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Friends With Benefits: Behavioral and fMRI Studies on the Effect of Friendship Reminders on Self-Control for Compulsive and Non-compulsive Buyers

Does the real or imagined presence of friends invariantly drive consumers to engage in disinhibited behavior, and give in to the "urge to splurge" in the face of consumption temptations? Or might there be situations in which being with friends or even merely thinking of friends or the friendships we have with them can actually *improve* self-control?

In five studies, using a unique combination of controlled experiments examining overt consumer behavior and functional magnetic resonance imaging (fMRI), we propose and show that the extent to which consumers identify a goal conflict between giving in to buying temptations on the one hand and the perceived consequences for maintaining satisfactory relationships with close friends on the other is a critical mediator of whether friendship reminders decrease or increase self-control. We further show that such a goal conflict is most likely for consumers with a chronic, compulsive tendency for uncontrolled, disinhibited acquisition and consumption —for consumers classified as compulsive buyers. For their non-compulsive counterparts, in contrast, acts of acquisition and consumption, even incidental disinhibited ones, are perceived to be less problematic in light of their friendships and hence do not induce a goal conflict to the same extent. Our findings provide insights into social influences on self-control and identify the concept of friendship reminders as a way to reduce a common type of dysfunctional consumer behavior. In addition to enhancing consumer well-being, reducing compulsive buying will substantially reduce handling costs for organizations. Hence, the findings are of academic, societal and managerial relevance.

Key words: compulsive buying, self-control, social influence, friendship, fMRI

1. Introduction

"A faithful friend is the medicine of life."

—Bible: Ecclesiasticus

The notion that humans have a strong need to acquire and maintain meaningful social relationships is widely accepted (Baumeister & Leary, 1995; Maslow, 1954). Friendship, defined as a close, intimate, mutual relationship with a same-sex peer (Sullivan, 1953), has been consistently proven to be beneficial for a wide range of issues, including well-being (Baumeister & Leary, 1995) and mental and physical health (Wilkinson, 1999). But the impact of close relationships does not stop there. Research in marketing has found that relationships exert a strong influence on a host of consumption decisions ranging from holiday destinations to battery choices (Argo, Dahl, & Manchanda, 2005; Ariely & Levav, 2000; Childers & Rao, 1992; Hofmann, Baumeister, Förster, & Vohs, 2012; Rook & Fisher, 1995). Moreover, researchers have recently begun to explore how close-relationship partners affect a specific kind of consumption situations: those that involve self-regulation (see for example Dzhogleva & Lamberton, 2014). Self-regulation is generally defined as the psychological and behavioral process that moves people toward desired, and away from undesired end-states (Fitzsimons, Finkel, & VanDellen, 2015). One aspect of self-regulation is self-control, which takes place when a predominant response is inhibited, altered or overridden (Muraven & Baumeister, 2000). Relationship partners may have an important impact on whether consumers exercise self-control (Dzhogleva & Lamberton, 2014).

Work in consumer behavior generally corroborates the notion that friends may lower consumers' self-control when eating (DeCastro, 1994; Redd & DeCastro, 1992), consuming alcohol (Zhang & Shrum, 2009), or going shopping (Kurt, Inman, & Argo, 2011; Luo, 2005). Indeed, a recent survey among 2000 British women (Kirkova, 2013) reports that 62 percent of female respondents spent more money when they shop with a friend compared to when they shop alone. The researchers calculated that over the course of a year, those who shop with friends spend almost £900 (approximately €1,000 or $1,200) more than what they would have done shopping alone. Does this mean that friends invariantly drive consumers to engage in disinhibited behavior, and give in to the "urge to splurge" in the face of consumption temptations? Or might there be situations in which being with friends or even merely thinking of friends or the friendships we have with them can actually *improve* self-control?

In the current paper we identify an important condition under which the frequently observed adverse effect may be reversed. Specifically, using a unique combination of controlled experiments examining overt consumer behavior and functional magnetic resonance imaging (fMRI) focusing on relevant neural substrates, we propose and show that the extent to which consumers identify a goal conflict between giving in to buying temptations on the one hand, and the perceived consequences for maintaining satisfactory relationships with close friends on the other, is a critical mediator of whether friendship reminders decrease or increase self-control. We further propose that such a conflict is most likely for consumers with a chronic, compulsive tendency for uncontrolled, disinhibited acquisition and consumption —for consumers classified as compulsive buyers. For their non-compulsive counterparts, in contrast, acts of acquisition and consumption, even incidental disinhibited ones, are perceived to be less problematic in light of their friendships and hence do not induce a goal conflict to the same extent. If anything, the

safety and comfort that friends and friendships might represent may free these consumers to occasionally 'let go a little' and disinhibit in the face of temptations.

Consequently, we propose that the degree of goal conflict that mediates the impact of (reminders of) close friendships on consumer self-control in the face of temptations will be a function of buyer compulsivity, such that reminders of friendship will *decrease* self-control when *little to no* goal conflict is identified, i.e., for non-compulsive buyers for whom acquisition and (disinhibited) consumption is generally unproblematic in light of their friendships. In contrast, reminders of friendship will *increase* self-control when such a goal conflict *is* likely, i.e., for compulsive buyers for whom acts of uncontrolled indulgence in response to temptations will likely conflict with their goals of maintaining satisfactory friendship relationships. Hence, we propose a crossover interaction between reminders of friendship and buyer compulsivity on perceptions of conflict and on subsequent consumer self-control exertion, with goal conflict perceptions mediating the impact of the friendship × compulsivity interaction on self-control. Hence, formally, we propose a moderated mediation model for when and why friendship reminders may hamper or aid consumer self-control.

Please note that our reasoning hinges on the salience of a goal conflict between indulgent consumption on the one hand, and the goal of maintaining satisfactory friendship relationships on the other. That implies that such a conflict (or lack thereof) can in principle be triggered by any juxtaposition, real, imagined, concrete or more abstract, between the concept of indulgent consumption on the one hand, and the concept of close friendship, on the other. Consequently, in our studies, we will induce both notions using indulgent spending reminders and friendship reminders. We will use a variety of methods, involving the real and/or imagined presence of close others in temptation contexts as well as relying on more abstract reminders of the goal of

close friendships in such contexts. We contend that it adds to the robustness of our findings if we show consistent effects in the expected directions across these various manipulations.

The next sections elaborate on our reasoning in more detail.

