Predicting incidental and focal food consumption behaviors

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Abstract

Purpose – There has been contradictory evidence as to whether implicit attitudes are more indicative of food consumption behavior than explicit attitudes. The purpose of this paper is to clarify the predictive validity of implicit attitudes for food consumption behaviors with two popular indirect measures – the implicit association test (IAT) and the affective misattribution procedure (AMP).
Design/methodology/approach – The authors examined the predictive validity of the IAT and AMP for focal and incidental food consumption behaviors ($n = 277$).
Findings – Results revealed that the IAT and the AMP were more context-dependent than initially expected. The IAT only predicted incidental consumption behaviors in Study 1, and the AMP only predicted incidental consumption behaviors when preceding the IAT. However, the indirect measures provided unique variance for predicting incidental consumption behaviors. Only a direct, self-report measure predicted focal behaviors.
Research limitations/implications – These findings suggest that both the AMP and the IAT can predict incidental consumption behaviors, but the presence and strength of these effects may be moderated by unsuspected variables such as task order.
Practical implications – The current study provides evidence for the benefits of utilizing implicit measures in addition to self-report measures during consumer and market research.
Originality/value – This research reevaluates the predictive validity of the IAT and AMP for food consumption behaviors and employs two measures of food consumption behaviors.

Keywords Food consumption, Predictive validity, Implicit attitudes, Consumption behaviour

Paper type Research paper

Introduction

Many nations are in the midst of a public health crisis stemming from issues related to food consumption. In response to this crisis, researchers have proposed strategies to promote healthier eating habits (Dudley *et al.*, 2015; Michie *et al.*, 2009; Vilà *et al.*, 2017), with recent focus given to how food information is processed. It stands to reason that if some properties of food are processed more automatically than others, automatic or controlled processing may produce different food preferences/attitudes, which affect subsequent consumption behaviors. Such food preferences are reflected in either implicit attitudes – attitudes with unknown origin and/or justification (e.g. De Houwer, 2006; Gawronski *et al.*, 2006; Greenwald and Banaji, 1995; Nosek *et al.*, 2011; Wilson *et al.*, 2000) or explicit attitudes – attitudes that are controlled and deliberative. These attitudes can foster differences in consumption behaviors. That is, people can extend relatively little controlled thought toward consumption behaviors, resulting in snacking as an automatic or incidental behavior. However, people could directly attend to their snacking behaviors, resulting in focal consumption recruiting conscious decision making. The current research tests for processing congruencies, in which implicit attitudes toward food may better predict incidental consumption behaviors, and explicit attitudes may better predict focal behaviors.

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Over the past decade, researchers have developed indirect measures to understand the complexity of implicit attitudes on a variety of dimensions, including food consumption preferences (e.g. Payne *et al.*, 2007, 2008). In contrast to direct measures of explicit attitudes, indirect measures allow researchers to assess attitudes not readily accessible through introspection (Gawronski *et al.*, 2006; Nosek *et al.*, 2011). Dozens of studies have since emerged to explore the relationship between food choices and consumption, implicit attitudes and explicit attitudes (e.g. Blanton *et al.*, 2016; Conner *et al.*, 2007; Friese *et al.*, 2008; Maison *et al.*, 2001; Songa and Russo, 2018; Spence and Townsend, 2007). However, there has been contradictory evidence as to whether implicit attitudes are more indicative of food consumption behavior than explicit attitudes (Ayres *et al.*, 2012; Karpinski and Hilton, 2001; Payne *et al.*, 2008; Trendel and Werle, 2016), perhaps due to underlying differences in the indirect measure used, state-dependent effects on implicit attitudes (e.g. Haynes *et al.*, 2015, 2016; Hensels and Baines, 2016; Kemps *et al.*, 2013; König *et al.*, 2016; Richard *et al.*, 2018; Roefs *et al.*, 2011; Seibt *et al.*, 2007; Wang *et al.*, 2016) and/or methodological shortcomings of indirect measures (e.g. Azar, 2008; Blanton *et al.*, 2009). The current research aims to clarify the predictive validity of implicit attitudes of food consumption behaviors with two popular indirect measures – the implicit association test (IAT; Greenwald *et al.*, 1998) and the affective misattribution procedure (AMP; Payne *et al.*, 2005).

