RUNNING HEAD: Moderated predictive validity

When impulses take over: Moderated predictive validity of explicit and implicit attitude measures in predicting food choice and consumption behaviour

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Abstract

Recent theories in social psychology suggest that explicitly measured attitudes are particularly valuable for the prediction of deliberate, controlled behaviour. In contrast, implicitly measured attitudes are assumed to be more important for the prediction of less controlled, more impulsive behaviour. Yet conclusive evidence for the differential predictive validity of both measures is scarce. We hypothesized that limitations of different control resources would lead to functionally equivalent effects. In Study 1, cognitive capacity moderated the predictive validity of both explicit and implicit attitude measures in a choice task. Self-regulatory resources led to similar patterns for eating (Study 2) and drinking behaviour (Study 3). In addition to the predictive validity of implicit and explicit attitude measures, in Study 3 we more closely investigated the relative contributions of explicitly measured attitudes and general restraint standards as two distinct, but complementing constructs that are dependent on control resources.

When Impulses Take Over: Moderated Predictive Validity of Explicit and Implicit Attitude Measures in Predicting Food Choice and Consumption Behaviour

The extra scoop of ice cream on a hot summer's day in spite of the intention to lose weight. The chocolate bar you find yourself absentmindedly grabbing as you talk to a colleague while waiting at a checkout counter. That bag of potato crisps that is suddenly empty although you just wanted to relax in front of the TV for a couple of minutes after a long and tiring day. The common link between these behaviours is poor self-regulation. In other words, in their everyday lives, many people frequently find themselves acting impulsively and in ways that do not necessarily correspond to their declared evaluations and goals. The research presented in this article is concerned with how social psychological theory and methodology can be used to predict when behaviour is primarily driven by explicit evaluations and goals and when by impulsive processes.

The ability to regulate one's behaviour effectively is relevant in many aspects of daily life, such as the consumption of unhealthy food, purchase decisions, or sexual behaviour to name just a few. In addition, self-regulation is at the core of severe social problems such as substance addiction and aggressive or criminal behaviour (Baumeister, Heatherton, & Tice, 1994; Baumeister & Vohs, 2004). Numerous different models stress different aspects of self-regulation such as willpower (e.g., Metcalfe & Mischel, 1999), motivational systems influencing approach and avoidance-related behaviours (e.g., Higgins, 1997), or how different affective states influence behaviour regulation (e.g., Kuhl, 2000). In this article, we will focus on a resource-oriented notion of self-regulation (e.g., Muraven & Baumeister, 2000).

Up to now, research has focused on the behavioural consequences of impulses filling the gap in the guidance of behaviour when self-control breaks down (e.g., more consumption of a tempting food in one experimental condition than in the other). An underlying assumption in this research has been that most people have a strong impulse to eat tempting food. Consequently, impulses were mostly treated as a constant element that need not be taken into account. The present research extends previous work in assuming that there are individual differences in the strength of impulses. So variance in impulses will lead to variance in impulsive behaviour between persons. This reasoning is in line with models of self-regulation (e.g., Muraven & Baumeister, 2000; Shiv & Fedorikhin, 1999) and extends these models by the dynamic component of individual differences in impulse strength that have typically been neglected in research relating to these models.

Several models in social psychology provide a theoretical guideline for the investigation of impulsive and controlled behaviour (e.g., Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004). The MODE model (Fazio & Towles-Schwen, 1999) suggests that behaviour is predominantly influenced by controlled processes only if a person is sufficiently motivated to engage in deliberate reasoning and has the necessary resources to do so, such as time and cognitive capacity. If either motivation and/or opportunity are missing, associative processes assume a larger role and behaviour will be influenced more by attitudes that are automatically activated. In terms of the reflective-impulsive model (RIM, Strack & Deutsch, 2004) these automatic attitudes are part of the impulsive system and predispose the organism to spontaneously approach or avoid a stimulus (Chen & Bargh, 1999). They provide an estimate of the strength and quality of the impulse toward the respective object. Often, these impulses are in conflict

with more deliberate evaluations, personal standards, and goals that reside in the reflective system. Under normal conditions these higher-order processes are capable of overriding the impulsive action tendencies. However, when necessary control resources are missing, efficient functioning of the reflective system is impaired and inhibition of impulses is less successful. As a consequence, impulsive processes become more important in guiding behaviour.

In recent years, implicit measures such as evaluative priming (Fazio, Jackson, Dunton, & Williams, 1995) or the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) have been used to measure automatic attitudes as precursors of impulsive behaviour. Explicit self-report measures serve to assess more deliberate evaluations and personal standards. Following the assumptions of the MODE model or the RIM the predictive validity of explicit and implicit measures should depend upon situational circumstances. Explicit self-reports should be particularly valuable in the prediction of behaviour in situations when the person disposes of the necessary resources to guide behaviour, but less so in situations when this is not the case. In contrast, implicit measures should predict behaviour in particular when resources are scarce.

Given the number of theoretical models that converge in this reasoning, it is fair to say that there is a remarkable theoretical foundation for this hypothesis of moderated predictive validity. Yet few studies tested and found support for the complete pattern including differential predictive validities for explicit *and* implicit measures. Even fewer studies used actual behaviour as the criterion (e.g., Asendorpf, Banse, & Mücke, 2002; Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997), most of them in the domain of racial stereotyping. For example, Dovidio et al. (1997) found a semantic

priming procedure to predict various nonverbal, but not verbal behaviours in an interracial conversation. The opposite held for an explicit measure of attitudes.

Importantly, up to now researchers put weight on the assumption that implicit and explicit measures predict qualitatively distinct behaviours that can be identified as such from an observer's perspective (e.g., verbal vs. nonverbal behaviour; Dovidio et al., 1997; Fazio et al., 1995). However, it is conceivable that a given observable behaviour, say, consumption of a tempting food, can vary in the extent to which it is controlled as well. Indeed, the present research will show that it may not be the behaviour per se that determines whether an explicit or an implicit measure will be better suited to predict it. Instead, we will investigate if *one and the same* observable behaviour such as product choice or consumption can be differentially predicted by explicit and implicit measures, depending on situational circumstances.

What are these situational circumstances that can moderate which measure will be more successful in the prediction of behaviour? According to the models outlined above, deliberate/reflective processes are dependent on control resources to steer behaviour. Therefore, any manipulation that removes relevant control resources from an individual should decrease the predictive value of explicit self-report measures and increase the weight of implicit measures in the prediction of behaviour. The present series of studies proposes that indeed the cutback of *different* control resources leads to *functionally equivalent* effects.

Preliminary evidence for the hypothesis comes from research by Friese, Wänke, and Plessner (2006) who investigated the influence of the control resource *processing time*. At a computer, participants chose between two sets of products, one containing brand-name products and the other generic products. Half of the participants had ample

time to make their decision, the other half were to pick their set under time pressure. Participants who held congruent explicitly and implicitly measured attitudes towards brand and no-name products chose the arrangement that met their attitudinal preference in more than 80% of the cases. For participants with dissociated explicitly and implicitly measured attitudes (i.e., who explicitly favoured one but implicitly favoured the other brand class), the pattern changed. With ample time 90% of the participants followed their explicitly measured attitude. However, when put under time pressure more than 60% followed their *implicit* preference as indicated by an IAT. However, this study did not address several important points. First, the effect could only be tested for the subsample of participants with diverging explicitly and implicitly measured attitudes. Second, due to the small sample size the study was confined to frequency-based calculations and lacked more powerful statistical analyses such as correlation and regression analyses. The important question of the relative contributions of explicit and implicit attitude measures could thus not be tackled. Third, no actual behaviour served as the criterion, but only participant's choice at the computer. Thus, in spite of this first evidence, more studies are needed to test the hypothesis of moderated predictive validity more adequately.

