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On the predictive validity of indirect attitude measures: Prediction of consumer choice behavior on the basis of affective priming in the picture–picture naming task ☆

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Abstract

Recent studies have revealed that robust and replicable affective priming of naming responses can be obtained when pictures are used as primes and targets. The aim of the present research was to examine the predictive validity of affective priming effects that are obtained with the picture–picture naming task. In two studies that were modeled after [Karpinski, A., & Hilton, J. L. (2001). Attitudes and the Implicit Association Test. *Journal of Personality and Social Psychology*, *81*, 774–778], we observed that individual difference scores that are obtained with the naming task exhibit good predictive validity. Both practical and theoretical implications of this finding are discussed.

Keywords: Affective priming; Naming task; Evaluative categorization task; Implicit Association Test; Predictive validity; Indirect attitude measures; Attitudes; Extra-personal associations; Choice behavior

Introduction

Throughout the history of psychology, it has been widely assumed that attitudes can serve as a powerful energizer of behavior (e.g., Allport, 1935). It is not surprising then that behavioral scientists have long sought for reliable attitude assessment techniques in order to understand and predict behavior. Recently, a number of attitude measurement techniques have been developed that assess an individual's attitudes 'indirectly', that is, without having to ask for a direct, verbal report (Fazio & Olson, 2003). Well-known examples are the Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998), the Extrinsic Affective Simon Task (EAST, De Houwer, 2003), the Go/No-Go Association Task (GNAT, Nosek & Banaji, 2001), and the affective priming paradigm (e.g., Fazio, Jackson, Dunton, & Williams, 1995), but many other attitude measurement techniques are also available (see Fazio & Olson, 2003, for a review). As a rationale for the use of these 'indirect' attitude measures, it is typically argued that they (a) are less likely to be affected by social desirability and intentional deception as compared to direct verbal reports (e.g., Fazio & Olson, 2003; but see Steffens, 2004) and (b) might be able to register traces of past experience that are introspectively unidentified (e.g., Asendorpf, Banse, & Mücke, 2002; see also Banaji & Greenwald, 1994; Greenwald, 1990; Greenwald & Banaji, 1995; Nisbett & Wilson, 1977; Olson & Fazio, 2003; Wilson, Lindsey, & Schooler, 2000).

The aim of the present research was to examine the usefulness of the picture–picture naming task, a specific

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version of the affective priming paradigm, as an indirect attitude measurement procedure. The motivation for this enterprise was twofold. First of all, we reasoned that the reliability of affective priming scores may be dependent upon the nature of the response task that is used. Indeed, recent studies have revealed that (a) different underlying processes can drive the affective priming effect, and (b) that the extent to which each process contributes to the observed priming effects is conditional upon specific task demands. Consider, for instance, the standard evaluative categorization task in which participants are asked to judge the affective connotation of positive and negative target stimuli (e.g., the word 'LOVELY') that are preceded by affectively polarized prime stimuli (e.g., the word 'CANCER') (e.g., Fazio, Sanbonmatsu, Powell, & Kardes, 1986). Evidence suggests that affective priming effects that are obtained with this task are largely due to the fact that the primes can trigger response tendencies that either facilitate or interfere with target responding (e.g., De Houwer, Hermans, Rothermund, & Wentura, 2002; Fazio, 2001; Klauer, 1998; Klauer, Roßnagel, & Musch, 1997; Klinger, Burton, & Pitts, 2000; Musch, Klauer, & Mierke, 2004; Rothermund & Wentura, 1998; Wentura, 1999, 2000). However, such a response interference mechanism cannot contribute to the affective priming effect in the so-called naming task (e.g, pronouncing the word 'LOVELY') because the correct response in this task depends on the identity of the targets rather than on the valence of the targets. Nevertheless, affective priming of naming responses can be found (e.g., Bargh, Chaiken, Raymond, & Hymes, 1996; Hermans, De Houwer, & Eelen, 1994; Spruyt, Hermans, De Houwer, & Eelen, 2002, 2004; Spruyt, Hermans, De Houwer, Vandromme, & Eelen, in press), suggesting that other processes also contribute to the affective priming effect. More specifically, it has been argued that affective priming of naming responses is best explained on the basis of processes that operate at an encoding level. According to such an account, affectively polarized prime stimuli automatically pre-activate the memory representations of affectively related target stimuli, thus making it easier to encode target stimuli with the same valence than targets with a different valence (e.g., Bargh et al., 1996; Chen & Bargh, 1999; De Houwer, Hermans, & Spruyt, 2001; De Houwer & Randell, 2004; Duckworth, Bargh, Garcia, & Chaiken, 2002; Ferguson, Bargh, & Nayak, 2005; Spruyt et al., 2002, 2004, in press; see also Bargh, 1997).

Crucially, to the extent that affective priming in the evaluative categorization task is based on processes that operate at a response selection stage, individual difference measures that are obtained with this task may be affected by factors that are unrelated to an individual's attitude towards the prime objects. Consider, for example, the findings of Wentura (1999). He demonstrated that the time needed to evaluate a target on trial *n* increases when the valence of that target matches with the valence of an incongruent prime on trial $n-1$. Such an effect can be explained if it is assumed that a response conflict on trial $n-1$ results in a suppression of the response alternative that is trigged by the prime. If the information that was irrelevant on trial $n-1$ is then relevant on trial *n*, this inhibition needs to be overcome and responses will be delayed. Clearly, such an effect can impair the usefulness of the evaluative categorization task as an indirect attitude measurement procedure. In contrast, given that it is unlikely that affective priming in the naming task is based on processes that operate at a response selection stage (e.g., De Houwer et al., 2001; De Houwer & Randell, 2004; Spruyt et al., 2002, 2004, in press; Spruyt, Hermans, Pandelaere, De Houwer, & Eelen, 2004), individual difference measures that are obtained with this task may provide a more unbiased estimate of an individual's attitude towards the prime objects than the standard evaluative categorization task.