2. Conceptual Framework

2.1. The role of conflict identification in self-control

The exertion of self-control in the face of temptations has been conceptualized as the outcome of a "tug-of-war" or conflict between two opposing forces: impulse strength and inhibition strength (Hofmann, Friese & Strack, 2009). That is, self-control is exerted when there is a conflict between a strong hedonic impulse to satisfy the short-term goal of indulgence on the one hand, and the strength to inhibit or restrain that impulse in the service of valued longer-term goals on the other. For example, a consumer may identify a conflict between the acute desire for another pair of expensive, fashionable shoes and the long-term goal to save money. Or, more germane to the present context, a consumer may experience a sense of conflict between indulging in self-centered binge-consumption or overspending on the one hand, and maintaining good and fulfilling social relationships with close others who might perceive this behavior as disturbing and hence a threat to the relationship, on the other. Self-control exertion thus consists of two critical stages: (1) the identification of a goal or response conflict between competing behavioral options, choices, goals or preferences, which is followed by (2) the implementation of an inhibitory response towards the temptation (Carver & Scheier, 1990; Myrseth & Fishbach, 2009; Strack & Deutsch, 2004). If this conflict identification results in inhibiting the impulse to

splurge and indulge, successful self-control exertion has been displayed. In contrast, when there is no perception of conflict, mere exposure to buying temptations may suffice to induce indulgence and hence the display of disinhibited acquisition and consumption (Wagner & Heatherton, 2015).

Next, to break up our reasoning, we will first argue why it is plausible to assume that friendship reminders will *reduce* perceptions of goal conflict and subsequent self-control exertion among non-compulsive consumers, followed by our argumentation for why it should *increase* these perceptions and ensuing self-control exertion among their compulsive counterparts.

2.2. Friendship reminders reduce perceptions of goal conflict and self-control among non-compulsive buyers

Non-compulsive buyers may be viewed as 'regular' or 'default' consumers (to the extent that there is such a phenomenon). To argue why friendship reminders might reduce perceptions of a goal conflict and subsequent self-control exertion among these consumers, we draw on several literatures. First, research on the facilitating effects of others on consumption has largely focused on (over)eating, alcohol consumption and substance use and abuse (e.g., Howland, Hunger, & Mann, 2012; Wagner & Heatherton, 2015). The most prolific literature has accumulated in the food consumption domain (e.g., DeCastro, 1997; Clendenen, Herman, & Polivy, 1994; Herman, 2015; Hetherington, Anderson, & Norton, 2006; Salvy et al., 2007). This literature shows consistently that, compared to being alone, food consumption tends to be higher when one is in the real or imagined presence of others (see DeCastro, 1997; Herman, 2015, for

reviews). Only a small subset of studies has focused on distinguishing between those others either being friends or strangers (see Herman, 2015, for an overview). Strikingly, these studies suggest that while in the presence of strangers people sometimes tend to eat less, they typically eat *more* when in the presence of friends (e.g., Clendenen et al., 1994; Salvy et al., 2007). This research resonates well with work by Wilcox and Stephen (2013) who found that consumers focusing on close friends (strong ties) in an online social media environment showed lower self-control than consumers focusing on mere acquaintances (weak ties).

These facilitating, disinhibiting effects of the presence of friends on food intake have been attributed to (lack of) impression management concerns: while the presence of strangers or acquaintances might sometimes motivate one to control food intake so as not to communicate an undesirable impression, the safety and comfort that close friends and friendships represent typically frees the consumer from any such concerns and hence effectively reduces any self-control motivation. By implication, if such concerns play less of a salient role, then there is no ground to infer that an (incidental) act of indulgence in the face of temptations will evoke a strong goal conflict in the consumer when in the real or imagined presence of friends. Rather, even mere exposure to consumption temptations may then promote more disinhibited indulgence as previous research on self-control suggests (see Wagner & Heatherton, 2015, for an overview). Hence, to the extent that perceiving such a conflict is a necessary and sufficient antecedent of self-control, we should thus observe less self-control in non-compulsive buyers when friendship reminders are salient.

2.3. Friendship reminders increase perceptions of goal conflict and self-control among compulsive buyers

For compulsive consumers, the role of friendship reminders is posited to be opposite to the former case. Compulsive buying involves an overpowering urge to indulge and systematic failure to curb that urge, leading to chronic, disinhibited, uncontrolled, excessive buying 'binges' of consumer goods (Dittmar, 2005; Faber & O'Guinn, 2008; Müller, Mitchell, & De Zwaan, 2015). The tail of the compulsive buying distribution has been deemed so problematic that it has made it as an entry as part of the obsessive-compulsive and related disorders in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V, 2013). Indeed, buying compulsivity is frequently part and parcel of a more generalized obsessive-compulsive pathology involving a chronic, more generic impairment in inhibiting prepotent responses across a variety of domains including hoarding, (binge) eating and substance use (Müller et al., 2015). While estimates vary, some studies suggest that the prevalence of consumers who are classified as compulsive buyers may be as high as 16 per cent of the general population (Dittmar, 2005; Faber & O'Guinn, 1992; Friese, 2000; Müller et al., 2015; Ridgway, Kukar-Kinney, & Monroe, 2008).

That such behavior is disturbing and problematic has not escaped compulsive buyers themselves. Indeed, these consumers frequently experience post-purchase guilt (Valence, d'Astous, & Fortier, 1988) and/or regret after engaging in acts of compulsive buying (Faber & O'Guinn, 1992). They go to great lengths trying to keep their behavior and purchases secret from close others whom they suspect might be able to infer that their acquisitions are the product of a compulsive disorder (Friese, 2000; O'Guinn & Faber, 1989). These observations signal that impression management concerns toward one's close others may play a profound role in the buying and consumption decisions of compulsive buyers. More importantly, to the extent that these 'close others' are close friends, the strength of those concerns is likely much larger than for

non-compulsive buyers. But why would compulsive buyers' concerns focus particularly on their close friendships? The literature suggests several grounds to infer that the origins of these concerns may well lie in compulsive buyers' perceiving their own disinhibited behavior as a direct threat to maintaining and consolidating these valued social relationships. First, in contrast to other types of close relationships, such as those with family members, friendships are not a given, but are *optional* (Chopik, 2017). Hence, the relationship exists as long as it is mutually beneficial, but may be terminated when it ceases to be. Particularly for (young and adult) consumers with a compulsive disorder, this is a daunting, yet realistic prospect (e.g., Borda et al., 2013), making the display of disinhibited acquisition and/or consumption in the real or imagined presence of friends not safe and comfortable but threatening and problematic. Second, research shows that displays of compulsivity may indeed undermine friendship bonds as compulsive individuals tend to experience substantial problems making and keeping friends (Borda et al., 2013; Torres, Cruz, Vicentini, Lima, & Ramos-Cerqueria, 2016). Third, these findings converge with additional research from the perspective of these friends, which shows that they indeed perceive displays of disinhibited, uncontrolled behaviour as problematic, reducing perceptions of interpersonal reliability and trustworthiness (Righetti & Finkenauer, 2011). Hence, displays of buying compulsivity are not only an imagined, but also a *real* threat to maintaining close and fulfilling social relationships.

