated (Keller & van der Horst, 2013; Raghunathan et al., 2006).

Based on cognitive neuroscience research on systems of implicit learning and memory (Amodio & Devine, 2006; Amodio & Ratner, 2011; Rangel, 2013), we propose that the affective and cognitive bases of implicit attitudes towards a food item are distinct constructs that independently build the conventional overall implicit attitude toward the item. More importantly, we propose that each basis directly and uniquely influences eating behaviors under different conditions. In line with recent theoretical developments stressing the importance of palatability in explaining food intake (e.g., Lowe & Butryn, 2007; Rangel, 2013), we expect the affective basis of implicit attitudes (i.e., automatic hedonic reactions to food)

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to be the main driver of eating behaviors, and the only driver when cognitive resources during choice are limited (Mann & Ward, 2007). We expect the cognitive basis of implicit attitudes (i.e., automatic cognitive reactions to food) to predict food choice only when cognitive resources during choice are plentiful and only for participants good at self-control (Hare, Camerer, & Rangel, 2009, Rangel, 2013).

We explore these predictions through two studies. Our first study examines the influence of affective and cognitive automatic reactions to food on overall implicit attitudes towards the food items and shows that both types of reactions independently influence overall implicit attitudes. Our second study investigates how affective and cognitive automatic reactions to food explain food choices under different conditions. This study also shows that implicit attitudes are not good predictors of food choices because they mix both affective and cognitive automatic reactions. We begin with a brief review of prior work providing evidence for affective and cognitive bases of implicit attitudes and for the role of both bases in eating behaviors. We then present our studies and discuss theoretical and practical implications of this research.

1.1. Conceptual background

Eating behaviors are not only the result of controlled processes but also and predominantly the result of automatic processes (Rangel, 2013; Wiers et al., 2010). Automatic processes are fast, unintentional and effortless (Bargh, 1994). To account for the importance of automatic processes and to better understand eating behaviors, researchers focused on assessing automatic or implicit attitudes (Chen & Bargh, 1999; Roefs et al., 2011; Wiers et al., 2010). Yet, implicit attitudes often fail to predict eating behaviors (e.g., Karpinski & Hilton, 2001; Olson & Fazio, 2004; Spruyt, Hermans, De Houwer, Vandekerckhove, & Eelen, 2007; for a review, see Roefs et al., 2011). We suggest that a key reason why implicit attitudes are not good predictors of eating behaviors is that multiple memory systems actually contribute to automatic evaluative processes (Amodio & Ratner, 2011; Amodio & Devine, 2006; Rangel, 2013; Stanley, Phelps, & Banaji, 2008). In particular, there is evidence 1) that affective and cognitive forms of information processing can be performed automatically, 2) that both processes are distinct and 3) that both processes can influence implicit attitudes (Amodio & Devine, 2006; Amodio & Mendoza, 2010). We briefly review such evidence in the next part.

1.1.1. Affective and cognitive automatic processes in implicit attitudes

While traditional models of information processing assume that a uniform processing mode characterizes automatic processes (e.g., Sloman, 1996; Smith & Decoster, 2000; Strack & Deutsch, 2004), findings in cognitive neuroscience research clearly support the view of distinct automatic systems (Amodio & Ratner, 2011; Poldrack & Foerde, 2008). In particular, affective learning and memory involve the amygdala and its related subcortical circuits (LeDoux, 2000) while cognitive (or semantic) learning and memory are associated with activity in evolutionary newer network of neocortical structures (e.g. left prefrontal cortex; Martin, 2007; Rissman, Eliassen, & Blumstein, 2003). Importantly, both affective and cognitive processes can operate automatically. It is well known that Pavlovian learning (i.e., classical conditioning), one of the fundamental systems for the learning of affective associations in the food domain, can operate automatically (Rangel, 2013). Yet, the mechanisms producing cognitive associations can also operate automatically. This can, for instance, be observed in implicit semantic priming tasks (Rissman et al., 2003). Seeing a word such as "chocolate" spontaneously activates part of the semantic network of the word. It has even been shown that affective associations are not necessarily more accessible than semantic associations (Giner-Sorolla, 2004). The two systems, affective and cognitive, can thus operate automatically. Interestingly, they have also been shown to be distinct because (1) amygdala-based learning is not dependent on semantic associations and (2) semantic associations can be learned without involving the amygdala (Bechara, Damasio, & Damasio, 2003).

It is well established that affective associations influence implicit attitudes. Indeed, the amydgala is strongly associated with automatic evaluation of stimuli (Cunningham & Zelazo, 2007; Stanley et al., 2008). Some researchers even adopt the view that implicit attitudes "represent the affective component attributed to attitudes" (Gawronski & Bodenhausen, 2006, *p*. 694). However, besides the amygdala, neural components associated to cognitive learning and memory are also involved in automatic evaluations. In particular, the dorsolateral prefrontal cortex is involved in the cognitive regulations of implicit attitudes (Stanley et al., 2008). Moreover, such cognitive regulation can be performed automatically in a few hundred milliseconds (Cunningham & Zelazo, 2007). Thus, "an implicit evaluation (i.e., attitude) may reflect a combination of affective and semantic (i.e., cognitive) associations" (Amodio & Mendoza, 2010, *p*. 367; see Eagly & Chaiken (2007) for a similar view).

In research on traditional explicit (i.e., deliberative) attitudes, the conceptual distinction between the affective and cognitive bases of attitudes was useful to improve the prediction of behaviors, and this also in the food domain (Dubé, Cervellon, & Jingyuan, 2003; Millar & Tesser, 1986). We suggest that a similar distinction between the affective and cognitive bases of attitudes at an implicit level should improve the understanding of the relationship between implicit attitudes toward food and eating behaviors. We next define the affective and cognitive bases of implicit attitudes toward food.

1.1.2. The affective and cognitive bases of implicit attitudes toward food

Following research on explicit attitudes toward food (Dubé et al., 2003), the affective component of an implicit attitude toward a food item corresponds to the automatic hedonic reactions to the item (its spontaneous palatability) and the cognitive component contains the automatic beliefs about the item (e.g., spontaneous perceived healthiness, calories, fattiness, dieting effect). Using implicit measures, some researchers have independently assessed either the affective basis (e.g., Papies, Stroebe, & Aarts, 2007; Roefs, Herman et al., 2005) or part of the cognitive basis (e.g., Stroebe et al., 2008; Werrij et al., 2009) of implicit attitudes toward food. Yet, to the best of our knowledge and quite surprisingly, no study concerns the prediction of eating behaviors. Because the affective and cognitive bases of implicit attitudes reflect independent memory systems, each basis should uniquely influence eating behaviors under different conditions (Amodio & Devine, 2006). We next detail such conditions.

1.1.3. The role of the affective and cognitive bases of implicit attitudes in eating behaviors

There is ample theoretical and empirical evidence that food decisions are largely driven by hedonic reactions (e.g. tastiness) (Lowe & Butryn, 2007; Pinel, Assanand, & Lehman, 2000). Indeed, palatability is one of the main drivers of food intake and is one major reason the homeostatic regulation of hunger does not well explain eating behaviors (Herman & Polivy, 2014; Rangel, 2013; Wansink & Chandon, 2014). In particular, the Pavlovian system, based on affect, often controls food decisions (Rangel, 2013). This system dominates when food decisions are made under cognitive

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