The implicit association test

The IAT (Greenwald *et al.*, 1998) is the most popular and frequently used indirect measurement procedure (Nosek *et al.*, 2011). During this task, four different categories appear on the screen. Participants are tasked with the goal of categorizing target stimuli as quickly as possible into the appropriate categories. During the first critical block of trials, two of the four categories are assigned to one key press and the other two categories are assigned to another key press. The categories are then reorganized on the screen during the second critical block of trials such that new category key pairs are made. Faster categorization of stimuli into appropriate categories occurs when paired category concepts are closely associated with one another. By investigating how closely participants associate an object (e.g. M&Ms and apples) to an evaluative trait (e.g. good and bad), the IAT can reliably measure implicit attitudes toward that object (Greenwald *et al.*, 2003). For instance, individuals are faster at categorizing liked items when paired with good words than bad words, indicating that the individual has a positive attitude toward that particular category relative to the other category being tested.

Using the IAT to understand how implicit attitudes predict food consumption behaviors has produced inconsistent results. For instance, Karpinski and Hilton (2001) established that the IAT was not predictive of candy bar vs apple selection, whereas direct attitudinal measures were predictive of this choice. Following this logic, Perugini (2005) postulated that direct measures of explicit attitudes would predict snack and fruit preferences; however, contrary to Perugini's initial hypotheses, the IAT demonstrated predictive validity for snack vs fruit consumption preferences – a finding the author attributed to the study's general category labels (i.e. Perugini used the general category labels of snack and fruit, whereas Karpinski and Hilton provided specific category labels of apple and candy bar). Further, Richetin *et al.* (2007) examined the interactive and additive effects of direct (i.e. self-report questionnaires) and indirect measures (i.e. IAT) on predicting fruit and snack consumption decisions. One week following the completion of the IAT, participants were provided with the opportunity to select a piece of fruit or a snack. Results indicated that the IAT demonstrated both predicative and incremental validity for eating behaviors beyond that of direct measures.

Taken together, there was inconsistent evidence regarding whether preferences measured indirectly by the IAT were better predictors of consumption behaviors than direct attitudinal measures. These contradicting findings reveal that the limits of the IAT's predictive validity of consumption are still not fully understood.

The affective misattribution procedure

Another indirect measurement procedure that has demonstrated sufficient reliability and predictive validity for behavior is the AMP (Payne *et al.*, 2005). The AMP relies on an individual's tendency to misattribute personal feelings toward one source onto another source. In this task, two images are quickly flashed on the screen one after the other. The first image is of a familiar object that elicits either a positive or negative connotation. The first image serves as a prime for a second neutral image (typically a Chinese symbol). Affective reactions toward the prime are often misattributed onto the neutral image as a result of the individuals' inability to consciously moderate responses (Gawronski and Ye, 2014; Payne, 2005). The AMP does not designate correct responses, rather it depends on the participants' tendency to rely on internally generated reactions toward the novel cue (Payne *et al.*, 2005).

Across multiple studies, Payne *et al.* (2008) explored the effect of automatic attitudes for alcohol consumption behaviors using the IAT and the AMP. The AMP reliably predicted drink choice and related drinking behaviors even when participants were motivated to conceal drinking habits. The AMP also consistently predicted behavior, whereas the IAT demonstrated small, inconsistent findings. Additionally, although self-report measures fell victim to self-presentation biases, the AMP results remained unaffected. Thus, the AMP effectively predicted implicit attitudes for a stigmatized behavior (e.g. excessive drinking) beyond conscious attitudes (Payne *et al.*, 2008). Importantly, the predictive validity of the AMP extends beyond the prediction of immediate and past consumption behaviors. That is, the AMP was predictive of drinking behaviors one year later regardless of previous experience with drinking alcohol (Payne *et al.*, 2016). Thus, the AMP is sufficient to predict the initiation of consumption behaviors in addition to behavioral drinking choices.