Second, we reasoned that the picture–picture naming task might be relatively insensitive to so-called "extra-personal" associations–associations that, although available in memory, are irrelevant to one's evaluation of a particular attitude object (see Olson & Fazio, 2004, p. 663). Recent evidence shows that the predictive validity of indirect attitude measures can be crippled when they are influenced by this kind of information (Olson & Fazio, 2004). As an example, consider Experiment 2 of Karpinski and Hilton (2001). In that study, it was examined whether it would be possible to predict the choice between an apple and a candy bar on the basis of the IAT. Despite the socially uncontroversial nature of the relevant attitude objects, Karpinski and Hilton (2001) failed to find any relation between IAT scores reflecting relative preferences for apples versus candy bars and participants' subsequent choice behavior. However, the IAT did reveal a marked preference for apples over candy bars. Both Karpinski and Hilton (2001) and Olson and Fazio (2004) suggested that this pattern of results may have been due to the fact that society portrays apples quite positively relative to candy bars, and that these pro-apple extra-personal associations were reflected in their IAT scores. In a replication study, Olson and Fazio (2004) obtained supporting evidence for this reasoning. They found that IAT scores revealed little preference for either apples or candy bars when using a modified version of the IAT that reduced the impact of extra-personal associations. Moreover, they also observed significant correlations between IAT scores that were obtained with their modified IAT and a behavioral intention measure. These findings strongly suggest that the standard IAT can be contaminated with extra-personal associations and that it is important to control for these extra-personal associations in case one wants to predict behavior that is primarily driven by personal associations.

Recently, Olson and Fazio (2004) suggested that the affective priming paradigm may be less affected by extra-personal associations. These authors demonstrated that the IAT assesses associations to categories whereas the affective priming paradigm assesses evaluations of exemplars (see also De Houwer, 2001; Mitchell, Nosek, & Banaji, 2003). To the extent that the IAT's susceptibility to extra-personal associations is due to the fact that it assesses associations to categories rather than evaluations of exemplars, it could indeed be argued that a measurement procedure that assesses evaluations at an exemplar level (like the affective priming paradigm) should be less affected by extra-personal associations. Crucially, this reasoning implies that the naming task may even be less sensitive to extra-personal associations than the evaluative categorization task, because it does not rely on an explicit (normative) classification of the target stimuli as positive or negative.

In sum, the naming task may be particularly suited to be used as an indirect attitude measurement procedure because priming scores obtained with this task are probably less affected by (a) attitude-irrelevant processes operating at a response selection stage, and/or (b) extra-personal associations.

Stimulus modality effects in the naming task

Before presenting our experimental work, some elaboration on the nature of the priming tasks used in the present studies is in order. Over the past decade, several researchers reported that they were unable to obtain reliable affective priming of naming responses (e.g., De Houwer, Hermans, & Eelen, 1998; Hermans, 1996, Experiment 8; Klauer & Musch, 2001; Spruyt et al., 2004). Recent studies suggest, however, that reliable affective priming effects can nevertheless be obtained with the naming task when procedures are used that increase the extent to which naming is semantically mediated (De Houwer et al., 2001; De Houwer & Randell, 2004; Spruyt et al., in press). For example, De Houwer and Randell (2004) recently showed that significant affective priming effects can be found in a word naming task when participants are asked to name only those target words that belong to a specific semantic category. Because such an effect was not found when word naming was made conditional upon the detection of a (non-semantic) perceptual feature of the target words, De Houwer and Randell (2004) concluded that the affective relationship between a prime and a target will influence the naming of the target word only if and to the extent that semantic information can feed into the orthography-to-phonology translation process (see also De Houwer et al., 2001). As an alternative method to increase the extent to which naming is semantically mediated, one could also use pictures instead of words as primes and targets. According to the model of Glaser and Glaser (1989; see also Glaser, 1992), pictures have privileged access to a semantic system that contains all semantic knowledge whereas words first need to access a non-semantic lexical system before they can activate semantic stimulus information. Given that affective information is stored within the semantic system (e.g., Bower, 1991; De Houwer & Hermans, 1994; De Houwer & Randell, 2004; Fiske & Pavelchak, 1986), it could thus be predicted that it is more likely to obtain reliable affective priming of naming responses when pictures, instead of words, are used as primes and targets. In line with this reasoning, it is indeed found that the affective priming effect replicates rather easily in a picture–picture naming task (e.g., Spruyt et al., 2002, 2004, in press), whereas studies that failed to produce reliable affective priming of naming responses all used words as primes and targets. In the present study, we therefore used the picture–picture naming task. For convenience, we will simply refer to the picture–picture naming task as the "naming task".

Experiment 1

The aim of the present study was to examine the predictive validity of the naming task. More specifically, we were interested in how well individual difference scores that were obtained with the naming task would predict participants' behavior when they were given the choice between an apple and a candy bar (see Karpinski & Hilton, 2001). In addition, for the sake of comparability with previous research, two other indirect attitude measures were administered: (a) an affective priming task with evaluative categorization responses and (b) a fruit/candy IAT that was modeled after Karpinski and Hilton (2001). It should be noted, however, that our study was primarily designed to examine the predictive validity of the naming task. Hence, in order to prevent the contamination of the naming task with an evaluative processing mindset (see Bargh et al., 1996; Gollwitzer, 1990; Gollwitzer, Heckhausen, & Steller, 1990; Hermans et al., 1994), we decided to always administer the naming task before the evaluative categorization task and the IAT. The ordering of the IAT and the evaluative categorization task, on the other hand, was counterbalanced. Finally, a number of direct attitude measures were collected. However, following Karpinski and Hilton (2001), only half of the participants completed the direct attitude measures. That way, we could assess whether the act of explicitly reporting attitudes influenced the participants' choice behavior.

Method

Participants

Sixty University of Leuven students (14 men, 46 female) took part in the experiment in exchange for course credit. All participants were native Dutch-speakers and had normal or corrected-to-normal vision.