In the present research we investigated two moderators of the predictive validity of implicit and explicit attitude measures, *cognitive capacity* and *self-regulatory resources*. We assumed that both moderators, although distinct, would lead to functionally equivalent effects. In Study 1 we examined choice behaviour under high vs. low cognitive capacity. In Studies 2 and 3 we manipulated participants' ability to self-control (Muraven & Baumeister, 2000) and predicted their consumption of tempting snacks and beverages in subsequent taste-and-rate tasks. Recently, Hofmann,

Rauch, and Gawronski (2007) found first evidence for the moderating role of self-regulatory resources for the predictive validity of an implicit measure and dietary restraint standards, a construct that is independent of an individual's evaluation of a product. Extending this research our studies additionally investigated more closely the role of *explicit attitude measures* and their relative contribution to behaviour prediction compared to general restraint standards. Study 3 will provide evidence that explicit attitude measures and restraint standards serve independently from each other as predictors of consumption behaviour.

Following the theoretical models reviewed above, for each of the three studies in this paper we hypothesized implicit measures to be more successful in predicting impulsive behaviour, and less so in predicting controlled behaviour. The opposite should be true for explicit measures.

Study 1

In Study 1, we manipulated the control resource cognitive capacity. During a choice task between chocolates and fruit participants' working memory was temporarily loaded with extra information that was intended to impair central executive functioning (Baddeley, 1990). Similar manipulations of cognitive distraction have been shown to reduce processing capacity and to facilitate dominant responses (e.g., Gilbert & Hixon, 1991; Greenwald & Banaji, 1995). This manipulation is clearly distinct from the manipulation of processing time in the study by Friese et al. (2006). In the case of time pressure working memory is intact and no extra information has to be stored. Nevertheless, controlled processing is difficult to accomplish because it needs more time than is given. In contrast, in the case of cognitive distraction sufficient time is given, but controlled processing is impaired because of high working memory load.

Consequently, we predicted participants to act more impulsively when they were cognitively busy than when they were cognitively less busy.

Method

Participants and Design

Eighty-eight female undergraduate students of psychology of the University of Basel were randomly assigned to one of two conditions, high or low cognitive load. They received partial course credit in exchange for their participation. We excluded one participant due to technical problems with the computer and another two because at the beginning of the session they reported that they were aware of the hypotheses. The age of the final sample ranged from 19 to 41 years (M = 23.19, SD = 4.29).

Procedure

Two to 18 days (M = 9.69, Mdn = 10.00, SD = 5.46) before the experimental session the explicit attitude measure was assessed in a plenary session in which data for various other studies were collected. In the experimental session, up to four persons attended at a time. Participants were informed that the study would contain several parts, including a categorization task and a questionnaire, and was concerned with how various common products were perceived. First, participants completed the implicit measure followed by a short questionnaire including an anonymous personal code that was used to match the data from the two sessions. Next, they completed the choice task. Finally, participants were probed for suspicion, thanked, and asked to maintain confidentiality about details of the study. After data collection was completed participants were debriefed via e-mail.

Measures

Explicit measure. In the plenary session, participants evaluated fruit and chocolate in general on a 10-point scale ranging from “very negative” to “very positive” (translated from German). The difference between the ratings formed the explicit measure such that positive values indicated more positive attitudes toward chocolate compared to fruit.

Implicit measure. As an implicit measure we used a variant of the IAT (Greenwald et al., 1998) with the target categories “fruit” and “chocolate” and the attribute categories “pleasant” or “I like” and “unpleasant” or “I don’t like”.[1] As evaluative stimuli we used positive and negative words and pictures (e.g., picture of an angry dog, word “joy”). Pictures of tangerines and apples and Twix and Snickers chocolate bars represented the target categories of fruit and chocolate, respectively. Each category was represented by five stimuli. In the first combined block of 80 trials, participants sorted positive (negative) stimuli and pictures depicting chocolate (fruit) on one response key. In the second combined block this assignment was reversed such that positive (negative) and fruit (chocolate) stimuli shared one response key. Because we were interested in individual differences and not in the absolute IAT effect on the group level all participants completed the IAT in the same order and all stimuli appeared in a predetermined random order (cf. Egloff & Schmukle, 2002; Gawronski, 2002). IAT effects were calculated using the D-measure proposed by Greenwald, Nosek, and Banaji (2003) such that positive values indicate a more favourable reaction toward chocolate compared to fruit. As in the subsequent studies, internal consistency was calculated using a tripartite split of the IAT (α = .93).

Choice task. After the computer task, the experimenter led one participant at a time to another room where she performed the behavioural choice task. In this room, a

box was standing upside down on a table, hiding a mixture of 20 items placed on table napkins. The items were fruits and chocolates, five each of the following: tangerines, small apples, small Snickers bars, small Twix bars. The experimenter informed the participant that when she lifted the box she was to select exactly five items from a variety of products that were hidden under the box. The instructions pointed out that participants could choose five of the same kind of item or any mixture they preferred. The experimenter gave an envelope to the participants containing a number that they should keep in mind and that they were to report to the experimenter later on. Depending on condition, this was a one-digit number (high cognitive capacity) or an eight-digit number (low cognitive capacity, Gilbert & Hixon, 1991). Participants were instructed to take as much time as needed to study the number to be sure they would remember it later. Number of chocolates chosen served as the dependent variable. The experimenter additionally noted how many seconds the participants took to make their choices.

Results

Preliminary analyses

Conditions did not differ significantly with respect to the central variables implicit attitude measure, explicit attitude measure, and number of chocolates chosen (all absolute *t*s < .57, all *p*s > .57; all analyses in this paper are two-tailed, see Table 1). All participants in the low-capacity condition met the cutoff criterion for the capacity manipulation established by Gilbert & Hixon (1991): None reported four or more of the digits incorrectly. Importantly, time taken to make the decision also did not differ between conditions ($M_{\text{LowCapacity}}$ = 10.47 s, *SD* = 3.10 vs. $M_{\text{HighCapacity}}$ = 9.57 s, *SD* = 3.09, $t(83) = 1.33$, $p = .186$). Theoretically, participants in the low-capacity condition

could have tried to take more time for the choice task to make up for the lack of processing capacity. This was not the case. Also, number of days between the two sessions did not differ between conditions ($M_{\text{LowCapacity}}$ = 9.84 d, SD = 5.47 vs. $M_{\text{HighCapacity}}$ = 9.55 d, SD = 5.52, $t(83) < 1$, $p = .809$).

Choice task

We computed zero-order correlations between the central variables, separately for each condition (see Table 2). The pattern of correlation provides first evidence for the hypothesis that cognitive capacity during the choice task moderates the impact of explicit and implicit attitude measures on behaviour. Investigating our hypothesis more precisely, we ran a multiple regression analysis ($R^2 = .27$). First, all continuous variables were z-standardized. Number of chocolates chosen served as dependent measure. As predictors we entered the dummy coded experimental condition (0 = low capacity, 1 = high capacity), the implicit measure, the explicit measure, as well as all possible two-way interactions between these variables (Aiken & West, 1991). As expected, both the interaction between the explicit measure and the capacity condition, $\beta = .50$, $t(78) = 2.32$, $p = .023$, and the interaction between the implicit measure and the capacity condition, $\beta = -.48$, $t(78) = -2.36$, $p = .021$, were statistically significant.

Simple slope tests (Aiken & West, 1991) revealed that in the high capacity condition the explicit measure predicted choice behaviour very well, $\beta = .53$, $t(78) = 3.54$, $p = .001$, whereas it had no impact on participants' decisions in the low capacity condition, $\beta = .03$, $t(78) = .19$, $p = .848$ (Figure 1). Conversely, the implicit measure was a very good predictor of behaviour in the low capacity condition, $\beta = .44$, $t(78) = 2.98$, $p = .004$, but it was unrelated to behaviour when participants had ample resources during their choice, $\beta = -.04$, $t(78) = -.25$, $p = .805$ (Figure 1). Neither the main effect of

capacity condition, $\beta = -.02$, $t(78) = -.12$, $p = .908$, nor the interaction between the explicit and the implicit measure, $\beta = -.11$, $t(78) = -1.05$, $p = .296$, were significant.