Against this backdrop it makes sense to assume that impression management concerns may play an important role in the behavioural regulation of compulsive buyers. Moreover, these concerns will mainly be targeted towards one's close friends, rather than strangers or acquaintances with whom a relationship goal is less at stake, and for whom the display of uncontrolled behaviour may be deemed less diagnostic of an underlying pathology. Given the

possible adverse consequences for their long-term friendships, compulsive buyers will thus perceive a more pronounced goal conflict between indulging in self-centered binge-spending on the one hand, and maintaining good, fulfilling social relationships with close others on the other.

In sum and in contrast to non-compulsive buyers, compared to a stranger, acquaintance or an alone condition, a friendship reminder condition —either by being in the physical or psychological presence of a close friend or by being reminded of a strong friendship with a close friend— will engender increased perceptions of goal conflict in the compulsive consumer. To the extent that such goal conflict is a necessary and sufficient antecedent of self-control, we should thus observe more self-control in response to buying temptations in compulsive buyers when friendship reminders are salient.

2.4. Contributions

The current research aims to contribute to the literature in six ways. First, we replicate and extend past findings by forwarding and testing a theory-based self-regulatory account of when and why friendship reminders increase or decrease consumer self-control. In so doing, we reconcile conflicting findings on the self-regulatory effects of (close) others, which have sometimes pointed to their facilitating and sometimes to their inhibiting impact on product acquisition and consumption. More specifically, while previous research has mainly focused on conditions where friendship cues decrease self-control and increase indulgence, the present work highlights that this is only half the story, and that there are specific conditions where such cues may actually foster self-control and curb the desire to indulge. Moreover, we pinpoint when and why both types of effects may occur and so not only replicate past findings in an as yet untested

"theatre of operations" —the urge to buy consumer products—but also extend previous research by demonstrating the beneficial effects of such cues to enhance consumer self-control, particularly among chronically vulnerable consumers, —those high in buying compulsivity. Furthermore, the present research is the first to propose and systematically test the underlying process responsible for the harmful vs. beneficial impact of such friendship cues on consumer self-control, —the extent of experienced goal conflict between giving in to buying temptations on the one hand, and the perceived consequences for maintaining satisfactory relationships with close friends on the other.

Second, we also extend the literature on social facilitation and inhibition by adopting a more generic lens. More in particular, while previous research has mainly focused on the role of physical presence of other consumers, our perspective moves beyond that by proposing that such physical presence of friends (or strangers/ mere acquaintances) is not a necessary precondition for observing an impact on (lack of) self-control, but a mere instance of a more general phenomenon, i.e., the notion that the postulated effects may extend to *any* cue, physical or imaginary, concrete or more abstract, that may signal the superordinate goal of maintaining satisfactory friendship relationships to the target consumer. Hence, our work bridges the gap between "classic" studies in social facilitation (and inhibition) and more recent work on consumer goal activation and goal pursuit. Thus, in our studies, we employ a variety of manipulations to remind our participants of the goal of friendship. In addition to the physical presence of one's close friend, we identify the *imagined* presence of one's close friend and actively thinking about friendship per se to yield comparable effects and so demonstrate the robustness of our notions across tasks and manipulations. Moreover, the extension to *any* cue activating the notion of friendship opens new doors to possibly effective (marketing)

interventions to promote consumer resilience in the face of buying temptations. That is, these interventions need not necessarily be limited to the physical presence of one's friends, but also interventions that focus on other cues to activate the representation of the friendship goal may be considered, such as (online and offline) advertising depicting (symbols of) friendship, or imagery-evoking messages about the value of friendship.

Third, we extend the literature on consumer self-control by zooming-in on a particular, yet largely neglected form of chronically impaired consumer self-control –compulsive buying. That is, buying compulsivity, while sometimes being part of a wider spectrum of obsessive compulsive disorders (Müller et al., 2015), has received some —mainly phenomenological— research attention (e.g., Black, 2011; O'Guinn & Faber, 1989), but has to our knowledge not figured prominently in the burgeoning field of consumer self-regulation, which has focused predominantly on the role of consumer goal pursuit and state self-control. That is all the more striking given the high prevalence of the phenomenon in the general population (Ridgway et al., 2008). However, the specific dimensionality of the construct, comprising both experiencing sudden excessive urges to engage in binge spending, combined with a chronic impairment in inhibiting these impulses, yields a "unique testing ground" for examining the dynamics of self-regulation in consumer behavior.

Fourth, our focus on consumers classified as compulsive buyers yields insights with clear practical and managerial implications. That is, our research highlights being reminded of friendship as a condition under which compulsive buyers are better able to respond with self-control to buying temptations, which may provide tools to therapists, public policy makers and marketing practitioners concerned with consumer well-being. For instance, interventions based on fairly simple friendship reminders (e.g., a photo of a close friend in one's wallet, an imagery

provoking message about the value of friendship) may suffice to improve the self-regulatory performance of consumers who are typically viewed as being chronically challenged when it comes to self-control. Indeed, our work shows the potential for these relatively easy-to-implement and cost-efficient approaches to reduce this type of dysfunctional consumption behavior and as such could complement more intensive and structural forms of treatment, such as those that rely on psychotherapy. On the other hand, our work also shows the power of such simple friendship reminders in marketing efforts aimed at 'regular', non-compulsive consumers, where such cues may actually foster an increased purchase and consumption tendency.