Materials

The priming tasks and the IAT were completed on an AMD Athlon 1900 computer (64 MB VRAM) with a 19 inch computer monitor (100 Hz, screen resolution 1024 × 768). An Affect 3.0 program (Hermans, Clarysse, Baeyens, & Spruyt, 2003) controlled the presentation of the stimuli as well as the registration of the response latencies. An external voice key that was connected to the parallel port of the computer was used to measure response latencies in the naming task.

Affective priming tasks. Twelve prime pictures and eight target pictures were used for the two priming tasks. The target pictures (4 positive, 4 negative) were selected on the basis of a preliminary rating study in which participants ($N = 51$) rated the affective connotation of 215 real life color pictures on a 11-point rating scale ranging from −5 (*very negative*) to +5 (*very positive*).[1] All target pictures could be named with a single word (corpse, explosion, garbage, skulls, baby, bride, dolphin, kitten) and the difference in mean valence ratings between positive and negative target pictures was statistically significant, $M_{\text{negative}} = -2.91$ ($SD = 0.24$), $M_{\text{positive}} = 2.56$ ($SD = 0.84$), $t(6) = 12.41$, $p < .001$. Four fruit related pictures (an apple, a banana, an orange, and a strawberry), four candy related pictures (a lollipop, a Snickers, a praline, and a bar of chocolate), and four geometric figures were selected to serve as primes. All pictures were presented against the black background of the computer monitor and were 512 pixels wide and 384 pixels high.

Implicit Association Test. Five fruit related words (apple, banana, orange, strawberry, and fruit) and five candy related words (lollipop, Snickers, praline, chocolate, and candy) were selected to serve as target items for the IAT. Note that, with the exception of the words ‘candy’ and ‘fruit’, these target words matched with the pictures that were used in the naming task. Thus, possible differences between the IAT and the priming tasks cannot be attributed to the use of different target concepts in the two tasks.[2] Five positive and five negative words (taken from Karpinski & Hilton, 2001) were used as attribute items (cheer, pleasure, happy, love, peace, death, filth, jail, murder, and ugly). All words were presented in white uppercase letters (font Lucida Console, font size 50) against the black background of the computer monitor.

Procedure

Participants were randomly assigned to be either in the indirect + direct measures condition ($n = 30$) or the indirect measures only condition ($n = 30$). Participants were tested individually in a dimly lit and soundproof room. All instructions were presented on the computer screen. The naming task was always completed before the evaluative categorization task and the IAT so as to prevent the contamination of the naming task with an evaluative processing mindset (see Bargh et al., 1996). The ordering of the IAT and the evaluative categorization task was counterbalanced. In the indirect + direct measures condition, direct attitude measures were collected after the indirect attitude measures were completed. At the end of the experiment, all participants were presented with a Fun-size Snickers candy bar and an apple. They were informed that they could choose one and only one of these objects to eat or to take home with them. The experimenter was present during the entire experiment.

Naming task. Prior to the start of the experimental priming trials, two series of practice trials were presented. During the first series of practice trials, the eight target pictures were presented in a random order with their corresponding names written underneath them. Participants were asked to look attentively at the pictures and at the corresponding names because they would need to use these words to name the pictures correctly during the experimental phase of the experiment. The pictures remained on the screen until the participant pressed the space bar of the keyboard. At the end of the first practice phase, the keyboard was removed and a microphone was placed in front of the participant. During the second series of practice trials, the eight targets were presented again in a random order, but this time without the corresponding names written underneath them. Participants were instructed to name the pictures as fast as possible. They were instructed to use the names that were learned during the preceding series of practice trials. The pictures remained on the screen until a response was detected. When a target was named incorrectly, the experimenter corrected the participant. After the experimenter entered the code, the next priming trial was initiated after a time interval that varied randomly between 500 and 1500 ms.

The actual priming phase consisted of 96 experimental trials (12 primes × 8 targets). Each priming trial started with a 500 ms presentation of a fixation cross in the center of the computer screen. Five hundred milliseconds after the offset of the fixation cross, a prime picture was presented for 200 ms. The target picture followed the offset of the prime after an inter stimulus interval of 50 ms, resulting in a SOA of 250 ms. The targets were displayed until the participant gave a response or 2000 ms elapsed. By pressing one of three keys on the computer keyboard, the experimenter coded whether the microphone was accurately triggered and whether the participant’s response was correct. After the experimenter entered the code, the next priming trial was initiated after a time interval that varied randomly between 500 and 1500 ms.

Evaluative categorization task. The experimental procedure of the evaluative categorization task was almost identical with the procedure of the naming task. Besides the nature of the response task, the only difference with the naming task was that there was only one practice phase. During this practice phase, participants were asked to watch a random presentation of the eight target pictures

[1] Some of these pictures originated from the International Affective Picture System (IAPS; Center for the Psychophysiological Study of Emotion and Attention, 1994). IAPS numbers: 1030, 1050, 1120, 1201, 1300, 1301, 1302, 1500, 1610, 1750, 1930, 1931, 2070, 2120, 2220, 2565, 2800, 4490, 4611, 4534, 4651, 4672, 4680, 5030, 6250, 6350, 6550, 6560, 7350, 9040.

[2] Nevertheless, an apparent difference between the IAT and the two priming tasks can be identified: whereas words were used as target items in the IAT, pictures were used in the priming tasks. Clearly, this confound complicates a direct comparison between the IAT and the two priming tasks. However, we deliberately chose this strategy so as to be able to compare our findings with those of Karpinski and Hilton (2001). Besides, to our knowledge, a systematic analysis of stimulus modality effects in the IAT has not been undertaken yet. It thus remains to be seen whether IAT effects vary as a function of stimulus modality.

and to evaluate them as fast as possible by pressing one of two keys. When a target was evaluated incorrectly, a short message was displayed that corrected the participant.