The current study goes beyond the work conducted by Payne *et al.* (2008) to reevaluate the predictive validity of the IAT and the AMP for food consumption behaviors. Specifically, this research examined apples and M&Ms food consumption behaviors/preferences rather than drinking behaviors (Payne *et al.*, 2008). Additionally, this research employed techniques beyond self-report of consumption behaviors; participants were provided with the opportunity for incidental food consumption throughout the study (i.e. leaving a cup of M&Ms on the table for snacking) as well as a focal food consumption choice at the end of the study (i.e. participants chose an apple or a M&Ms snack pack as a reward for completing the study).

Study overview

This paper examines implicit attitudes about food preferences as well as the predictive validity of the IAT and AMP for incidental and focal consumption behaviors. Incidental behaviors (consumption without conscious intention) were measured by the amount of M&Ms participants ate freely throughout the experiment while attention was focused on another task. Focal behaviors (consumption with conscious deliberation) were measured at the end of the study when participants selected either an apple or M&Ms snack packet. Importantly, although cognitive resources might be slightly depleted when participants were given the M&Ms vs apples choice at the end of the study (a factor known to influence the predictive validity of indirect and direct measures – see Friese *et al.*, 2008), it is expected that time to deliberate resulted in a more focal rather than incidental behaviors.

Incidental and focal consumption behaviors were independently measured and compared to participants' scores on the IAT, AMP and a self-report attitude measure. It was hypothesized that the AMP and the IAT would predict unique variance of incidental consumption behavior when controlling for the direct measures as both measures have demonstrated predictive validity for behavior (Cameron *et al.*, 2012). It was also hypothesized that the self-report measure would solely predict focal consumption behaviors since both self-report and focal behaviors rely on conscious self-assessment.

To test these hypotheses, two independent, nearly identical studies, were conducted with the only difference between the studies being the amount of M&Ms provided to participants (Study 1 = 20 M&Ms; Study 2 = 25 M&Ms). For the ease of interpretation, all of the data were combined into one analysis.

Methods

Participants

In total, 343 students participated in this study in exchange for partial course credit. However, a total of 66 participants were removed from this sample due to machine failures ($n = 47$), greater than 20 percent error rates on the IAT and/or lack of variability in AMP responses ($n = 15$) and missing behavioral data ($n = 4$). After these data exclusions, 277 students (204 women and 73 men; 152 White, 41 African–American, 37 Asian–American, 21 Hispanic–American and 26 other; 165 in Study 1 and 112 in Study 2) completed this study.

Measures

IAT. An apple–M&Ms IAT is an indirect measure of preference/bias for apples compared to M&Ms (see Karpinski and Hilton, 2001). The evaluative dimension was labeled good/bad and the target dimension was labeled apple/M&Ms. The procedures followed those outlined by Greenwald *et al.* (1998). The IAT is a five-stage procedure, with three non-critical stages and two critical stages. Stages 1, 2 and 4 consisted of 30 single-categorization practice/non-critical trials that allowed the participants to practice categorizing good and bad words (Stage 1) and apples and M&Ms pictures (Stages 2 and 4). Stages 3 and 5 consisted of the dual-categorization critical trials. In one critical stage of 60 trials, apple pictures and good words were paired on the "A" key, and M&Ms pictures and bad words were paired on the "5" key. In a second critical stage of 60 trials, M&Ms pictures and good words were paired on the "A" key, and apple pictures and bad words were paired on the "5" key. The order of these critical stages was counterbalanced across participants. Participants were given unlimited time to complete the trials. An IAT score was calculated using the new D-score algorithm described in Greenwald *et al.* (2003). Higher scores indicate a preference for M&Ms over apples (split-half $\alpha = 0.76$).