Fifth, we add to the consumer behavior literature by employing a triangulation approach. That is, we aim to seek support for our main hypothesis —the extent to which consumers identify a goal conflict underlies when and why reminders of friendship help or hurt self-control—by demonstrating, then replicating and subsequently also explaining, the proposed crossover interaction between friendship reminders and buyer compulsivity, while ruling out alternate explanations (i.e., the role of social relationships per se and non-social yet positive circumstances). In so doing, we rely on self-report, overt behavior, and fMRI indices of self-control exertion and we use two distinct measures of buyer compulsivity, four different indicators of goal conflict identification, and four different friendship reminder procedures. Finally, we rely on a scenario procedure, a Stroop task and Go/No-go tasks as prevalidated paradigms to test our propositions. Using this plethora of studies, measures and tasks contributes to the robustness of our findings.

Finally, a major contribution of the present work is the focus on behavioral data on the one hand and their neural underpinnings using fMRI on the other. The use of fMRI is relatively new in consumer science (see for recent applications Berns & Moore, 2012; Couwenberg et al.,

2017; Hedgcock & Rao, 2009; Hedgcock, Vohs, & Rao, 2012; Yoon et al., 2006, 2012) and allows the identification of cerebral activation in areas that have been reliably associated with the identification of conflict (the anterior congulate cortex; ACC; Kerns et al., 2004; MacDonald et al., 2000) and actual self-control exertion (the dorsolateral prefrontal cortex; DLPFC; MacDonald et al., 2000). By combining more traditional behavioral methods with fMRI we respond to calls for more research on the neural substrates of consumer self-control. Indeed, to the extent that self-report data, behavioral data and neural data converge to support our notions, the present work contributes to gaining a fuller understanding of the phenomenon of consumer self-regulation. More specifically, our joint approach pinpoints the critical role of conflict identification (both using self-report and its neural –ACC–manifestation) as a necessary precursor to actual self-control exertion (witnessed in self-report indices, overt inhibition behavior and –again– its neural substrate, DLPFC activation). Such conflict identification has been all too often assumed, yet only rarely assessed in research on (consumer) self-regulation, and to the extent that it *has* received research attention, typically has been limited to self-reports, rather than the unique combination of self-report, behavioral and fMRI indices used in the present work. Moreover, our approach also adds to the literature on consumer self-regulation by highlighting "what we can do to become better at it" (Wagner & Heatherton 2011, p. 55). More specifically, our results indicate how simple contextual cues reminding consumers of their friendships can boost self-control, even among chronically challenged consumer segments. As such our findings resonate well with recent "situated cognition" approaches to fostering self-control (see Schwarz, 2006; Fennis, 2017, for an overview). That is, rather than relying on extensive training to improve chronic self-control, the choice context itself harbors simple cues, nudges or heuristics that shift consumer cognition, judgment and choice in the direction of more

self-control and so promotes conditions where more impulsive behaviors need not invariantly be considered indulgent and harmful, but instead can be beneficial and fostering well-being.

2.5. Overview of studies

Five studies examine how friendship reminders affect self-control in both compulsive and non-compulsive buyers. Our main hypothesis is that the extent to which consumers identify a goal conflict mediates the impact on self-control of being reminded of friendship on the one hand and buyer compulsivity on the other. We dissect our main hypothesis across five studies, focusing on the main constituent parts and relations using a variety of validated measures and paradigms in Studies 1-3 and ultimately integrating our findings in Studies 4 and 5.

More specifically, the first study is a behavioral experiment designed to investigate the effect of friendship reminders on self-control by assessing the actual, overt extent to which compulsive and non-compulsive consumers are able to inhibit the impulse to approach tempting products. Study 2 shows that the hypothesized effect only occurs with friendship reminders, and not with acquaintances or positive circumstances in general, thus ruling out mere presence of others and mood as alternative explanations. It moreover shifts the focus from inhibition to impulse by zooming-in on acutely experienced product desire as a particularly marketing-relevant dimension of self-control. Study 3 builds on the previous findings by measuring self-control exertion in the real physical presence of either a close friend, or a stranger, or when alone. In Studies 4 and 5, we focus on the role of the proposed underlying mechanism driving the effects: the extent of experiencing a goal conflict and its implications for exerting inhibitory control. Specifically, in Study 4 we test our key postulate that friendship reminders are more

likely to induce goal conflict for compulsive than for non-compulsive buyers. Moreover in this study we directly test the proposed moderated mediation model —that goal conflict perceptions mediate the impact of the friendship × compulsivity interaction, such that salient conflict perceptions mediate the impact on self-control for compulsive buyers more than for non-compulsive buyers. Finally, in Study 5 we study both self-control stages together by addressing the neural correlates of goal conflict identification and control exertion in an fMRI experiment.

Note that in our studies we will focus on both sides of the "tug-of-war" of self-control. That is, Studies 2 and 4 will focus on impulse strength by assessing the extent to which consumers experience a strong impulse or desire to engage in unplanned buying. In contrast, Studies 1, 3, and 5 will focus on the inhibition strength by assessing the ability to suppress an impulse and hence the ability to inhibit a prepotent response.

3. Study 1

We started by investigating the substantive phenomenon in a behavioral experiment. This allowed us to examine the observable behavioral impact of friendship reminders on consumers' ability to implement self-control. In doing so, we used a buying temptations-specific Go/No-go task, a pre-validated measure of consumer self-control exertion (Batterink, Yokum, & Stice, 2010; Mishra & Mishra, 2010; Newman, Widom, & Nathan, 1985). The task is based on the notion that successful self-control exertion manifests itself in the ability to inhibit a prepotent approach response towards consumption temptations.

If our hypothesis that being reminded of a strong friendship with a close friend may decrease self-control for non-compulsive buyers while increasing it for compulsive buyers is

correct, then non-compulsive buyers should show *more* while compulsive buyers should show *fewer* inhibition failures towards buying temptations when reminded of friendship compared to when they are not. In sum, we expect a crossover interaction between friendship reminders and buyer compulsivity on self-control exertion.

3.1. Participants and design

To warrant a sample size of at least twenty participants per cell (cf. Simmons, Nelson, & Simonsohn, 2011), we recruited 69 undergraduate students that participated in exchange for money or partial course credit. Given that around 90 percent of compulsive buyers are female (Dittmar, Long, & Bond, 2007), only women were invited. Also, in anticipation of the fMRI experiment performed in Study 5 in which all participants should be right-handed, we chose to minimize potentially confounding factors by including only right-handed participants. Two participants were excluded from further analysis. One of them did not comply with experimental instructions, while the other reported an extremely negative mood. This resulted in an effective sample of 67 participants (mean age 19.81 years, *SD* = 1.69; matching the onset age of compulsive buying; Black, 2007). The experiment employed a design with one between-subjects factor (friendship reminder present vs. absent), and measured individual differences in compulsive buying tendency as a continuous moderator.