Implicit Association Test. Procedures were modeled closely after Greenwald et al. (1998) and Karpinski and Hilton (2001). Participants completed 7 blocks, each consisting of 40 trials. In Block 1, participants categorized the fruit related and candy related words by pressing a right and left key, respectively. In Block 2, participants categorized positive and negative words on the basis of their valence. Positive words were assigned to the right key and negative words were assigned to the left key. During Blocks 3 and 4, the target concept discrimination task and the evaluative discrimination task were combined: candy related words and negative words were assigned to the left key and fruit related and positive words were assigned to the right key. In Block 5, participants again categorized the fruit related and candy related words, but the response keys were reversed. Finally, in Blocks 6 and 7, the new target object categorization practiced in Block 5 was combined with the evaluative discrimination task. Thus, candy related words and positive words were assigned to the left key and fruit related and negative words were assigned to the right key.

Direct measures. After completing the affective priming tasks and the IAT, participants that had been assigned to the indirect + direct measures condition completed several self-report attitude measures. More specifically, they were asked (a) to complete several semantic differential items ('ugly/beautiful', 'bad/good', 'foolish/wise', 'awful/lovely') regarding apples, Snickers, candy, and fruit on a 7-point scale ranging from −3 to +3, (b) to indicate how much they liked eating apples, Snickers, candy, and fruit on an 11-point scale ranging from 0 to 100, and (c) to reveal their explicit evaluation of apples, Snickers, candy, and fruit on a 11-point scale ranging from −100 ('negative') to +100 ('positive'). In order to asses the participants' past eating behavior, participants were also asked to indicate how frequently they ate apples, Snickers, candy, and fruit on an 11-point scale ranging from 0 to 100. Finally, participants were asked to indicate what they would choose if given a choice between an apple and a Snickers. For convenience, we will refer to the direct measures regarding Snickers and apples as "specific" direct measures. Likewise, we will refer to the direct measures regarding fruit and candy as the "general" direct measures.

Results

Data reduction and analysis

Due to technical problem, evaluative categorization data were not collected for two participants. Neutral priming trials (neutral/negative trials and neutral/positive trials) were considered filler trials and were not included in the analyses. In addition, the data from naming trials on which the voice key was not appropriately activated (2.71%) or trials on which an incorrect response was given (2.45% in the naming task, 3.93% in the evaluative categorization task) were excluded from the analysis. Finally, for each of the four crucial priming conditions, response latencies that deviated more than 2.5 standard deviations from a participant's mean latency were also discarded (1.69% in the naming task, 2.58% in the evaluative categorization task). Individual priming measures were computed by subtracting the difference between the mean latency of the candy/negative trials and the candy/positive trials from the difference between the mean latency of the fruit/negative trials and the fruit/positive trials. Thus, positive priming scores indicate a preference for fruit over candy.[3]

The new scoring algorithm for the IAT (Greenwald, Nosek, & Banaji, 2003) was used to calculate IAT scores. No subjects or trials had to be excluded. Positive IAT scores indicate a preference for fruit over candy.

Did completing the direct attitude measures change behavior?

Participants in the indirect + direct measures condition completed several self-report measures before choosing an apple or a Snickers. In order to examine whether the act of explicitly reporting their attitudes toward apples, Snickers, fruit, and candy influenced the participants' choice behavior, we analyzed the choices of apples and Snickers in the two conditions. In the indirect measures only condition, 15 participants (50%) chose an apple and 15 participants chose a Snickers (50%). In the indirect + direct measures condition, 17 participants (56.67%) chose an apple and 13 participants chose a Snickers (43.33%). This pattern of results suggests that the choice between an apple and a Snickers was not affected by completing the direct attitude measures, $\chi^2(1) = .27$, $p = .60$.

The indirect attitude measures

Detailed descriptive statistics as well as significance tests for each measure are provided in Table 1. The mean priming score in the naming task was −8.82 ms and a *t*-test showed that this priming score was not significantly different from zero. Likewise, a statistically unreliable mean priming score of −5.29 ms was obtained with the evaluative categorization task. Accordingly, it can be concluded that, neither the naming task nor the evaluative categorization task revealed a particular preference for either fruit or candy. In contrast, the mean IAT score was 0.66 and proved to be significantly different from zero. Thus, the

[3] It is well known that response latencies in the affective priming paradigm can be affected by main effects of target valence. Therefore, in case separate priming measures for fruit and candy would be of interest, one would need to take into account such an effect of target valence. For example, a participant's priming measure for fruit could be calculated by subtracting the difference between the mean latency of neutral/negative trials and neutral/positive trials from the difference between the mean latency of fruit/negative trials and fruit/positive trials. However, in the present study, we were interested in a priming measure that reflected the preference for fruit *relative to* candy. Thus, the effect of target valence was cancelled out simply by subtracting the difference between the mean latency of candy/negative trials and candy/positive trials from the difference between the mean latency of fruit/negative trials and fruit/positive trials.

IAT indicated that participants had more positive associations with fruit than with candy.

The direct attitude measures

Following Karpinski and Hilton (2001), we summed the responses to the items of the semantic differential for each attitude object and for each participant. Snickers scores were subtracted from the apple scores to obtain a 'specific' semantic differential score. Likewise, candy scores were subtracted from the fruit scores to obtain a 'general' semantic differential score. Specific and general difference scores were also computed for the liking measures, the self-reported behavior measures, and the evaluative ratings. For each of these measures, the apple scores and the fruit scores were subtracted from the Snickers scores and the candy scores, respectively. Finally, the answers on the behavioral intention question were recoded as either 1 (apple) or −1 (Snickers). Thus, for all direct attitude measures, positive numbers indicate a preference for apples (fruit) over Snickers (candy). Means and *t*-tests against zero for each direct attitude measure are presented in Table 1. As can be seen in Table 1, most direct attitude measures revealed a strong preference for apples (fruit) over Snickers (candy). Only the behavioral intention measure and the liking measures did not show a particular preference for either apples (fruit) or Snickers (candy).