AMP. The AMP measures liking for attitude objects by assessing the extent to which affect provoked by an attitude object is misattributed to a neutral symbol. The AMP created for this study measured attitudes toward apples and M&Ms and followed standard AMP procedures (see Payne *et al.*, 2005). First, participants were presented with an image of either apples or M&Ms for 75 ms. The photos used in this task were the same photos as used in the IAT task. A blank screen followed this image for 125 ms and then a picture of a Chinese symbol appeared for 100 ms. Participants were asked to indicate if the Chinese symbol was a pleasant symbol or an unpleasant symbol. A mask was shown until participants submitted their responses. Following five practice trials, participants completed 48 randomly ordered critical trials – 24 apple trials and 24 M&Ms trails. The AMP score was calculated by subtracting the total number of liked symbols following an apple picture from the total number of liked symbols following an M&Ms picture. Thus, higher AMP scores indicated a preference for M&Ms over apples (split-half $\alpha = 0.77$).

Self-report measure. Participants were asked to explicitly state their preference for apples vs M&Ms using two self-report items. They were asked to evaluate the statement "I like apples" and "I like M&Ms" on a rating scale ranging from 1 (strongly disagree) to 7 (strongly agree). These questions were adapted from previous studies that measured the predictive validity of implicit measures for consumption behaviors (e.g. Haynes *et al.*, 2015; Karpinski and Hilton, 2001). Explicit ratings of apples were subtracted from explicit ratings of M&Ms to obtain a self-reported, comparative measure of apple/M&Ms preference/bias.

Behavioral measurements. Participants completed a measure of incidental M&Ms consumption behavior and a measure of focal apple/M&Ms consumption behavior. For the

incidental measure, participants were presented with a cup of either 20 (Study 1) or 25 (Study 2) M&Ms at the beginning of the session. The number of M&Ms was increased from 20 (Study 1) to 25 (Study 2) to reduce ceiling effects. Participants were asked to eat one M&M of each color and to make taste-judgments about each M&M. This taste task served as a cover story to get the participants to eat the M&Ms. After the judgments were made, participants were informed that the M&Ms were no longer needed for the study. The M&Ms were set aside, but participants were told that they were allowed to eat the remaining M&Ms throughout the study if they desired. No further mention of the M&Ms was made. At the conclusion of the study, the experimenter recorded the total number of M&Ms consumed.

A focal measure of apple vs M&Ms preference was obtained at the end of the study by asking participants to select an apple or snack pack of M&Ms as their reward for completing the study.

Procedure

Participants first completed the informed consent that provided a brief outline of the experimental tasks. Following the informed consent, participants filled out demographic questions. Next, incidental consumption of M&Ms was initiated and subsequently permitted during subsequent tasks. All participants then completed an apple–M&Ms IAT and an apple–M&Ms AMP (in counterbalanced order) using DirectRT software followed by self-report measure of preference. Participants then completed the focal food consumption task. Finally, participants were thanked for their time and debriefed. Data for Study 2 was collected immediately after the completion of Study 1. Data can be found at https://osf.io/nqxc8/

Results

Descriptive statistics

An initial analysis investigated whether or not scores on any of the measures were affected by the order of implicit measure (IAT first vs AMP first). A 2 (between subjects: order of indirect measures) × 3 (within subjects: IAT, AMP and self-report) ANOVA was conducted to examine potential order effects. This preliminary analysis revealed no significant effect of order of measure, $F(1, 275) = 0.71$, $p = 0.401$, $\eta^2 p < 0.01$, or order by measure interaction, $F(2, 275) = 1.06$, $p = 0.347$, $\eta^2 p < 0.01$. To be thorough, follow-up t-tests were conducted to examine the effect of order on each individual attitude measure. These tests also revealed no evidence of an order effect, $|t|$s < 0.99, ps > 0.324.