3.2. Procedure

Upon arrival at the laboratory, participants were randomly assigned to one of two conditions. After signing an informed-consent form, they were individually seated in cubicles. Computer instructions told them that the experiment consisted of several unrelated tasks. The first task involved the reminder of friendship manipulation, using an established mindset activation procedure (Stillman, Tice, & Fincham, 2009; Zhang & Shrum, 2009). In line with Sullivan's (1953) definition of friendship, participants in the friendship reminder condition were asked to describe a situation in which they felt strong friendship with a close, same-sex friend. In the control condition, participants were asked to describe the manufacturing process of a wooden table. All participants were asked to write at least four sentences and to be as accurate as possible in their description. In the friendship condition, participants were required to use the words: *we, together, friendship* and *bond*. In the control condition, the words *trees, wood, sawmill* and *truck.*

Immediately following the friendship reminder procedure, all participants participated in a Go/No-go task (see next for a detailed description). This task was presented as a speed/accuracy test and designed to measure participants' self-control exertion by assessing their ability to inhibit prepotent approach responses towards buying temptations. Next, participants completed the compulsive buying scale developed by Faber and O'Guinn (1992), a 7-item scale with items including: "I bought things even though I couldn't afford them," and "I felt others would be horrified if they knew of my spending habits," ranging from (1) *never/strongly disagree* to (5) *very often/strongly agree*. We used the average score as an indicator of compulsive buying tendency (M = 1.87, SD = .58; $\alpha = 0.7$) with higher scores indicating higher buying compulsivity. Finally, in order to verify that participants in the friendship reminder condition felt close to the friend, they responded to: "How close is the bond between you and the

friend you wrote about?" and "How close are you to this friend?" Both items ranged from (1) *not close at all* to (7) *very close* and were averaged (r = 0.8) into an indicator of friendship closeness.

3.3. Dependent measure

The main variable of interest was participants' ability to exert self-control, measured by the number of failures to inhibit prepotent approach responses towards attractive clothing items on a buying temptations-specific Go/No-go task. The Go/No-go task is an established measure of self-control exertion in the consumption domain (Batterink et al., 2010; Mishra & Mishra, 2010) and requires participants to perform a speeded behavioral response on Go trials (by pushing the / key), while inhibiting a behavioral response on No-go trials (by refraining from pushing the / key). While Go trials expose participants to neutral stimuli, No-Go trials typically involve exposing participants to tempting stimuli, for which inhibiting the approach response is relatively effortful. To be able to reliably assess inhibitory control, a large number of trials is required, with a large majority of Go (rather than No-go) trials. This standard procedure warrants that behavioural responses on the Go trials become maximally incongruent with the inhibition of those responses on the No-Go trials, which increases the sensitivity of the task to pick-up on inhibition failures. The much smaller number of No-Go trials prevents the inhibition response itself to become habitual and hence prepotent. To be comparable to the task used in the fMRI study (Study 5), we followed Batterink et al. (2010) who, for their fMRI study, used 96 trials with three times more Go than No-go trials. Hence, in the present study, 75% of our trials were Go-trials where participants responded to pictures of neutral products of a typically non-hedonic, non-branded, non-luxurious, utilitarian nature. For these we followed Dittmar and Drury (2000)

who identified basic, non-branded furniture as satisfying these criteria. In contrast, the remaining 25% were No-go trials, consisting of pictures of buying temptations of a more hedonic, luxury nature (for which inhibiting the approach response is likely more effortful, see Wagner & Heatherton, 2015). Following Dittmar and Drury (2000) we selected clothing items like dresses, jewelry and high-heeled shoes as products that typically possess these attributes. By refraining from responding in the No-go trials, participants thus had to inhibit the impulse to respond to attractive clothing stimuli, thus exerting self-control. We expected compulsive buyers to have greater difficulties with this than non-compulsive buyers, given their problems with chronic impulse inhibition (Ridgway et al., 2008).

Trials were presented for 500 ms. Each trial was followed by a 500 ms inter-trial interval, showing a fixation cross that appeared directly after the participant's response. In case of non-response, the fixation cross appeared automatically 750 ms after stimulus presentation. Trials were presented in pseudo-randomized order, such that pictures of clothes appeared after one, two or three pictures of furniture. The total number of failures to inhibit responses to No-go (clothing) items served as our measure of self-control, with lower numbers indicating a greater ability to inhibit approach responses to buying temptations. That is, a greater capacity to exert self-control.

3.4. Results and discussion

3.4.1. Friendship closeness

An one-sample t-test using the scale's mid-point (i.e., 4.0) as a benchmark confirmed that participants in the friendship condition indeed wrote about a strong friendship with a close friend (M = 5.83; SD = 0.85; $t(38) = 13.42$, $p < .001$).

3.4.2. Inhibition failures

After standardizing the compulsive buying tendency measure, we performed a regression analysis (Hayes 2013; Process Model 1) on participants' total number of failures of inhibition with the friendship reminder procedure (0 = control, 1 = friendship), compulsive buying tendency, and their interaction as predictors. This analysis showed a significant main effect for compulsive buying tendency (B = 2.14, SE = 0.75, $t(65) = 2.85$, $p < .01$), such that higher compulsivity yielded more inhibition failures, thus aligning the present findings with previous research on buying compulsivity (Ridgway et al., 2008). There was no main effect of the friendship reminder procedure (B = 0.10, SE = 0.69, $t < 1$, NS). More importantly, the expected crossover interaction between the friendship reminder procedure and compulsive buying tendency was significant (B = -2.55, SE = 0.84, $t(65) = -3.05$, $p < .01$). Additional simple slope analyses to probe the interaction indicated that –in line with predictions– for non-compulsive buyers (evaluated at -1 SD from the mean), the friendship reminder *increased* the number of inhibition failures made compared to the control condition and hence decreased self-control (B = 2.65, SE = 0.98, $t(65) = 2.70$, $p < .01$), thus replicating past research. In contrast, and as predicted, for compulsive buyers (evaluated at +1 SD from the mean), the friendship reminder *decreased* the number of inhibition failures made compared to the control condition and hence

increased self-control (B = -2.46, SE = 1.17, $t(65)$ = -2.09, $p < .05$; Johnson-Neyman values: -0.55, 0.91, respectively; see Figure 1) [1].