Discussion

The results corroborate the predictions made on the basis of current models like the MODE model or the RIM (Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004). When participants had ample processing resources, an explicit attitude measure based on controlled processes predicted their choice between a variety of fruit and chocolate bars very well, but the implicit measure failed to contribute independently to the prediction. However, when processing resources were taxed, behaviour appeared to be more strongly driven by spontaneous/impulsive processes as indicated by the increase in the implicit measure's predictive validity. At the same time, the explicit measure no longer was a significant predictor of behaviour. Thus, behaviour was determined by different sources under each condition and the implicit measure was capable of giving an indication of the strength of the impulses that guided behaviour under low cognitive capacity. Given that we examined the same behaviour in both conditions, it is remarkable that the explicit measure lost virtually all its predictive power when participants had low processing resources available with which to monitor their behaviour.

This is the first study to show the moderating role of cognitive capacity for the predictive validity of both explicit and implicit attitude measures at the same time. The implications of the data may be far reaching. Everyday subjective experiences as well as scientific evidence suggest that people make a considerable number of their decisions while mentally preoccupied (Bargh, 2002). The data from Study 1 suggest that these decisions are chiefly influenced by impulsive tendencies. Controlled processes seem to

play a much smaller role under these conditions, but are very important under full resources.

In the next study we undertook several changes. Most importantly, instead of cognitive capacity we extended our moderator-approach to a different manipulation of controlled and impulsive behaviour, self-regulatory resources (Muraven & Baumeister, 2000). Second, we aimed at predicting a behaviour that extends over a longer time period, consumption of food products, rather than a single choice behaviour. Finally, from our perspective, an asset of Study 1 is the independent assessment of the explicit and implicit attitude measures. On the other hand, it could be argued that the differential predictive validity of the attitude measures was due to an unequal time interval between the attitude assessments and the measurement of behaviour. Thus, in Study 2, both attitude measures were collected in the same experimental session.

Study 2

In their model of self-regulation, Baumeister and colleagues (e.g., Muraven & Baumeister, 2000) assume that the ability to self-regulate behaviour is based on a limited resource. This resource works like a muscle in that it depletes as a result of operational demands and rejuvenates after some time has passed. An initial act of self-control will deplete the resource so that a second attempt to self-control will be less successful, leading to less controlled, more impulsive behaviour. In only a few years an impressive amount of data consistent with this model has been accumulated (e.g., Baumeister & Vohs, 2004).

As mentioned before, first evidence regarding the moderating role of self-regulatory resources comes from a study by Hofmann et al. (2007). In this research an implicit attitude measure was more strongly related to consumption of candy for

participants who were depleted of their self-regulatory resources than for participants in a control condition with full resources. The opposite held for a measure of dietary restraint standards that was assessed at the end of the experiment. No explicit attitude measure was included.

In Study 2 we went beyond past research in investigating whether the moderating role of self-regulatory resources generalizes to explicitly measured attitudes. The distinction between explicitly measured attitudes and restraint standards is important, since both constructs describe different influences on behaviour regulation. Explicitly measured attitudes refer to a conscious evaluation of a certain product (e.g., how positive or negative one finds the product etc.). In contrast, dietary restraint standards more generally describe how much one regulates the intake of food. Questions in common measures of dietary restraint refer to the frequency of dieting, or whether or not one restrains oneself independent of feeling hungry (Pudel & Westenhöfer, 1989; Stunkard & Messick, 1985). These measures deal with general nutrition strategies, and they do not ask for evaluations of products. Thus, the constructs of restraint and explicit evaluation are conceptually distinct as it is well possible to like a product and yet to restrict oneself to not eating it ("I really love ice-cream, but I want to keep a slim figure"). Importantly for present purposes, both constructs are products of higher-order cognitive processes that are dependent on resources (Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004).

In our study in the "media and entertainment domain" participants were assigned to one of two conditions in which their self-regulatory resources were either depleted or not depleted. Subsequently they took part in a product test: Using explicit and implicit attitude measures we predicted consumption of potato crisps (referred to as potato *chips*

in American English). Thus, in contrast to a single-act choice task, as in Study 1, we used an even more realistic, continuous behavioural criterion that extends over several minutes. In providing information about the amount of intake consumption behaviour is particularly relevant for more applied contexts. To take or not to take a chocolate bar is only one aspect of consumption control. But often self-regulation bears on less dichotomous acts, but concerns *how much* one eats, drinks, smokes, or watches TV. The exertion of control may be even harder for such continuous behaviours than for single-act choices.

We expected the explicit attitude measure to predict consumption well when people had ample resources to monitor their behaviour, but not under depleted self-regulatory strength. The opposite should hold for the implicit measure.

Method

Participants and Design

Sixty-nine female undergraduate students of psychology of the University of Basel were randomly assigned to either a resource depletion or a control condition. They received partial course credit in exchange for their participation. We excluded one participant because she was aware of the hypotheses and two others because of failure to comply with instructions during the experiment. The age of the final sample ranged from 18 to 39 years (M = 22.48, SD = 4.59).

Procedure

Data collection was done in groups of up to four persons. It took place between 4 and 6 pm. After signing an informed consent form, participants were informed that the study involved a perception task (the implicit and explicit attitude measure), an entertainment part, and a product test. During the entertainment part participants

watched a sequence from a movie with the instruction to control or let flow the emotions that came up in response to what they viewed. Directly after the film they completed a questionnaire pertaining to their current mood and the ease with which they had followed the assignment. In the product-testing phase participants were offered a serving of potato crisps that they tried and rated on a number of dimensions. They were informed that they were free to eat as much or as little as they wanted. Finally, they completed some closing questions, were thanked, and were sworn to secrecy. After all data collection had been completed participants were debriefed via e-mail.

Manipulation of self-regulatory resources

To deplete the self-regulatory resources of half the participants we used an emotion suppression task that has been successfully employed in past research (e.g., Muraven, Tice, & Baumeister, 1998). All participants watched a 7-minute sequence from the movie "City of God." The sequence contained positive aspects (a party with people celebrating) as well as negative aspects (a strong argument between the two main characters that ends with one person shooting the other) and was meant to be emotionally arousing. Participants in the control condition were instructed to let flow the emotions that came up in response to the movie sequence just as they would do when watching a movie in the cinema. In contrast, participants in the depletion condition were instructed to suppress all emotions such that another person looking at them would not be able to tell from their appearance if the movie was happy or sad.

Measures

Implicit measure. As an implicit measure we used a Single Category IAT with just one target category (SC-IAT, Karpinski & Steinman, 2006) with the category labels "pleasant" or "I like", "unpleasant" or "I don't like", and "chips".[1] (*Chips* is the

colloquial German expression for potato crisps.) Evaluative stimuli were positive and negative words and pictures. Target stimuli related to potato crisps. Each category was represented by six stimuli. In the first combined block participants had to sort the positive category and “chips” on one response key. This assignment was changed in the second combined block such that the negative category and “chips” shared a response key. Each combined block contained 70 trials in a predetermined random order. All participants completed the SC-IAT in the same order (Egloff & Schmukle, 2002; Gawronski, 2002). For each category, the number of stimuli per block was determined such that the proportion of left and right key responses was 3:4 in the first combined block and 4:3 in the second combined block. IAT scores were calculated based on potato chip pictures using the D-algorithm proposed by Greenwald et al. (2003) such that more positive values indicate a more positive reaction to potato crisps (α = .73).

Explicit measure. After the IAT participants were asked to evaluate the product potato crisps on two 5-point bipolar rating scales with “negative” versus “positive” and “not delicious at all” versus “very delicious” as poles. The two ratings were combined to form the explicit attitude index (α = .71).