Overall, the IAT and self-report measures displayed a preference for apples compared to M&Ms, all ps < 0.001 and $|d|$s > 0.19, while the AMP revealed no significant preference for apples or M&Ms, $p = 0.117$ and $|d| = 0.09$ (see Table I). Additionally, the IAT was significantly correlated with all other attitude measures, but the AMP and self-report measures were not significantly correlated: IAT and AMP, $r(275) = 0.12$, $p = 0.043$; IAT and self-report measure, $r(275) = 0.30$, $p < 0.001$; AMP and self-report measure, $r(275) = 0.03$, $p = 0.634$.

The number of M&Ms consumed during the incidental consumption task ranged from either 5 to 20 ($M = 13.01$), with 28.5 percent of participants consuming all of the M&Ms provided (Study 1) or 5 to 25 ($M = 15.13$), with 23.2 percent of participants consuming all of

			Difference from midpoint		
Measure	*M*	SD	*t*	*p*	|*d*|
IAT	−0.09	0.47	$t(276) = -3.26$	*0.001*	0.19
AMP	−0.58	6.19	$t(276) = -1.57$	0.117	0.09
Self-report measure	−0.34	1.51	$t(276) = -3.77$	*> 0.001*	0.23

Notes: $n = 277$. IAT, implicit association test. AMP, affect misattribution procedure. IAT range: −1.19 to 1.37; AMP range: −22 to 23; self-report measure range: −5 to 6

Table I. Descriptive statistics

the M&Ms provided (Study 2). A correlational analysis revealed that M&Ms consumption was marginally correlated with the AMP, $r(275) = 0.12$, $p = 0.052$, and significantly correlated with the IAT, $r(275) = 0.19$, $p = 0.001$ and self-report measure, $r(275) = 0.23$, $p < 0.001$.

For the focal choice behavior, 160 participants selected an apple and 117 participants selected the M&Ms snack pack. The number of M&Ms consumed and the choice of an apple or snack pack of M&Ms were independent, $r(275) = 0.03$, $p = 0.67$. Point-biserial correlations between the choice behavior and all measures revealed a significant correlation with self-reported measures, $r(275) = 0.38$, $p < 0.001$, no significant correlation with IAT scores, $r(275) = 0.10$, $p = 0.092$ and no significant correlation with AMP scores, $r(275) = -0.01$, $p = 0.929$.

Prediction of consumption behavior

To investigate the unique contribution of each attitude measure in predicting the incidental behavior, a simultaneous regression predicting number of M&Ms consumed was conducted. Study and condition (order of implicit measures) were effect coded and the predictor variables were mean centered. Then, we entered the following variables into the model (see Table II): IAT scores, AMP scores, self-report measure scores, condition, study, all possible two way interactions involving study or condition, and attitude measures by study by condition three way interactions. To simplify the model, all core aspects of the design (all attitude predictors, study and condition) and any interaction term with $p < 0.10$ were retained. Removing these non-significant terms did not change the fit of the model, $F(8, 261) = 0.94$, $p = 0.487$, Adj. R^2 change < 0.01. The final model (see Table III) revealed

Table II. Simultaneous regression analysis predicting incidental M&Ms consumption behavior: initial model

	β	t	p-value
IAT	0.12	1.92	0.056
AMP	0.17	2.60	*0.010*
Self-report measure	0.24	3.80	*< 0.001*
Condition (order of measures)	0.05	0.89	0.375
IAT × condition	0.08	1.30	0.196
AMP × condition	0.16	2.46	*0.014*
Self-report measure × condition	0.01	0.12	0.908
Study	−0.14	−2.39	*0.018*
IAT × study	−0.12	−1.91	0.057
AMP × study	−0.02	−0.22	0.823
Self-report × study	−0.07	−1.15	0.251
Condition × study	−0.07	−1.09	0.277
IAT × study × condition	−0.03	−0.43	0.669
AMP × condition × study	−0.08	−1.18	0.238
Self-report measure × condition × study	−0.08	−1.25	0.212