3.4.3. Discussion

Study 1 showed that compulsive buying tendency is positively related to failures of inhibition, supporting our suggestion that compulsive buyers show impaired inhibition of prepotent approach responses and hence are relatively low in self-control when exposed to buying temptations, i.e., attractive clothing items in the present case. Importantly, however, when compulsive buyers were asked to remember a situation where they experienced a strong friendship with a close friend, their ability to inhibit these approach responses to buying temptations increased. That is, reminding compulsive buyers of friendship enhanced their capacity to exert self-control. In contrast, and in line with our expectations based on existing findings, friendship reminders decreased the self-control of 'regular,' non-compulsive buyers. Hence, Study 1 provides evidence in favor of our hypothesis that in the face of consumption temptations, friendship reminders decrease self-control for non-compulsive buyers, but increase self-control for consumers classified as compulsive buyers.

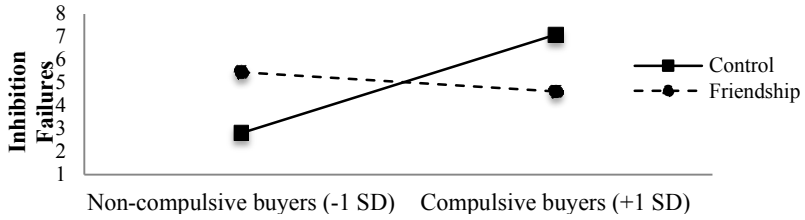


Figure 1. Failures of inhibition as a function of friendship reminder and compulsive buying tendency

[1] Using average response latencies on the No-go trials as dependent variable yielded similar results. The expected crossover interaction between the friendship reminder procedure and compulsive buying tendency was significant (B = -0.04, SE = 0.01, $t(63)$ = -3.33, $p < .01$). Non-compulsive buyers (-1 SD from the mean) showed higher response latencies in the friendship reminder (M = 0.09 sec) compared to the control condition (M = 0.04 sec; B = 0.05, SE = 0.01, $t(63)$ = 3.19, $p < .01$), suggesting lower self-control when reminded of friendship. Conversely, compulsive buyers (+1 SD from the mean) showed lower response latencies in the friendship reminder (M = 0.07 sec) compared to the control condition (M = 0.10 sec; B = -0.04, SE = 0.02, $t(63)$ = -2.08, $p < .05$), suggesting higher self-control when reminded of friendship.

4. Study 2

Study 2 was designed to examine whether the proposed effect is indeed a function of reminders of friendship, excluding mere acquaintances or generally positive circumstances as alternate explanations for the effect. Moreover, while the previous study focused on the ability to inhibit a prepotent approach response towards buying temptations, we extended the previous findings by focusing on the impulse-strength side of the "tug-of-war" between the opposing forces of self-control and assessed experienced acute purchase desire.

4.1. Method

4.1.1. Participants and design

One hundred thirty-four students (59.7% male; mean age 19.76 years, *SD* = 1.93) participated in return for partial course credit. The study employed a single factor (friendship reminder: close friend vs. acquaintance vs. positive event) between-participants design with compulsive buying tendency as a continuous moderator.

4.1.2. Procedure

After signing an informed-consent form, participants were randomly assigned to one of three conditions. All participants read a hypothetical shopping scenario adapted from Rook and Fisher (1995). They were asked to imagine a situation in which they went to a department store to purchase a pair of socks but once in the store saw a great looking pair of jeans on sale.

Participants in the close friend condition were asked to imagine being accompanied by a close friend while shopping, participants in the acquaintance condition by an acquaintance and participants in the non-social, positive event condition were asked to imagine that they had just heard that they passed an exam with a good grade. More specifically, in the close friend and acquaintance conditions, the scenarios read:

> *"Imagine you are a college student with a part-time job. You've got an outdoor party this weekend and still need to buy a pair of warm socks. After work, you go together with a close friend [vague acquaintance] to a department store to purchase the socks. As you and your close friend [vague acquaintance] are walking through the store, you see a great looking jeans on sale. You've got already sufficient jeans, but it's your favorite brand and it's a good offer."*

In the positive event condition the scenario read:

> *"Imagine you are a college student with a part-time job. You've got an outdoor party this weekend and still need to buy a pair of warm socks. After work, you hear that you passed an important exam with a good grade. You go to a department store to purchase the socks. As you are walking through the store, you see a great looking jeans on sale. You've got already sufficient jeans, but it's your favorite brand and it's a good offer."*

We then measured purchase desire by: "I felt a sudden urge to buy" (1 = *not at all* to 7 = *very much*). In this and the next studies, we used a different scale to measure compulsive buying tendency than in the previous study to increase the generalizability and robustness of our

findings. Hence, participants next completed the 6 item Compulsive Buying Scale (CBS; Ridgway et al., 2008), using a 7-point scale. In this, and the subsequently reported studies we used the sum score (M= 20.97, SD = 6.65; α = 0.7) as an indicator of compulsive buying tendency with higher scores indicating higher buying compulsivity.

4.2. Results and discussion

4.2.1. Purchase desire

After standardizing the compulsive buying measure, we performed a regression analysis (Hayes & Preacher, 2014; Process Model 1) on purchase desire with the friendship reminder procedure (dummy coded, positive event condition being the reference category), compulsive buying tendency, and their interaction as predictors. Although there was no main effect of the friendship reminder procedure (B_{acq} = 0.16, SE = 0.24, $t(128)_{acq}$ = 0.65, NS; B_{friend} = -0.19, SE = 0.25, $t(128)_{friend}$ = -0.77, NS), the impact of compulsive buying tendency was significant (B = 1.19, SE = 0.17, $t(128)$ = 6.99, $p < .0001$), indicating that higher levels of compulsive buying yielded stronger acute purchase desires.

More importantly, while the interaction between the presence of a friend (vs. acquaintance) and compulsive buying tendency did not reach significance (B = -0.36, SE = 0.26, $t(128)$ = -1.39, NS), we did find significant interaction effects between the presence of a friend (vs. positive event) and compulsive buying tendency (B = -0.96, SE = 0.26, $t(128)$ = -3.65, $p < .001$) and between the presence of an acquaintance (vs. positive event) and compulsive buying tendency (B = -0.60, SE = 0.23, $t(128)$ = -2.54, $p < .05$).