Mood ratings. Directly after the movie sequence participants filled out a German version of the Positive and Negative Affect Schedule (PANAS) mood scale (α = .81; Krohne, Egloff, Kohlmann, & Tausch, 1996).

Manipulation check of resource depletion. To bolster the cover story participants answered several questions pertaining to the movie sequence. Embedded in the questionnaire were two questions relating to the instructions, which participants answered on 7-point rating scales: “How exhausting was it for you to follow the instructions you were asked to bear in mind?” and ”How hard did you have to

concentrate to follow the instructions that you were asked to bear in mind?" The two items were combined and used as a manipulation check for the resource depletion manipulation (α = .93).

Potato chip consumption. During the product test each participant was provided with a 90-g serving of potato crisps. Participants were given 6 minutes to taste and rate the potato crisps. After the product test the potato crisps were removed from participants' desks. Following the session, the amount eaten by each participant was determined by putting the remaining potato crisps back into the respective bag and subtracting the final weight from the initial weight. Amount eaten served as the main dependent variable.

Results

Preliminary Analyses

As expected, participants in the depletion condition reported that it was more exhausting and difficult for them to follow the instructions (emotion suppression) while watching the movie sequence than participants in the control condition (emotion flow), $M_{\text{Depletion}} = 4.56$, $SD = 1.74$ vs. $M_{\text{Control}} = 2.59$, $SD = 1.41$, $t(64) = 5.06$, $p < .001$. We log-transformed the distribution of potato chip consumption to achieve a normal distribution. All analyses are calculated with this index. However, for ease of interpretation, the raw scores in grams are depicted in Table 1. Experimental conditions did not differ significantly with respect to the central variables explicit attitude measure and implicit attitude measure. However, the difference between IAT effects approached significance, $t(64) = 1.70$, $p = .094$. In line with expectations and replicating numerous findings in the self-regulation literature, participants in the depletion condition consumed marginally more, $t(64) = 1.95$, $p = .055$. No differences emerged with regard

to participants' mood ratings. This was true irrespective of whether positive and negative mood items were analyzed separately (all absolute *t*s < 1.55) or as one compound index of negative mood ($M_{\text{Depletion}}$ = 3.24, *SD* = .43 vs. M_{Control} = 3.16, *SD* = .53), $t(64) = .62$, $p = .539$. Finally, time since last food intake did not differ between conditions ($M_{\text{Depletion}}$ = 2.76 h, *SD* = 1.48 vs. M_{Control} = 2.48 h, *SD* = 1.28), $t(64) = .80$, $p = .427$.

Potato crisps consumption

Zero-order correlations provide first evidence for the moderating role of resource depletion on the predictive validity of both the explicit and the implicit attitude measure (see values above the diagonal in Table 3). A closer inspection of the data revealed that potato crisps consumption was significantly correlated with time since last food intake ($r = .33$, $p = .006$), a variable that apparently strongly influenced our dependent measure without being the focus of our hypotheses. Therefore, we calculated partial correlations controlling for this variable (see values below the diagonal in Table 3). When time since last food intake was controlled for, the pattern of correlations shows even more clearly.

To investigate our hypotheses in more detail we ran a multiple regression analysis ($R^2 = .30$). All continuous variables were *z*-standardized. Consumption of potato crisps served as the dependent variable. The dummy coded experimental condition (0 = depletion condition, 1 = control condition), the explicit measure, the implicit measure, as well as all possible two-way interactions between these variables were entered as predictors. Additionally, we included time since last food intake as a covariate. The main effect of experimental condition was marginally significant, reflecting the slightly higher consumption of potato crisps in the depletion condition

compared to the control condition, β = -.41, $t(58) = 1.73$, $p = .089$. Also, as anticipated, the main effect for time since last food intake was significant, indicating that participants ate more the longer they had not eaten before the experiment, β = .35, $t(58) = 3.00$, $p = .004$. Consistent with our hypotheses, both the interaction between experimental condition and the explicit measure, β = .50, $t(58) = 2.11$, $p = .039$, and the interaction between condition and the implicit measure, β = -.52, $t(58) = -2.18$, $p = .033$, were significant.

Simple slope tests (Aiken & West, 1991) revealed that as expected the explicit measure was a good predictor in the control condition, β = .48, $t(58) = 2.72$, $p = .009$, but was virtually unrelated to consumption in the depletion condition, β = -.02, $t(58) = -.10$, $p = .919$. Conversely, in the depletion condition the implicit measure was a significant predictor of potato crisps consumption, β = .34, $t(58) = 2.11$, $p = .039$, but not in the control condition, β = -.18, $t(58) = -.99$, $p = .328$ (see Figure 2). The interaction between the implicit and the explicit measure was not significant, β = -.02, $t(58) = -.12$, $p = .902$.

Discussion

This is the first study to show a moderating role of self-regulatory resources for the predictive validity of both implicit *and* explicit attitude measures simultaneously. As expected, when participants had full resources, the explicit attitude measure was a strong predictor of consumption behaviour whereas the implicit measure was not. In contrast, when participants were depleted of their self-regulatory strength, the implicit measure not only gained considerable predictive power compared to the control condition, but the explicit measure was now unrelated to potato crisps consumption. In other words, whereas in the control condition participants' expressed liking of potato

crisps and their consumption were closely related, this relationship vanished in the depletion condition. Here, participants' explicit liking of potato crisps had nothing to do with how much they ate. This finding goes beyond past research that did not include explicitly measured attitudes, but product-unspecific dietary restraint standards (Hofmann et al., 2007), which are distinct from explicitly measured attitudes.

Study 3

The goals of Study 3 were twofold: First, we sought to extend the finding of the moderating role of self-regulatory resources to a different behavioural domain, beer drinking. Second, and more important, we aimed at showing that the distinction between explicitly measured attitudes and restraint standards is not only of theoretical interest. If our reasoning is correct that these constructs are distinct, both should contribute independently to the prediction of behaviour. However, this predictive validity should be limited to states of full control resources because both explicitly measured attitudes and restraint standards rely on higher-order cognitive processes. Measures of restraint have not only been proposed in the domain of eating, but also in other domains such as alcohol consumption. Restrained drinkers are characterized by being "cognitively and behaviourally pre-occupied with controlling their intake" (Collins & Lapp, 1992, p. 625).

First evidence for the interplay between resource depletion and drinking restraint standards comes from a study by Muraven, Collins, and Nienhaus (2002). They found a significant interaction between self-regulatory resources and restraint: Participants with higher restraint standards drank slightly less than participants with lower restraint standards in the control condition with full self-regulatory resources. Conversely, when self-regulatory resources were depleted, participants with higher restraint standards

drank even slightly more than those with lower restraint standards. However, in the Muraven et al. (2002) study neither of the simple slopes in the regression analysis differed significantly from zero and the study did not include an explicit or an implicit attitude measure, impeding the analysis of a more dynamic picture of behaviour regulation. Importantly, the empirical relation between restraint standards and an explicit attitude measure remains an open question.

Other research has more generally concentrated on investigating to what extent undermined self-regulation is associated with alcohol consumption (for a review see Hull & Slone, 2004). Apparently, impulses to drink alcohol are habitually overridden in many people when the necessary resources are available. However, also this line of research relied exclusively on the comparisons of means. Impulses to drink were treated as a constant and individual differences in impulse strength were not taken into account.

Still others have used implicit reaction time measures to investigate alcohol-related associations (e.g., Jajodia & Earleywine, 2003; Ostafin & Palfai, 2006; Wiers, van Woerden, Smulders, & de Jong, 2002). This recent research has been primarily concerned with identifying the best setup of measures for the purpose of optimizing relations to other measures and predicting general alcohol consumption over a longer time span over and above explicit measures.