Notes: $n = 276$. Adj. $R^2 = 0.10$. IAT, implicit association test; AMP, affect misattribution procedure

Table III. Simultaneous regression analysis predicting incidental M&Ms consumption behavior: final model

	β	t	p-value
IAT	0.12	1.89	0.060
AMP	0.16	2.49	*0.014*
Self-report measure	0.20	3.38	*0.001*
Condition (order of measures)	0.05	0.90	0.369
AMP × condition	0.14	2.31	*0.002*
Study	−0.13	−2.21	*0.028*
IAT × study	−0.12	−2.04	*0.042*

Notes: $n = 276$. Adj. $R^2 = 0.11$. IAT, implicit association test; AMP, affect misattribution procedure

several key findings. First, there was an effect of study. Participants ate more M&Ms in Study 2 than in Study 1. Given that more M&Ms were provided in Study 2 than in Study 1, this effect is not surprising. Second, self-reported attitudes were a significant predictor of incidental behavior with no evidence that this effect varied by order of measures or by study. Third, overall, the IAT was a marginally significant predictor of incidental behavior; however, inspection of the IAT by study interaction revealed that this effect was present and significant in Study 2 ($\beta = 0.20$, $p = 0.043$) and not present in Study 1 ($\beta = 0.01$, $p = 0.962$). Fourth, overall, the AMP was a significant predictor of incidental behavior, but this effect was moderated by condition with the AMP being a stronger predictor when it preceded the IAT ($\beta = 0.21$, $p = 0.015$) than when it followed the IAT ($\beta = 0.02$, $p = 0.833$).

To determine if the indirect measures provided incremental predictive validity of incidental consumption behaviors beyond the direct measures, all variables from the final regression model were entered into a stepwise regression. The first step included the study design variables and the direct measure (i.e. self-report, condition and study), and the second step included the terms involving the indirect measures (i.e. IAT, AMP, AMP × condition and IAT × study). R^2 significantly increased between steps, $F(4, 269) = 3.79$, $p = 0.005$, R^2 change = 0.05. Thus, the indirect measures provided incremental predictive validity for the incidental consumption behaviors.

Next, the unique contribution of each attitude measure in predicting the focal behavior was examined. Because the focal behavior was a dichotomous choice, a logistic regression predicting the choice of an apple or a snack pack of M&Ms was conducted. Once again, all attitude measures, condition, study, all possible two-way interactions involving study or condition and attitude measures by study by condition three-way interactions (see Table IV) were entered into the model. To simplify the model, all core aspects of the design (all attitude predictors, study and condition) and any interaction term with $p < 0.10$ were retained. Removing these non-significant terms did not change the fit of the model, $\chi^2(9) = 4.81$, $p = 0.850$ (See Table V). The final model revealed no evidence for the predictive validity of the AMP or the IAT on the focal behavior. On the other hand, the self-reported attitudes measure significantly predicted the focal behavior, although this effect was marginally stronger in Study 2 (odds ratio = 2.77) than it was in Study 1 (odd ratio = 1.71). Finally, the main effect of study indicates that participants were more

	Wald test	*p*-value	Odds ratio
IAT	0.32	0.571	1.22
AMP	0.10	0.756	1.01
Self-report measure	29.13	*< 0.001*	2.33
Condition (order of measures)	1.41	0.235	0.82
IAT × condition	0.01	0.956	0.98
AMP × condition	0.23	0.635	0.99
Self-report measure × condition	2.58	0.108	1.29
Study	8.52	*0.004*	1.65
IAT × study	0.08	0.776	0.91
AMP × study	0.37	0.543	0.98
Self-report × study	2.82	0.093	0.76
Condition × study	0.64	0.423	1.15
IAT × study × condition	0.21	0.650	1.17
AMP × condition × study	0.01	0.996	1.00
Self-report measure × condition × study	0.24	0.622	0.93