In line with our expectations and previous research, for non-compulsive buyers (-1 SD from the mean) the presence of a friend *increased* acute purchase desire relative to the positive event condition (B = -0.77, SE = 0.38, $t(128) = 2.03$, $p < .05$). The difference between the acquaintance and positive event condition was also significant (B = 0.76, SE = 0.33, $t(128) = 2.33$, $p < .05$), while the difference between friend and acquaintance was not ($t < 1$). Conversely, for compulsive buyers (+1 SD from the mean) the presence of a close friend *reduced* acute purchase desire relative to the positive event (B = -1.16, SE = 0.35, $t(128) = -3.34$, $p < .05$) and acquaintance condition (B = -0.71, SE = 0.35, $t(128) = -2.01$, $p < .05$). Moreover, as proposed, the presence of an acquaintance did not reduce purchase desire relative to the positive event condition (B = -0.45, SE = 0.35, $t(128) = -1.26$, NS; see Figure 2).

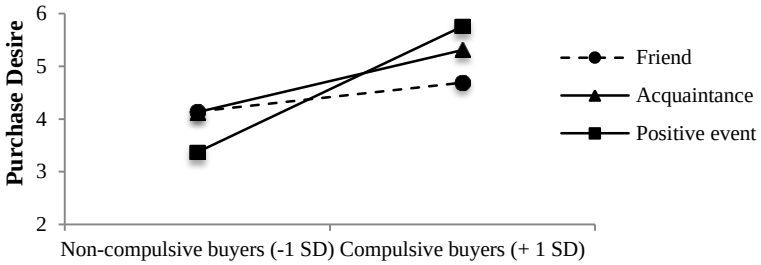


Figure 2. Purchase desire as function of friendship reminder and compulsive buying tendency

4.2.2. Discussion

Study 2 shows that for compulsive buyers the presence of a close friend reduces purchase desire compared to when they are in the presence of an acquaintance or under non-social but positive circumstances. The presence of an acquaintance did not produce the same effect as a close friend for compulsive buyers, confirming the importance of friendship reminders rather than social relationships per se. Also in line with our expectations, the presence of a friend did not reduce, but enhanced acute purchase desire for non-compulsive buyers compared to the

positive event condition, although the present study did not observe a difference between friends and acquaintances for non-compulsive buyers.

5. Study 3

Study 3 extended on the friendship reminder manipulation by assessing self-control exertion in the real physical presence of a close friend. To rule out that any effects could be attributable to the mere presence of any person, rather than a close friend, we included a condition with the physical presence of a stranger as a control condition. Compared to being alone, we expected to replicate the previous results that non-compulsive buyers would show *reduced* and compulsive buyers *enhanced* self-control exertion in the company of a close friend.

In addition, the present and following studies extend the previous studies by making the connection with the presumed underlying process: the extent of conflict identification underlying the exertion of self-control. To this end, we relied on an established paradigm in the present study. More specifically, to assess whether the postulated effects of friendship reminders and buying compulsivity are limited to, or might extend beyond, the product purchase domain, we used a more generic well-established task assessing intentional self-control exertion as a function of conflict identification —a Color Word Stroop Task (Fennis, Janssen, & Vohs, 2009; Muraven, Shmueli, & Burkley, 2006; Webb & Sheeran, 2003; see next for details). If compulsive buying is indeed typically part of a more general obsessive-compulsive disorder, involving impairment in inhibiting prepotent responses across multiple domains (DSM-V, 2013; Müller et al., 2015), and if for these consumers friendship reminders indeed promote perceptions of conflict in self-control situations, then we should observe facilitated conflict detection in the presence of a close

friend, even on a task that reaches beyond the buying sphere. Please note that such facilitated conflict detection should translate in *faster* response latencies (i.e., reduced interference) without making more errors on tasks requiring conflict identification (Harris, Harris, & Miles, 2017)"

5.1. Method

5.1.1. Participants and design

One hundred thirty undergraduate female students (mean age: 19.35 year, *SD* = 1.71) participated in the present study in return for money or partial course credit. Only female participants were recruited for the same reasons as Study 1. The experiment employed a single factor (friendship reminder: alone vs. stranger vs. close friend) between-participants design with compulsive buying tendency as a continuous moderator.

5.1.2. Procedure

Participants were asked to bring a close, same-sex friend to the lab. Pairs of friends randomly assigned to the alone condition were split and seated alone in a room, whereas pairs of friends assigned to the close friend-condition were seated together. Pairs of friends randomly assigned to the stranger condition were split and combined with an unacquainted participant from another pair of friends. All participants were seated behind a computer, with pairs of participants seated opposite to each other, not able to watch each other's responses. Participants were instructed to not talk to each other. These procedures warranted that any effects found were attributable to the mere physical presence of a close friend (rather than anyone) and not a

function of the other person acting as an exemplar, inducing behavioral contagion, or a source of distraction.

Instructions on the computer screens told participants they would participate in several unrelated tasks. The first task comprised our dependent variable of interest, participants' ability to implement self-control as measured by a Color Word Stroop Task (Fennis et al., 2009; Muraven et al., 2006; Webb & Sheeran, 2003). Participants received 32 randomized trials. On each trial a stimulus word was presented in a font color that was either congruent or incongruent with its semantic meaning, e.g., the word 'blue' presented in blue font (congruent), or in red font (incongruent). Of all trials 8 were congruent and 24 were incongruent. Participants were required to identify the font color in which the words were printed, by clicking as quickly as possible one of four buttons on their computer screen. The task presents participants with a response conflict between font color and task instruction on the incongruent trials only. Responding to the incongruent trials, one thus has to inhibit one's impulse to choose the semantic meaning of the word, rather than its font color, requiring conflict identification and intentional self-control exertion.

In line with previous research, we used the average response latencies on the incongruent trials as our main dependent measure of self-control exertion as a function of conflict identification, with lower response latencies indicating greater self-control exertion ability through improved conflict detection (Fennis et al., 2009; Harris et al., 2017; Muraven et al., 2006; Webb & Sheeran, 2003). Following the Stroop task, participants completed the CBS (M = 24.25, SD = 6.67; α = 0.8; Ridgway et al., 2008). Last, as a manipulation check, participants in the friend and stranger conditions indicated how long (in months) and how well they knew the other person in the room (1 = *not at all* to 7 = *very well*).