In Study 3 we intended to bring together these lines of research. We recruited participants for a study in the “media and entertainment domain” and either depleted or did not deplete their self-regulatory resources. Subsequently, participants attended a product test of beer. We predicted the amount participants would drink with implicit and explicit attitude measures as well as drinking restraint standards. Our hypotheses were as follows: We expected interactions similar to those obtained in Studies 1 and 2

between the implicit and the explicit attitude measures and the experimental condition. In addition, we predicted a third interaction between restraint standards and experimental condition. According to our assumption of restraint standards and explicitly measured attitudes as two distinct constructs, restraint standards should contribute independently (over and above the explicit and the implicit attitude measure) to the prediction of behaviour for participants with full resources, but less so for depleted participants.

Method

Participants and Design

Forty-eight male students of the University of Basel were randomly assigned to either a depletion condition or a control condition. They received 15 Swiss Franks (the equivalent of about €10 at the time of the study) as payment for their participation. We excluded one participant who refrained from drinking beer because he came with his motorcycle and one participant who was aware of the hypotheses. One participant failed to complete the drinking restraint measure. Therefore, all analyses relating to this measure were calculated without the data of this participant. Age ranged from 19 to 44 years (M = 24.11, SD = 4.41; all above legal drinking age).

Procedure

Participants who “liked to party and to go out” were recruited via bulletin boards in university buildings and through personal recruitment in the local cafeteria. Before the experimental session participants received an e-mail informing them that their participation would require them to taste an alcoholic beverage. If the potential participant could not or did not want to drink alcohol in the study for any reason, his participation would not be possible.

Data collection was done in groups of up to four persons and took place between 4 and 7 pm. Participants received an informed consent form containing notice that in the course of the study they were to taste an alcoholic beverage that would be denoted as such. If the participant could not or did not want to drink alcohol he was assured the full payment anyway. Participants signed the form that ended with a declaration that after the study they would wait to partake in road traffic again until their alcohol level would have dropped to a legal amount as indicated by a breath alcohol analyzer.

Participants were informed that the study contained a computer test of categorization, an entertainment part, a product-testing phase, and a task primarily requiring concentration and skill. This last task was never realized. Its announcement served the purpose of giving participants a reason to restrict their alcohol intake because alcohol would impair their performance on the concentration task (Muraven et al., 2002). The session started with the implicit measure, followed by some questions about their liking of beer. Next, participants watched a short movie sequence with the instruction to control or let flow the emotions that came up in response to the movie sequence. Directly after this sequence they completed a questionnaire pertaining to their current mood and the ease with which they had followed the assignment. In the product-testing phase participants were offered two bottles of beer that they tried and rated on several dimensions. They were informed that they were free to drink as much or as little as they wanted. Finally, they provided information pertaining to their alcohol consumption, completed the measure of drinking restraint standards, were asked several control questions, and probed for suspicion. At the end of the session participants were thanked, carefully debriefed, and sworn to secrecy.

Manipulation of self-regulatory resources

The manipulation of self-regulatory resources was similar to that employed in Study 2 with the following exception: We used a 9.5-minute sequence from the movie "American History X" that deals with racial discrimination and right-wing radicalism in the United States. The sequence portrays an argument in a family that escalates because of differing political attitudes of the family members.

Measures

Implicit measure. The implicit measure was similar to that employed in Study 2 with the following exceptions: The category labels were "pleasant," "unpleasant," and "beer." Target stimuli were pictures of beer in different kinds of typical glasses. Each category was represented by five stimuli (α = .81).

Explicit measure. After the SC-IAT, participants evaluated the product beer on two 7-point bipolar rating scales with "negative" versus "positive" and "not delicious at all" versus "very delicious" as poles. The ratings were combined to form the explicit attitude measure (α = .82).

Drinking restraint standards. Participants completed a German version of the Temptation and Restraint Inventory (TRI, Collins & Lapp, 1992), which has been successfully employed in previous research (Cox, Gutzler, Denzler, Melfsen, Florin, & Klinger, 2001). It contains 15 items referring to drinking restraint and temptation that are answered on 9-point rating scales. As the drinking restraint and temptation subscales were highly correlated (r = .46, p = .001) and since a factor analysis suggested one general factor as indicated by a screeplot, we used the global scale score as a measure of restraint standards (α = .76).

Mood ratings. After the movie sequence participants filled out a German version of the PANAS mood scale (α = .81, Krohne et al., 1996).

Manipulation check of resource depletion. The manipulation check of resource depletion was similar to that employed in Study 2. Both items were combined to form a single index (α = .92).

Beer consumption. During the product test each participant was provided with two 0.5-liter bottles of beer, labelled "A" and "B," respectively, as well as two cups with the same identifications. The bottles were similar looking and of a widely used shape and colour. The labels of the brands were removed so that previous knowledge about the brands would "not influence the taste ratings." Because of strict ethical guidelines at the university we used non-alcoholic beer. At the end of the session participants were asked for a guess on the brands of the beers. Only three participants indicated suspicion that at least one of the beers may have been nonalcoholic. Excluding these participants from data analyses did not alter any of the statistical conclusions drawn.

Participants were given 15 minutes to taste and rate the beers. After the product test, the bottles were removed from participants' desks. Following the session, the amount consumed by each participant was determined by pouring any beer remaining in the cups back into the respective bottles and subtracting the final weight from the initial weight. The differences from each bottle were added and total consumption weight served as the main dependent variable.

Results

Preliminary Analyses

As expected, participants in the depletion condition reported more difficulty obeying the instructions while watching the movie sequence than participants in the control condition ($M_{\text{Depletion}}$ = 4.24, SD = 1.49 vs. M_{Control} = 1.95, SD = 1.04), $t(44)$ =

5.82, $p < .001$. Conditions did not differ with respect to the central variables (all absolute *t*s < .1.05, all *ps* > .30, see Table 1), and drinking restraint standards ($M_{Depletion}$ = 2.12, *SD* = .80 vs. $M_{Control}$ = 2.03, *SD* = .75), $t(43) = .38$, $p = .704$). Also, groups did not differ with regard to mood ratings. This was true irrespective of whether positive and negative mood items were analyzed separately (all absolute *t*s < .95) or as one combined index of negative mood ($M_{Depletion}$ = 2.76, *SD* = .49 vs. $M_{Control}$ = 2.59, *SD* = .50), $t(44) = 1.21$, $p = .233$. Finally, time since last (alcoholic or non-alcoholic) liquid intake did not differ between conditions ($M_{Depletion}$ = 2.07 h, *SD* = 3.92 vs. $M_{Control}$ = 1.74 h, *SD* = 1.37), $t(44) = .37$, $p = .716$.

Beer consumption. We expected the manipulation of self-control strength to moderate the predictive validity of both the implicit and the explicit attitude measure as well as that of drinking restraint standards. Table 4 depicts the zero-order correlations between these variables and beer consumption, separately for each condition. Again, we ran a multiple regression analysis to investigate the hypothesis more closely ($R^2 = .40$). All continuous variables were *z*-standardized. Beer consumption served as the dependent measure. We entered as predictors the dummy coded condition variable (0 = depletion condition, 1 = control condition), the implicit measure, the explicit measure, and drinking restraint standards, as well as all possible two-way interactions between these variables. The main effect of experimental condition approached significance, reflecting the slightly higher consumption in the depletion condition, $\beta = -.54$, $t(34) = -1.91$, $p = .064$. Confirming the results from the previous studies both the interaction of the implicit measure with experimental condition, $\beta = -.74$, $t(34) = -2.60$, $p = .014$, and the interaction of the explicit measure with condition, $\beta = .67$, $t(34) = 2.08$, $p = .045$, were significant. What is more, as expected the interaction between restraint standards

and condition also reached significance, β = -.64, $t(34) = -2.10$, $p = .043$. Simple slope tests (Aiken & West, 1991) revealed that the implicit measure was a significant predictor of beer consumption in the depletion condition, β = .62, $t(34) = 3.07$, $p = .004$, but not in the control condition, β = -.12, $t(34) = -.49$, $p = .625$. For the explicit attitude measure the simple slope in neither the depletion condition, β = -.32, $t(34) = -1.46$, $p = .154$, nor the control condition reached significance, β = .35, $t(34) = 1.48$, $p = .148$.[2] Finally, restraint standards were significantly negatively related to consumption in the control condition, β = -.59, $t(34) = -2.58$, $p = .014$, but unrelated in the depletion condition as predicted, β = .05, $t(34) = .28$, $p = .779$ (see Figure 3). None of the remaining three interactions approached significance, all *p*s > .20.