The relationship between direct and indirect measures

Although correlations between the IAT and the direct attitude measures were all non-significant (see Table 2), the IAT measure did correlate significantly with self-reports of past eating behavior (see Table 3). However, the correlation between the IAT and the behavioral intention measure was non-significant. Interestingly, a reversed pattern was be obtained with the naming task: although the naming scores and self-reports of past eating behavior were unrelated to each other, naming scores did correlate (or tended to correlate) with several direct attitude measures (see Table 2) as well as with the behavioral intention measure (see Table 3). We also calculated a single index of directly measured attitudes for general and specific direct measures as the average of the standardized individual measures. As can be seen in Table 2, the naming scores correlated significantly with these composite attitude scores whereas no such relation was found between the IAT and the composite attitude scores. No significant correlations were found between the evaluative categorization task and the direct attitude measures or between the indirect measures mutually (all *p*'s above .14).

Table 1
Experiment 1: descriptive statistics and *t*-tests for each measure

Measure	*N*	*M*	*SD*	*t*	*p*
Indirect measures					
Naming task	60	−8.82	46.42	1.47	.15
Evaluative categorization task	58	−5.29	59.99	<1	.50
IAT	60	0.66	0.41	12.27	<.001
Specific direct measures					
Semantic differential	30	5.23	5.91	4.85	<.001
Liking	30	11.67	33.74	1.89	.07
Evaluative rating	30	83.33	56.04	8.15	<.001
Self-reported eating behavior	30	28.67	21.77	7.21	<.001
Behavioral intention	30	0.13	1.01	<1	.47
General direct measures					
Semantic differential	30	5.63	5.29	5.86	<.001
Liking	30	1.00	27.21	<1	.84
Evaluative rating	30	93.33	53.13	9.62	<.001
Self-reported eating behavior	30	11.00	27.59	2.18	<.05

Note. Positive numbers indicate a preference for apples (fruit) over Snickers (candy). Priming effects (naming task and evaluative categorization task) are expressed in milliseconds. *D* metric for the IAT (Greenwald et al., 2003). Direct attitude measures: 11-point rating scales ranging from 0 to 100 for liking measures and self-reports of eating behavior, 11-point rating scales ranging from −100 to 100 for evaluative ratings, 7-point rating scales (−3 to +3) for semantic differentials.

Table 2
Experiment 1: correlations between direct and indirect attitude measures (*p*-level in parentheses)

Direct attitude measure	Indirect attitude measure		
	Naming	Evaluation	IAT
Raw attitude scores			
General			
Semantic differential	.41 (.03)	.29 (.14)	.02 (.94)
Liking	.42 (.02)	.20 (.32)	.15 (.24)
Evaluative rating	.19 (.32)	.06 (.75)	.14 (.45)
Specific			
Semantic differential	.30 (.11)	.09 (.62)	.08 (.67)
Liking	.30 (.11)	.12 (.56)	.22 (.42)
Evaluative rating	.38 (.04)	.19 (.32)	−.03 (.88)
Composite attitude scores			
General	.41 (.02)	.23 (.23)	.19 (.33)
Specific	.43 (.02)	.17 (.38)	.10 (.61)

Table 3
Experiment 1: correlations between behavioral self-report measures and indirect attitude measures (*p*-level in parentheses)

Behavioral self-report measure	Indirect attitude measure		
	Naming	Evaluation	IAT
General			
Self-reported eating behavior	.23 (.21)	.20 (.32)	.39 (.03)
Specific			
Self-reported eating behavior	.19 (.30)	−.01 (.95)	.37 (.04)
Behavioral intention	.33 (.08)	.11 (.55)	.03 (.88)

The relationship between attitude measures and behavior

Because participants made a dichotomous choice between an apple and a Snickers, logistic regression analyses were performed to examine the predictive validity of the attitude measures. As can be seen in Table 4, the *specific* direct attitude measures predicted the participant's choice behavior relatively well (all *p*'s below .08), whereas the *general* direct attitude measures failed to predict the participants choice behavior. More important are the results that were obtained with the indirect attitude measures. Replicating the findings of Karpinski and Hilton (2001), the IAT measure failed to predict the participants' choice behavior

Table 4
Experiment 1: simple logistic regressions predicting behavioral choice

Measure	*B*	*t*	*p*	Odds ratio (unit change)
Indirect measures				
Naming task	.013	2.03	<.05	1.013
Evaluative categorization task	−.003	<1	.49	.997
IAT	−1.013	−1.52	.13	.363
Specific direct measures				
Semantic differential	.516	2.72	<.05	1.676
Liking	.116	2.54	<.05	1.230
Eating behavior	.042	1.96	.06	1.043
Evaluative rating	.014	1.88	.07	1.014
Behavioral intention	2.629	3.59	<.005	13.86
Composite attitude score	6.61	2.29	<.05	754.45
General direct measures				
Semantic differential	.210	1.93	.06	1.233
Liking	.015	<1	.33	1.015
Eating behavior	−.001	<1	.92	.999
Evaluative rating	.010	1.32	.19	1.010
Composite attitude score	1.20	1.75	.08	3.333

(see Table 4). The attitude measure that was obtained with evaluative categorization task also failed to predict the choice behavior. The naming data, on the other hand, showed good predictive validity (see Table 4): not only did the naming scores reliably predict the choice behavior, the naming data also showed incremental predictive validity over and above the attitude measures that were obtained with the IAT, $\chi^2(1) = 5.06$, $p < .05$, and the evaluative categorization task, $\chi^2(1) = 4.35$, $p < .05$. Crucially, the naming data also showed predictive validity over and above the direct attitude measures. That is, when the average of the standardized individual direct attitude measures (both specific and general) was used to predict the choice behavior, adding the naming scores as a predictor resulted in a significant increase of the model's predictive accuracy, $\chi^2(1) = 4.66$, $p < .05$. We also examined the incremental validity of the naming measure relative to direct measures for specific and general measures separately. In line with the overall result, the naming data showed incremental validity over and above the composite score of the *specific* direct measures, $\chi^2(1) = 6.26$, $p < .05$. Likewise, the naming data tended to enhance the predictive power of a logistic regression model in which the composite score of the *general* direct measures was entered as a predictor first, although the effect just missed significance, $\chi^2(1) = 3.48$, $p = .06$.