Notes: $n = 277$. IAT, implicit association test; AMP, affect misattribution procedure. All variables entered simultaneously

Table IV. Logistic regression predicting the focal choice of apple or M&Ms: initial model

likely to select an apple than a pack of M&Ms in Study 2 than in Study 1. Specifically, in Study 1 53 percent of participants selected an apple, whereas in Study 2 65 percent of participants selected an apple.

Discussion

This investigation aimed to clarify the predictive validity of two indirect measures, the IAT and AMP, for incidental and focal food consumption behaviors. Consistent with the hypothesis, only direct measures (i.e. self-report measures) reliably predicted focal consumption behaviors. Likewise, whereas the direct measures also predicted incidental consumption behaviors, the indirect measures demonstrated incremental predictive validity for incidental consumption behaviors beyond that of the direct measures (although the predictive validity of the indirect measures for incidental consumption was less robust than initially suspected).

The current study complements previous research by providing evidence for utilizing implicit measures and self-report measures during consumer and market research. Past research reveals that indirect measures can help improve the prediction of consumer behaviors beyond that of self-report measures (e.g. Brunel *et al.*, 2004; Forehand and Perkins, 2005; Maison *et al.*, 2001, 2004). For example, Maison *et al.* (2004) uncovered the usefulness of indirect measures for detecting subtle differences in brand preferences for similar products (i.e. Coca-Cola vs Pepsi preferences), which subsequently predicted future purchasing and consumption decisions. Likewise, Friese *et al.* (2006) highlighted the importance of implicit measures in addition to explicit measures for distinguishing between preferences for and choices of generic and brand-name food products. Just like this past research, the current work highlights the importance of utilizing both implicit and self-report measures during assessments of food preferences and choices during market research.

Additional evidence demonstrates how consumer behaviors and preferences are better predicted when both indirect and direct measures are employed (Maison *et al.*, 2001, 2004). This is especially true in situations when choices must be made under time constraints, high cognitive load or time pressure. In these instances, automatic or habitual behavioral responses become activated, therefore, making implicit attitudes relevant for consumer decisions and predictive of choice behaviors (Friese *et al.*, 2006). Thus, when time is limited, impulsive/automatic choices become paramount, increasing the predictive validity of implicit measures and decreasing the predictive validity of explicit measures for consumer choices (Friese *et al.*, 2006).

As another benefit, this research suggests that implementing implicit measures during market research can also help address some of the methodological shortcomings of self-report measures. Implicit measures, for example, are advantageous as participants might not realize what is being measured or be able to consciously correct their responses (Dimofte, 2010). Similarly, implicit measures are immune to some of the pitfalls of survey methodology, including

Table V. Logistic regression predicting the focal choice of apple or M&Ms: final model

	Wald test	*p*-value	Odds ratio
IAT	0.02	0.892	1.04
AMP	0.03	0.872	1.00
Self-report measure	32.70	*< 0.001*	2.14
Condition (order of measures)	0.87	0.352	0.88
Study	7.73	*0.005*	1.54
Self-report measure × study	2.81	0.094	0.80

Notes: $n = 277$. IAT, implicit association test; AMP, affect misattribution procedure. All variables entered simultaneously

social desirability effects and self-deception biases (Dimofte, 2010; Gregg and Kylmowsky, 2013). As a result, implicit measures can be useful when assessing attitudes and subsequent consumption behaviors toward sensitive, controversial or stigmatized topics.