Discussion

The data extend the results for the moderating role of self-regulatory resources from Study 2 and Hofmann et al. (2007) to the domain of drinking behaviour. When resources were scarce the implicit measure predicted behaviour well and showed incremental validity over and above both explicit self-report measures at the same time. Importantly, this study goes beyond existing research by clarifying the roles of explicitly measured attitudes and restraint standards. Under conditions of full resources both explicitly measured attitudes and drinking restraint standards contributed to the prediction of behaviour, as predicted. Higher restraint standards were associated with less consumption in the control condition, but in the depletion condition there was no such relationship (Figure 3). To our knowledge this is the first study to show such a threefold pattern of moderated predictive validity.

This result indicates that the distinction between explicit attitude measures and restraint standards is imperative. Evidently, restraint standards can work independently

of the evaluation of a product (e.g., “I really like beer, but I don’t want to drink too much alcohol”). What both measures share is their susceptibility to cutbacks of control resources. If resources are limited, their influence on behaviour diminishes.

A word of caution should be noted with regard to the small sample size in Study 3. In studies with small samples effect sizes tend to vary more strongly than in studies with larger samples. However, we would like to stress that all three critical interactions (restraint standards × condition, explicit measure × condition, and implicit measure × condition) were significant in the predicted direction. What is more, the results not only confirm theory-driven hypotheses, they are also consistent with results from Studies 1 and 2 as well as results from Hofmann et al. (2007). Thus, we have confidence in the empirical pattern despite relatively low power ranging between $1-\beta = .47$ and .67 for each of the three interactions (given N, the empirical effect, and α set to .05).

General Discussion

In three studies we found evidence for the moderated predictive validity pattern that we expected on basis of several current dual-process models of social psychology (Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004). Implicit attitude measures predicted impulsive, but not controlled behaviour, whereas for explicit attitude measures the opposite was true. We used two different moderators of the predictive validity of these measures: cognitive capacity and self-regulatory resources. The results converge for single-act choices and continuous behaviours in three distinct behavioural domains: choice behaviour of fruit versus chocolate, potato crisps consumption, and beer drinking. In contrast to previous research we found differential predictive validity of implicit and explicit attitude measures for one and the same behaviour. In addition, Study 3 shows for the first time that restraint standards and explicitly measured attitudes

are two distinct, but complementing constructs. Both contributed independently to the prediction of behaviour under conditions of full resources, but were susceptible to a reduction of resources.

In Study 1 we investigated choice behaviour between several options. The results may provide further insights into the processes that influence buying decisions that are made rather absentmindedly or on impulse. Deciding in favour or against a certain product is one important aspect of behaviour. Another, probably even more intriguing aspect relates to the actual consumption of products. Which circumstances influence when and how much people actually consume of the goods they brought home? In Studies 2 and 3 we set up situations in which participants actually tasted the products for up to 15 minutes. Because participants did not know that consumption was measured afterwards, these tasks featured particularly realistic behaviours. The studies not only hint at self-regulatory resources as one key factor to the consumption of tempting foods. They also suggest that implicit measures may be able to provide answers to the question of who will be especially likely to fall for the seduction of the tempting products and who may not even feel attracted to them because his or her impulsive reaction toward the products is not very positive.

A close inspection of the results in Studies 1 and 3 in particular reveals the value of the present research by using an implicit attitude measure as an indicator of impulse strength. In these studies we did not obtain a main effect between conditions on the dependent variables “number of chocolates chosen” and “beer consumption” (see Table 1). The higher consumption of, for example, an affectively positive but unhealthy food in the experimental group with scarce resources typically serves as an indicator of impulsive rather than controlled behaviour in self-regulation research (e.g., Vohs &

Heatherton, 2000; see also Shiv & Fedorikhin, 1999). Impulses towards the respective food are seen as a constant and are not taken into account. The present studies advance research in that they are among the first to provide evidence of how the *strength of impulses* may be detected that guide behaviour when self-control fails (i.e., by measuring associations in the impulsive system). In the absence of such an implicit measure our findings in Studies 1 and 3 may have led to the assumption that behaviour was driven by the same processes in both experimental conditions. Fortunately, the implicit measure clarified the picture as indicated by the significant interaction with the experimental condition in the multiple regression analyses.

Functional equivalence of the moderators

As predicted at the outset of this paper, the moderators we used in the present studies – cognitive capacity and self-regulatory resources – were functionally equivalent in that they similarly led to the predicted pattern of results. However, the two manipulations are by no means equal. One of the major differences is that right after cognitive load is taken away from people, working memory is flexible again and full regulatory strength is reestablished immediately. In contrast, once self-control strength is depleted it needs more time to recover (Muraven et al., 1998). Also, given a sufficiently high working memory load to reduce cognitive capacity even high motivation will not allow individuals to regulate behaviour in a controlled way. This is different for self-regulatory strength. After all, even with depleted self-regulatory resources eating potato crisps and drinking beer remain essentially controlled and controllable behaviours. Had participants received instructions to eat or drink especially much or little, we believe they would not have had any difficulties in doing so. In fact, evidence exists that people depleted of self-regulatory resources can still successfully

regulate their behaviour provided strong enough motivation to overcome impulses (Baumeister et al., 1994; Muraven & Slessareva, 2003; Webb & Sheeran, 2003). So the question remains what is the linking element that is responsible for the functional equivalence of the two moderators? We speculate that the impairment in the work of the central executive (Baddeley, 1990) may be at the core of the moderating effects of both cognitive capacity and self-regulatory resources. The central executive is responsible for information processing, the monitoring of behaviour, and the distribution of cognitive resources. According to research on the central executive as a supervisory activating system (Norman & Shallice, 1986) it is dependent on controlled processes in order to fulfil its function (Baddeley, 2003). These are severely restricted in case of cognitive distraction (as in Study 1; Baddeley, 1990) and they are also strongly affected by the depletion of self-regulatory resources (as in Studies 2 and 3; Schmeichel, Vohs, & Baumeister, 2003). In contrast, automatic processes are left unchanged (Govorun & Payne, 2006). This impairment of central executive functioning prepares the ground for an enhanced reliance on spontaneous/impulsive processes and thus to increased predictive validity of implicit measures. Future research should investigate more directly if this impairment of central executive functioning is a main factor that leads to the functional equivalence of different moderators relating to control resources.

Applied relevance and outlook

The range of potential applications of the present research spans various domains in which initial impulses and more deliberate thoughts may conflict, such as aggressive and criminal behaviour, sexual behaviour, interactions with persons belonging to a stereotyped group, purchase and consumption behaviour, or drug use and abstinence. For example, marketers may benefit from theoretical frameworks such as

the MODE model or the RIM (Fazio & Towles-Schwen, 1999; Strack & Deutsch, 2004) by gaining further insights into the underlying psychological processes of impulse buying. In clinical psychology, the present research could be applied to work on substance abuse of nicotine, alcohol, or other drugs, as well as relapse. Given that associative structures play a prominent role in guiding impulsive behaviour, methodologies that provide insights into these structures may be valuable. A prospective aim may be to change these structures to reduce the risk of relapses. Of course, there is a long way to go before applicable programs will be developed. So far, little is known on how to change relevant associations on a long-term basis (e.g., Gregg, Seibt, & Banaji, 2006; Wiers, van de Luitgaarden, van den Wildenberg, & Smulders, 2005).