In addition, we examined whether the predictive power of the indirect attitude measures was influenced by the act of explicitly reporting attitudes toward apples, Snickers, fruit, and candy. Whereas the predictive validity of both the evaluative categorization task and the naming task proved to be unaffected by the presence or absence of the direct attitude measures (p's > .26), a marginally significant interaction between the IAT measure and a binary predictor coding the presence or absence of direct attitude measures was found, $t(56) = 1.91$, $p = .06$. This finding suggests that the act of explicitly reporting attitudes did have had an effect on the predictive validity of the IAT scores. Further analyses revealed that the IAT scores were unrelated to the choice behavior in the indirect + direct measures condition ($t < 1$), whereas a logistic regression for the indirect measures only condition showed a significant relation between the IAT scores and the choice behavior, $t(28) = 2.23$, $p < .05$. Curiously, the effect was in the opposite direction of what one would expect: the more a participant's IAT score indicated a preference for fruit relative to candy, the higher the probability that this participant actually chose the Snickers. Given that this unexpected finding failed to replicate in Experiment 2, it is probably wise not to attach too much weight to it.

Finally, we would like to point out that the IAT, in line with the pattern of results described above, revealed a statistically significant preference for apples over Snickers for both the group of participants that chose an apple, $t(31) = 7.65$, $p < .005$, and the group of participants that chose an Snickers, $t(27) = 10.21$, $p < .005$. In fact, the mean IAT score in the group of participants that chose a Snickers ($M = .74$) was even slightly more positive (more in favor of *apples*) than in the group of participants that chose an apple ($M = .58$), $t(58) = 1.55$, $p = .13$. The naming task, on the other hand, produced attitude scores that were consistent with the choice behavior. That is, the difference in the mean affective priming score between the group of participants that chose a Snickers and the group of participants that chose an apple was statistically reliable, $t(58) = 2.15$, $p < .05$, and in the correct direction, ($M_{\text{Snickers}} = -22.21$ ms, $M_{\text{apple}} = 2.89$ ms). In the evaluative categorization task, the difference in the mean affective priming score between the group of participants that chose a Snickers and the group of participants that chose an apple was statistically unreliable, $t < 1$, and in the incorrect direction, ($M_{\text{Snickers}} = 0.61$ ms, $M_{\text{apple}} = -10.43$ ms).

Discussion

In the present study, we examined whether it would be possible to predict consumer choice behavior on the basis of affective priming in the naming task. The most important findings can be summarized and interpreted as follows. First of all, it was observed that the individual difference scores that were obtained with the naming task predicted participants' choice behavior relatively well. Accordingly, it can be concluded that the naming task can indeed be used as a behaviorally predictive indirect measurement tool. This conclusion is particularly interesting because affective priming effects that are obtained with the naming task are not dependent on the subject having a strategic evaluative processing goal (e.g., Bargh et al., 1996; Hermans et al., 1994). Of course, an evaluative mindset (see Gollwitzer et al., 1990) can also be activated by other procedural features than the evaluative nature of the task at hand. For example, it has been argued that, once activated, an evaluative mindset can carry over from one task to another (e.g., Bargh et al., 1996). As a result, completing a task that focuses one's attention to the importance of stimulus valence prior to the naming task could activate a strategic evaluative processing goal that could still be operative during the naming task (see Gollwitzer et al., 1990). However, in the present study, the naming task was always administered before the evaluative categorization task, the IAT, and the direct attitude measures. Hence, we can safely conclude that the results that were obtained with the naming task were not conditional upon the activation of an evaluative mindset.

Second, we reasoned that the naming task may be less sensitive to extra-personal associations than the evaluative categorization task and the IAT. In line with this reasoning, we observed (a) that the naming task did not reveal a particular preference for either fruit or candy, and (b) that the mean affective priming scores that were obtained with the naming task were in line with the choice behavior. In contrast, the IAT revealed a marked group preference for apples over candy (96.67% of the IAT scores were in favor of apples). As pointed out by Karpinski and Hilton (2001) and Olson and Fazio (2004), the latter result suggests the IAT scores were contaminated with extra-personal information.

Third, in line with Karpinski and Hilton (2001) and Olson and Fazio (2004), we also found that the IAT failed to correlate with direct attitude measures. However, the IAT did correlate with self-report measures of past eating behavior. That is, the more that an individuals' IAT score revealed a preference for fruit over candy, the more that individual also reported to eat more apples (fruit) than Snickers (candy). Given that dietary self-report measures are often compromised by self-presentation (e.g., Hebert, Clemow, Pbert, Ockene, & Ockene, 1995), it could be argued that participants tried to reconcile their reports of past eating behavior with culturally derived information. However, one could also argue that this pattern of results emerged because the naming task better predicts immediate, episodic behavior, whereas the IAT better predicts behavior over a longer period of time. Future studies in which the time delay between the completion of indirect attitude measures and behavioral assessment is manipulated might shed light on this issue.

Finally, manifest null-findings were obtained with the evaluative categorization task. However, before we discuss the nature of this finding, we would like to present the results of a second study in which the predictive validity of the naming task was examined.

Experiment 2

The results of Experiment 1 suggest that the naming task can be successfully used as an indirect and behaviorally predictive attitude measurement tool. However, in Experiment 1, the experimenter was always present when participants made their choice between the candy bar and the apple. Thus, one could argue that the presence of the experimenter might have influenced the choice behavior. This problem was addressed in Experiment 2.

Method

Participants

Thirty-eight University of Leuven students (7 men, 31 female) took part in the experiment in exchange for course credit. All participants were native Dutch-speakers and had normal or corrected-to-normal vision.