Furthermore, past research on the Elaboration Likelihood Model (Petty and Cacioppo, 1984) suggests that decisions are processed either centrally or peripherally. Information processing via the central route occurs when there is sufficient time, motivation and cognitive resources for conscious, critical thinking. Yet when those factors are limited, information processing occurs via the peripheral route. The current research examined both types of processing in consumption decision making, as the incidental behaviors utilize peripheral processing (due to the automatic nature of this behavior) and the focal behaviors utilize central processing (due to the controlled nature of this behavior). It is also evident that different types of measures best predict these behaviors. Therefore, market research can be expanded by implementing both indirect and self-report measures to examine behaviors that result from different processing routes.

Limitations

In the current study, only M&Ms were used to measure incidental eating behaviors, whereas both M&Ms and apples were used to measure focal consumption behaviors. Since this research did not use a healthy counterpart in the incidental task and given that participants only could eat M&Ms during the study, focal consumption behaviors measured at the end of the study or performance on the latter indirect measure could have been affected. For instance, perhaps participants were tired of eating M&Ms, as they ate many throughout the study, and therefore, selected the healthy option as a result. Conversely, perhaps participants were primed to favor eating M&Ms during the study, which in turn could have influenced participants to choose M&Ms at the end of the study. To reduce these possibilities in future studies, researchers should consider creating more balanced food choices when measuring incidental and focal consumption behaviors.

Although the indirect measures demonstrated predictive validity for incidental consumption behavior, this property appeared to be context-dependent – the IAT predicted incidental consumption behaviors only in Study 1 (not in Study 2) and the AMP predicted incidental consumption behaviors only when it preceded the IAT (not when it followed the IAT). The present study did not permit insight into the context that produced this pattern; nevertheless, previous research suggests that subtle contextual and situational differences – such as situational encouragement (e.g. Marsh *et al.*, 2001), time constraints (e.g. Dijker and Koomen, 1996), mood (e.g. Bolte *et al.*, 2003) and task order (e.g. Ebert *et al.*, 2009; Monteith *et al.*, 2001; Perugini *et al.*, 2014; Scherer and Schott, 2012) – could affect the predictive validity of indirect measures (see Perugini *et al.*, 2010 for a review of potential moderators). Likewise, previous research reveals that a variety of factors can moderate the relationship between indirect measures and consumption behaviors (e.g. Hensels and Baines, 2016; Haynes *et al.*, 2015, 2016; Kemps *et al.*, 2013; König *et al.*, 2016; Richard *et al.*, 2018; Roefs *et al.*, 2011; Seibt *et al.*, 2007; Wang *et al.*, 2016), including emotional eating (Ayres *et al.*, 2011), self-regulatory resources (Friese and Hofmann, 2009; Hofmann *et al.*, 2007; Wang *et al.*, 2015), eating disorder symptomatology (Ellis *et al.*, 2014), experienced temptation (Haynes *et al.*, 2015), time pressure (Friese *et al.*, 2006) and evaluative conditioning (Hollands *et al.*, 2011). Inclusion of moderator variables in future studies could be useful to elucidate the predictive validity of indirect measures for food consumption behaviors. Furthermore, such moderators could also improve the amount of variance explained by the models for incidental consumption behavior.

As a final limitation, the sample was limited to a college population. Although this sample has been recognized as a key feature to consumer/market research, it could be that the generalizability of these results is limited. Therefore, an important future direction will be to examine these research questions with more diverse populations.

Conclusions

The predictive validity of indirect measures has yielded much attention, especially in the domain of food consumption behaviors. The current study provides empirical evidence that indirect measures (IAT and AMP) of implicit food attitudes/ preferences uniquely predict and provide incremental validity for incidental food consumption behaviors beyond direct measures, but that the presence and strength of these effects may be moderated by variables such as task order and unmeasured sample characteristics. Additionally, this research demonstrates that explicit attitudes, and not implicit attitudes, predict focal eating behaviors. This research goes beyond previous work by directly comparing the predictive validity of two popular indirect measures for two different types of consumption behaviors: incidental and focal food consumption behavior.

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