The point we want to make is that wherever impulsive behaviour plays a role in research and application, insight from research on social cognitive theory and methodology may broaden the picture, even if it does not lead to practical applications right away. Obviously, this relationship is not one-sided, but social-cognitive research could profit from more applied work just as well. The search and cataloguing of moderators of controlled and impulsive behaviour may serve as one example. We hope that the present work is at least one step in linking research on implicit social cognition to research on self-regulation.

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Footnotes

[1] We used two different labels for the evaluative target categories following Olson and Fazio (2004). However, no differences in results emerged when we included this factor in the multiple regression analyses that follow, $p > .74$ (Study 1) and $p > .13$ (Study 2), for the crucial three-way interaction between experimental condition, IAT score, and IAT condition. Thus, this manipulation receives no further mention.

[2] In another multiple regression analysis that resembles those from Studies 1 and 2 without restraint standards, the interaction between the explicit measure and experimental condition replicated the findings from the previous studies, with the simple slope for the explicit measure being non-significant in the depletion condition, $\beta = -.16$, $t(39) = -.76$, $p = .453$, but significant in the control condition, $\beta = .53$, $t(39) = 2.29$, $p = .028$. The opposite holds for the implicit measure, $\beta = .51$, $t(39) = 2.67$, $p = .011$ for the depletion condition and $\beta = -.30$, $t(39) = -1.37$, $p = .179$ for the control condition.

Table 1

Means and standard deviations of the central variables as a function of experimental condition in Studies 1–3

		Study 1		Study 2		Study 3	
		Low capacity (n = 43)	High capacity (n = 42)	Depletion (n = 33)	Control (n = 33)	Depletion (n = 25)	Control (n = 21)
Explicit measure	*M*	$.05_a$	$-.31_a$	4.09_a	4.23_a	5.36_a	5.21_a
	SD	3.07	2.76	.76	.73	1.58	1.35
Implicit measure	*M*	$.18_a$	$.18_a$	$.70_a$	$.41_b$	$.25_a$	$.29_a$
	SD	.55	.55	.69	.68	.29	.27
Behaviour	*M*	2.67_a	2.64_a	22.06_a	17.55_b	452.08_a	391.24_a
	SD	1.09	.80	11.61	14.62	191.35	202.64

Note. Behaviour in Study 1: Number of chocolates chosen. In Study 2: Consumption of potato crisps in grams. In Study 3: Consumption of beer in grams. Row Means with different subscripts in one study differ at $p < .10$ (two-tailed).

Table 2

Zero-order correlations between the explicit attitude measure, implicit attitude measure, and number of chocolates chosen as a function of experimental condition in Study 1

	1	2	3
High cognitive capacity (n = 42)			
1. Explicit measure	–	.20	.60**
2. Implicit measure		–	.12
3. Chocolates chosen			–
Low cognitive capacity (n = 43)			
1. Explicit measure	–	.37*	.24
2. Implicit measure		–	.45**
3. Chocolates chosen			–

Note. * $p < .05$. ** $p < .01$.

Table 3

Zero-order and partial correlations between the explicit attitude measure, implicit attitude measure, and potato crisps consumption as a function of experimental condition in Study 2

	1	2	3
Control condition (*n* = 33)			
1. Explicit attitude measure	–	.41*	.35*
2. Implicit attitude measure	.41*	–	-.05
3. Potato crisps consumption	.37*	-.01	–
Depletion condition (*n* = 33)			
1. Explicit attitude measure	–	.01	-.08
2. Implicit attitude measure	-.02	–	.29†
3. Potato crisps consumption	-.01	.47**	–

Note. Coefficients above the diagonal represent zero-order correlations. Coefficients below the diagonal represent partial correlations controlling for time since last food intake.

† $p = .10$. * $p < .05$. ** $p < .01$.

Table 4

Zero-order correlations between the explicit attitude measure, implicit attitude measure, drinking restraint standards, and beer consumption as a function of experimental condition in Study 3

	1	2	3	4
Control condition (n = 21)				
1. Explicit attitude measure	–	.18	-.19	.38†
2. Implicit attitude measure		–	.05	-.24
3. Restraint standards			–	-.49*
4. Beer consumption				–
Depletion condition (n = 25)				
1. Explicit attitude measure	–	.37†	.15	.11
2. Implicit attitude measure		–	.01	.50*
3. Restraint standards			–	-.04
4. Beer consumption				–

Note. † $p < .10$. * $p < .05$.

Figure Captions

Figure 1. Number of chocolates chosen as a function of attitude measure (implicit vs. explicit) and capacity manipulation (low vs. high) in Study 1 (estimated slopes).

Figure 2. Consumption of potato crisps in grams as a function of attitude measure (implicit vs. explicit) and resource manipulation (low vs. high) in Study 2 (estimated slopes).

Figure 3. Consumption of beer in grams as a function of attitude measure (implicit vs. explicit) as well as restraint standards and resource manipulation (low vs. high) in Study 3 (estimated slopes).

Figure 1

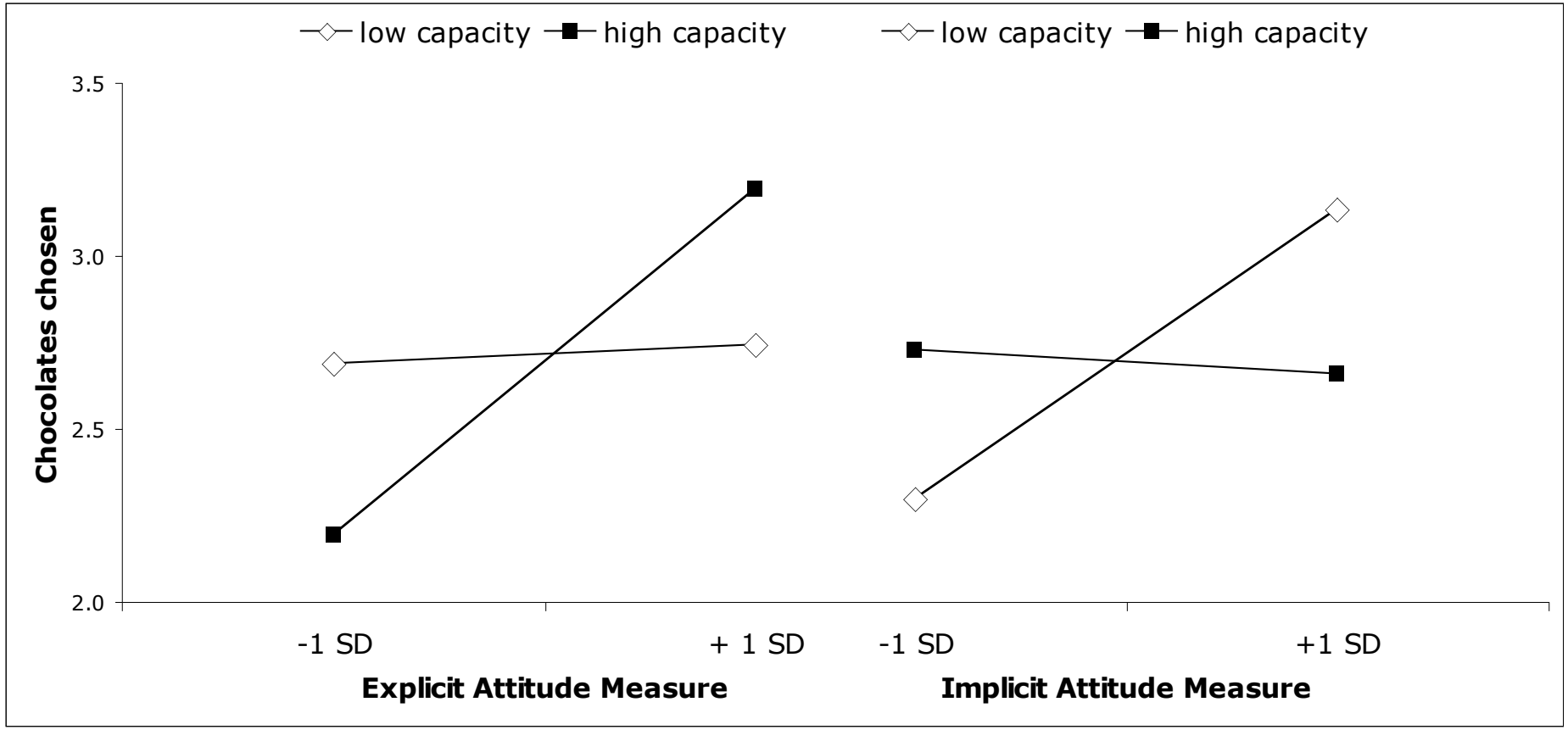

low capacity
high capacity
low capacity
high capacity
3.5
3.0
2.5
2.0
Chocolates chosen
-1 SD
+ 1 SD
-1 SD
+1 SD
Explicit Attitude Measure
Implicit Attitude Measure