Materials and procedure

These were identical to Experiment 1 with the following exceptions. First, no direct attitude measures were administered. Second, more practice trials were included in the priming procedure. More specifically, each target picture was presented twice instead of only once during the second practice phase. Additionally, two series of 32 dummy priming trials were presented prior to the actual priming phase in order to familiarize participants with the priming procedure. The eight pictures that were used as primes for these dummy trials were pictures of affectively neutral objects (e.g., a key). Third, and most importantly, the experimenter was not present when participants made their choice between an apple and a Snickers. That is, participants were welcomed in a room where they were asked to take off their coats and to sign an attendance register. They were then led to an adjacent soundproof room where the IAT and the two priming tasks were administered. During the completion of the IAT or the evaluative categorization task, the experimenter left the soundproof room and put one basket with 10 apples and one basket with 10 Snickers in the first room. The experimenter then returned to the soundproof room. After all indirect attitude measures were completed, participants were told that the experiment was finished and that they could fetch their coats and leave. In addition, they were informed about the two baskets. The apples and the Snickers were presented as a little thank-you present and participants were told that they could pick and choose one item. After the participants had left, the choice behavior of the participants was determined by counting the number of remaining apples and Snickers.

Results

Data reduction and analysis

Priming scores were calculated as described in the Results section of Experiment 1, after exclusion of trials on which (a) the voice key was not appropriately activated (4.68%), (b) an incorrect response was given (1.65% in the naming task, 1.79% in the evaluative categorization task), or (c) an outlying response latency was measured (2.05% in the naming task, 4.96% in the evaluative categorization task). The IAT data were again analyzed conform the recommendations of Greenwald et al. (2003). No participants or trials had to be excluded.

Choice behavior

Two participants picked both an apple and a Snickers and one participant did not choose anything. For obvious

Table 5
Experiment 2: descriptive statistics and *t*-tests for each indirect attitude measure

Measure	*N*	*M*	*SD*	*t*	*p*
Naming task	35	11.51	37.82	1.80	.08
Evaluative categorization task	35	2.80	49.64	<1	.74
IAT	35	.73	.39	11.22	<.001

Note. Positive numbers indicate a preference for apples (fruit) over Snickers (candy). Priming effects (naming task and evaluative categorization task) are expressed in milliseconds. *D* metric for the IAT (Greenwald et al., 2003).

reasons, the data from these participants were excluded from further analyses. Of the remaining sample, 20 participants (57.14%) chose an apple and 15 participants chose a Snickers (42.86%).

The indirect attitude measures

Detailed descriptive statistics as well as significance tests for each measure are provided in Table 5. The mean priming score in the naming task was 11.51 ms and a *t*-test revealed that this overall priming score was marginally significant. It can thus be concluded that, on average, the naming task revealed a moderate preference for fruit over candy. Note that this finding is perfectly in accordance with the observation that the majority of the participants chose an apple. The IAT also suggested that participants had more positive associations with fruit than with candy: the mean IAT score was 0.73 and proved to be statistically reliable. In contrast, a statistically unreliable mean priming score of 2.80 ms was obtained with the evaluative categorization task. Hence, it can be concluded that, on average, the evaluative categorization task did not show a particular preference for either fruit or candy.

The relationship between the indirect measures and behavior

Replicating the findings of Experiment 1, logistic regression analyses revealed that the choice behavior could be predicted on the basis of naming task, but not on the basis of the evaluative categorization task, or the IAT (see Table 6). Moreover, just as in Experiment 1, the naming data showed incremental predictive validity over and above the attitude measures that were obtained with the IAT, $\chi^2(1) = 5.42$, $p < .05$, and the evaluative categorization task, $\chi^2(1) = 7.02$, $p < .01$.

In addition, the IAT revealed a statistically significant preference for apples over Snickers for both the group of participants that chose an apple, $t(19) = 8.69$, $p < .005$, and the group of participants that chose a Snickers, $t(14) = 7.23$, $p < .005$. As was observed in Experiment 1, the mean IAT score in the group of participants that chose a Snickers ($M = .81$) was even slightly more positive (more in favor of *apples*) than in the group of participants that chose an apple ($M = .67$), $t(33) = 1.01$, $p = .32$.

Table 6
Experiment 2: simple logistic regressions predicting behavioral choice

Measure	*B*	*t*	*p*	Odds ratio (unit change)
Naming task	.028	2.23	<.05	1.028
Evaluative categorization task	.000	<1	.98	1.000
IAT	−.948	−1.01	.32	.387

The naming task, on the other hand, again produced attitude scores that were consistent with the choice behavior. That is, the difference in the mean affective priming score between the group of participants that chose a Snickers and the group of participants that chose an apple was statistically reliable, $t(33) = 2.57$, $p < .05$, and in the correct direction, ($M_{Snickers} = -6.08$ ms, $M_{apple} = 42.71$ ms). In the evaluative categorization task, the difference in the mean affective priming score between the group of participants that chose a Snickers and the group of participants that chose an apple was statistically unreliable, $t < 1$, $M_{Snickers} = 2.59$ ms, $M_{apple} = 2.96$ ms.

Discussion

In Experiment 1, the experimenter was present when participants made their choice between an apple and a candy bar. Because this aspect of the experimental procedure may have influenced the choice behavior, we decided to set up a replication study in which this problem was removed. It was again observed that the naming task produced individual difference scores that were related to the actual choice behavior. We can thus rule out the possibility that the pattern of results that emerged in the previous study was due to the fact that participants' behavior was influenced by the presence of the experimenter.

General discussion

In two experiments, we observed that individual difference scores that were obtained with the naming task predicted participants' choice behavior relatively well. Moreover, attitude scores that were obtained with the naming task showed predictive validity over and above direct attitude measures (Experiment 1). Accordingly, it can be concluded that the naming task may be a useful addition to the arsenal of indirect attitude measures that is currently available. In contrast, however, no relation was found between the choice behavior and attitude scores that were obtained with the evaluative categorization task and the IAT. Given that several reports attesting the predictive validity of the evaluative categorization task and the IAT have appeared in the literature (see, for an overview, Fazio & Olson, 2003), this finding is somewhat surprising. However, several reasons can be identified that might elucidate this pattern of results.