Figure 2

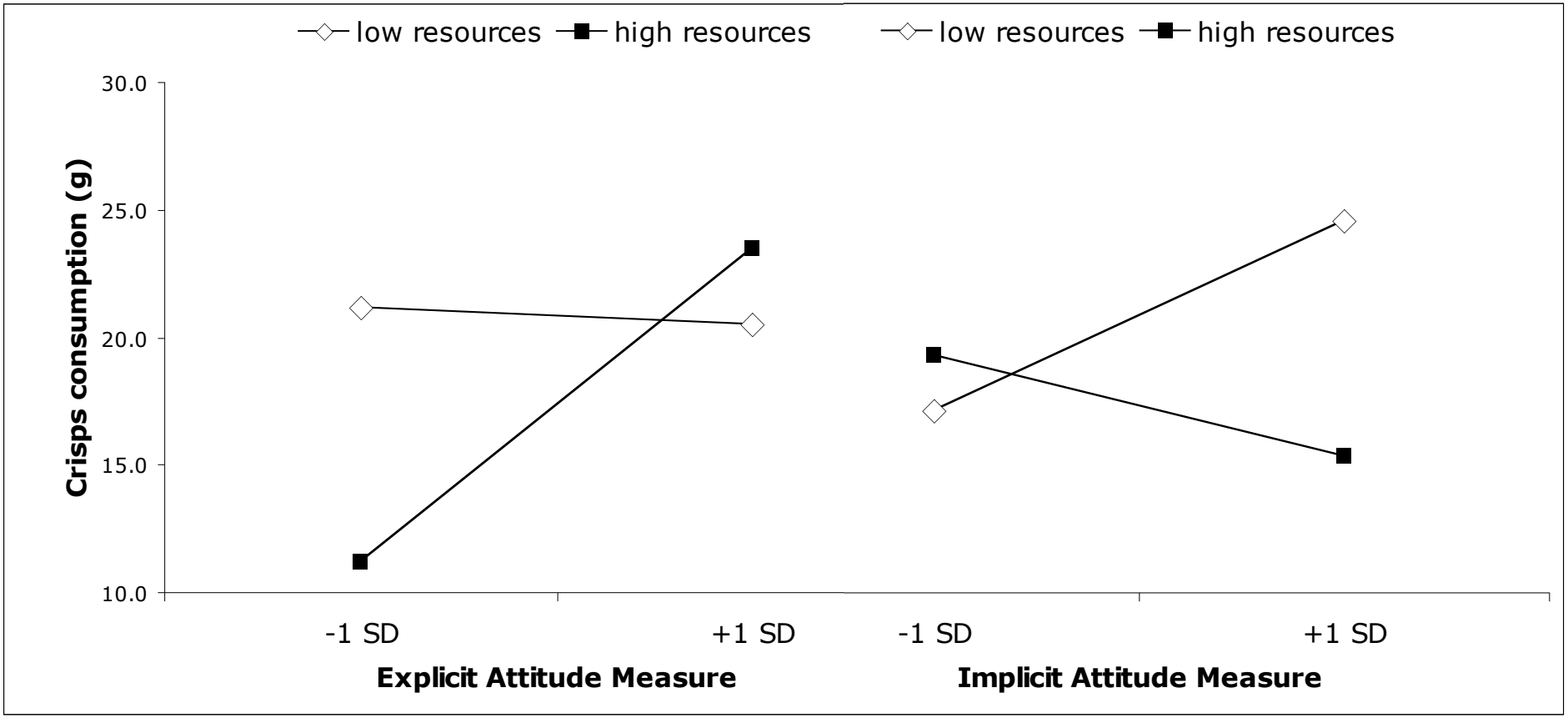
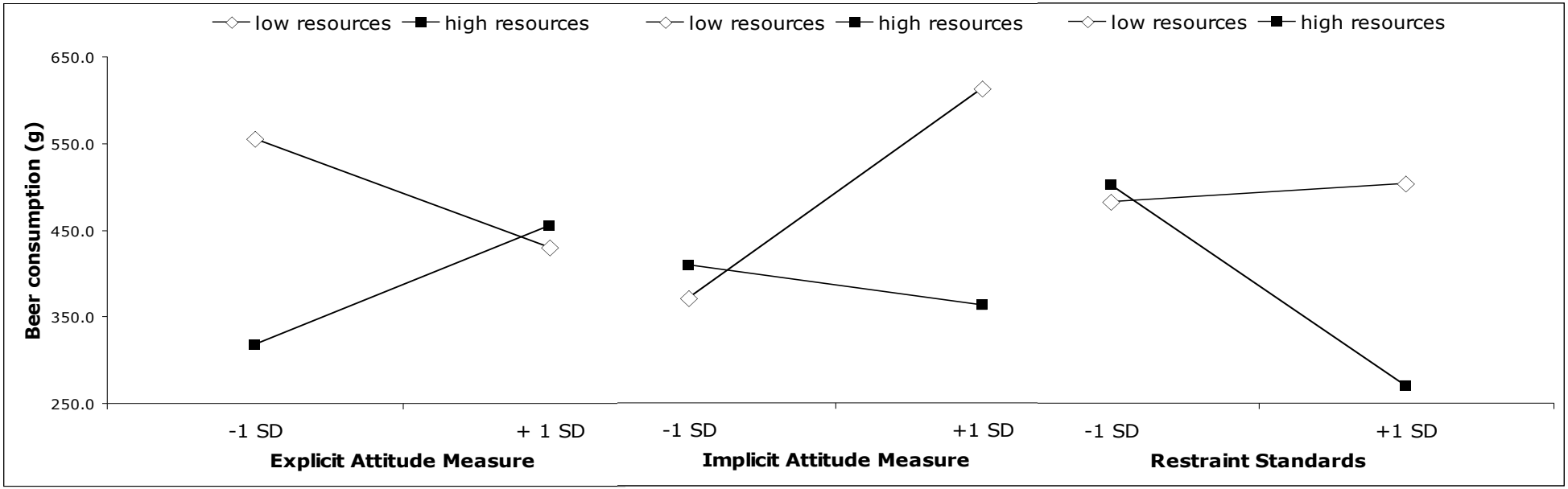

low resources
high resources
low resources
high resources
30.0
25.0
20.0
15.0
10.0
Crisps consumption (g)
-1 SD
+1 SD
-1 SD
+1 SD
Explicit Attitude Measure
Implicit Attitude Measure

Figure 3


low resources
high resources
low resources
high resources
low resources
high resources
650.0
550.0
450.0
350.0
250.0
Beer consumption (g)
-1 SD
+ 1 SD
Explicit Attitude Measure
-1 SD
+1 SD
Implicit Attitude Measure
-1 SD
+1 SD
Restraint Standards