First of all, affective priming research has demonstrated that affective priming effects that are obtained with the evaluative categorization task are largely due to processes that operate at a response selection stage (e.g., De Houwer et al., 2002; Klauer, 1998; Klauer et al., 1997; Klinger et al., 2000; Musch et al., 2004; Rothermund & Wentura, 1998; Wentura, 1999, 2000). For that reason, it could be argued that individual difference scores that are obtained with this task can be affected by processes that are completely unrelated to a person's attitude towards the prime objects. The findings of Wentura (1999) that we described earlier are consistent with this view. Klauer et al. (1997) also obtained evidence that suggests that affective priming in the evaluative categorization task can be affected by processes that are unrelated to a person's attitude towards the prime objects. They observed that, in the evaluative categorization task, the magnitude of the affective priming effect increases with increasing proportions of affectively congruent trials at short SOA's. Importantly, Musch et al. (2004) recently demonstrated (a) that such a relatedness proportion effect is based on the gradual learning of the relatedness proportion over a series of trials, and (b) that participants cannot react immediately to a change of the relatedness proportion. Although it is unclear how many trials are required to obtain a relatedness proportion effect, it could thus be argued that a random presentation of priming trials could occasionally introduce unintended variations in the *perceived* relatedness proportion. To the extent that responding is affected by this perceived relatedness proportion, the standard evaluative categorization task will thus fail to provide a pure estimate of an individual's attitude towards the prime objects.

In this respect, it is important to note that we recently conducted an affective priming study in which relatedness proportion effects were examined at several SOA's (0, 200, and 1000 ms) in both the evaluative categorization task and the naming task (Spruyt et al., in press). In line with the findings of Klauer et al. (1997), we obtained large relatedness proportion effects at short SOA's in the evaluative categorization task. In the naming task, however, no relatedness proportion effects emerged at short SOA's. Clearly this pattern of results is in line with our argument that affective priming effects in the naming task are less likely to be affected by factors that are unrelated to a person's attitudes. Even though this reasoning is somewhat speculative at this point, there is at least one additional piece of evidence that corroborates this interpretation. If it is assumed that affective priming in the evaluative categorization task is (relatively) sensitive to factors that are unrelated to a person's attitude towards the prime objects, one would predict larger variability within priming conditions in the evaluative categorization task as compared to the naming task. To evaluate this prediction, we calculated individual standard deviations for each priming condition and examined whether the size of these standard deviations was different for the two tasks. In line with our interpretation, variability was indeed significantly larger in the evaluative categorization task than in the naming task (F's > 3.29, p's < .01). Of course, variability within priming conditions becomes less an issue as the number of trials increases. In this respect, it is interesting to note that the number of priming trials in our studies was much smaller as compared to studies that did show a reliable relation between behavior and affective priming in the evaluative categorization task. In the study of Frings and Wentura (2003), for example, participants completed 400 priming trials. In contrast, the priming tasks in our studies consisted of just 96 trials (16 trials in each priming condition). In sum, the present failure to predict behavior on the basis of affective priming in the evaluative categorization task might have been due to the fact that we did not present enough trials to reliably capture idiosyncratic preferences.

Second, because the naming task was always administered before the evaluative categorization task and the IAT, it could be hypothesized that participants were already fatigued or bored by the time they were asked to complete these two tasks. It should be noted, however, that we did counterbalance the ordering of the IAT and the evaluative categorization task. If the ordering of the tasks was a crucial factor, one could expect the predictive validity of these two tasks to be dependent upon their mutual ordering. Both in Experiment 1 and Experiment 2, this factor exerted no influence whatsoever on the predictive power of the IAT or the evaluative categorization task (all t's < 1). This result suggests, at least indirectly, that the ordering of the tasks may not be the crucial factor to account for the null-findings obtained with the IAT and the evaluative categorization task. Nevertheless, it could be worthwhile to replicate the present study with full counterbalancing of the three tasks.

Finally, as far as the IAT results are concerned, emphasis should be placed on the fact that the procedures used in the present studies were modeled after those of Karpinski and Hilton (2001). That is, we implemented a standard version of the IAT (Greenwald et al., 1998). As described above, Olson and Fazio (2004) demonstrated (a) that attitude scores that are obtained with the standard IAT can be contaminated by extra-personal associations (see also Karpinski & Hilton, 2001), and (b) that this problem can be reduced by using attribute category labels and attribute items that emphasize personal endorsement. In the present studies, IAT scores revealed a marked preference for fruit, suggesting that performance was indeed strongly influenced by extra-personal associations. It could thus be argued that we would have observed higher predictive validity for the IAT scores had we used the so-called personalized IAT (Olson & Fazio, 2004). On the other hand, anecdotal evidence suggests that, under specific circumstances, the IAT's susceptibility to extra-personal associations may be an advantage rather than a disadvantage. At the end of the Experiment 1, some (female) participants spontaneously reported that they would have loved to choose a candy bar, but that their concerns about their weight made them choose the low-calorie alternative. Thus, on the one hand, these participants spontaneously reported a pro-Snickers attitude, yet their knowledge about the nutritional benefits of fruit relative to candy made them choose for the other alternative. In all likelihood, such extra-personal information can also influence eating behavior consistently over a longer period of time. Therefore, instead of trying to *minimize* the extent to which the IAT is affected by extra-personal information (e.g., Olson & Fazio, 2004), it could be worthwhile to search for ways to *maximize* the sensitivity of the IAT to extra-personal information. Such an IAT could then be used to reliably predict behavior that is itself influenced by extra-personal associations. Conversely, it is important to realize that attitude measures (direct or indirect) that tap into an individual's idiosyncratic attitudes may fail to predict behavior that is strongly influenced by extra-personal associations. In sum, we believe that more research is needed that focuses on the contextual factors that determine what kind of information influences behavior and to what extent. Undoubtedly, such an enterprise, no matter how complex, will lead to a better understanding of human behavior and to an increase of the predictive validity of our attitude measurement techniques.

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