5.2. Results and discussion

5.2.1. Manipulation check

Confirming the effectiveness of our manipulation, participants in the friend condition knew the other person in the room longer (M = 47.9 months, SD = 42.72) than participants in the stranger condition (M = 2.6 months, SD = 11.49; $t(83) = -6.71$, $p < .001$). They also indicated that they knew the other person better (M_{friend} = 5.48, SD = 1.35 versus $M_{stranger}$ = 1.47, SD = 1.28; $t(83) = -14.08$, $p < .001$).

5.2.2. Self-control exertion

After log transforming the response latencies to account for non-normality, we performed a regression analysis on the average response latencies with the friendship reminder procedure (dummy coded, alone being the reference category), compulsive buying tendency (standardized), and their interaction as predictors[2]. There were no main effects of the friendship reminder procedure ($B_{stranger}$ = 0.05, $SE_{stranger}$ = 0.03, $t(124)_{stranger}$ = 1.33, NS; B_{friend} = -0.01, SE_{friend} = 0.03, $t_{friend} < 1$, NS) and compulsive buying tendency (B = 0.04, SE = 0.03, $t(124) = 1.39$, NS). More importantly, replicating our previous findings, we found the predicted crossover interaction between the presence of a friend and compulsive buying tendency (B = -0.09, SE = 0.04, $t(124) = -2.31$, $p < .05$). For non-compulsive buyers (-1 SD from the mean), the pattern of results was in the predicted direction, although the simple slopes analyses did not reach significance (see

[2] When using the total number of inhibition failures on the incongruent trials as dependent variable, there were no main effects of the friendship reminder procedure (all t's < -1.01) nor of compulsive buying tendency ($t(124) = -1.63$, NS). There were also no interaction effects (all t's < 1.59). Please note that compulsive buyers' faster responding without them making more errors (i.e., inhibition failures on incongruent trials) in the presence of a friend indicates a net increase in self-control performance (see Harris et al., 2017).

Figure 3). That is, the presence of a close friend tended to *increase* response latencies relative to being alone (B = 0.07, SE = 0.05, $t(124)$ = 1.42, NS), as did the presence of a stranger (B = 0.07, SE = 0.05, $t(124)$ = 1.48, NS). In contrast, for compulsive buyers (+1 SD from the mean) the presence of a close friend significantly reduced response latencies relative to being alone (B = -0.10, SE = 0.05, $t(124)$ = -2.00, $p < .05$) and with a stranger (B = -0.12, SE = 0.05, $t(124)$ = -2.54, $p < .05$). The presence of a stranger did not reduce response latencies relative to being alone (B = 0.02, SE = 0.05, $t < 1$, NS).

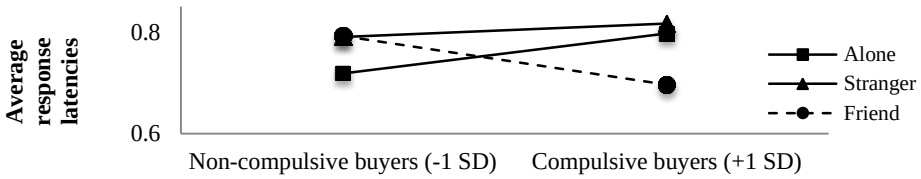


Figure 3. Average response latencies on Stroop task as function of friendship reminder and compulsive buying tendency

5.2.3. Discussion

Study 3 shows that for compulsive buyers the mere, physical presence of a close friend reduces response latencies on a Stroop Task, a well-established indicator of self-control exertion, relative to being with a stranger or alone. The presence of a stranger did not produce the same effect as a close friend for compulsive buyers, confirming the importance of friendship reminders rather than any social presence per se in the current theorizing. These results support our reasoning that friendship reminders engender increased perceptions of conflict in self-control situations, enabling compulsive buyers to display restraint and control in the real or imagined presence of a close friend, even in domains unrelated to buying and shopping. In addition, our results dovetail nicely with previous research that has established that Stroop performance is boosted when participants are reminded of important personal goals and values (see Harris et al., 2017). The present findings imply that the improved self-control ability of compulsive buyers

reminded of friendship may extend to other spheres of life beyond the purchasing domain. This is in line with the observation that buying compulsivity is frequently part of a more general obsessive-compulsive disorder, involving a chronic, more generic, domain unspecific impairment in inhibiting prepotent responses across multiple domains (DSM-V, 2013; Müller et al., 2015). As such, the present findings also attest to the potential of research in the marketing and consumer behavior domains to inform neighboring fields and disciplines.

6. Study 4

The previous study demonstrated improved self-control for compulsive buyers reminded of friendship using a Stroop Task. This task bridges the previous three studies that focused on self-control exertion with the next two that zoom-in on the role of the main concept proposed to drive our effects —conflict identification. That is, in addition to being a measure of self-control exertion, performance on a Stroop Task is typically measured on the incongruent trials, which represent a response conflict. Indeed, research in neuroscience has shown that better (i.e., faster) Stroop performance is associated with higher ACC activation, a brain area associated with conflict identification (Inzlicht & Gutsell, 2007; Kerns et al., 2004). Hence, in the following two experiments we will directly address the role of (goal) conflict identification in the relationship between friendship reminders, compulsive buying tendency and self-control. In Study 4 we test our postulate that friendship reminders will induce a higher (lower) sense of conflict between indulging in buying temptations on the one hand and the goal of maintaining satisfactory friendship relations on the other for compulsive (non-compulsive) buyers. Moreover, in this study we directly test the proposed mediating role of goal conflict identification in the

relationship between friendship reminders, buyer compulsivity and self-control exertion identified in Studies 1-3. Hence, not only do we aim to replicate the crossover interaction we systematically observed in the previous studies, we also test the proposed moderated mediation model that may account for our effects. In this study we also oscillate back to the impulse strength side of the self-control tug-of-war. In so doing, we included another, more elaborate, measure of purchase desire further corroborating the converging support for, as well as the marketing relevance of, our notions.

6.1. Method

6.1.1. Participants and design

Sixty-four undergraduate students (51.6% male; mean age 19.70 years, *SD* = 3.18) participated for partial course credit. The experiment employed a single factor (friendship reminder: close friend vs. acquaintance) between-participants design with compulsive buying tendency as a continuous individual difference variable.

6.1.2. Procedure

Participants were randomly assigned to one of two conditions. All participants read the same hypothetical shopping scenario as used in Study 2. Participants in the close friend condition were with a close friend, whereas participants in the acquaintance condition were with an acquaintance. We then asked participants to list the thoughts they had while imagining the shopping situation. Two coders blind to experimental hypotheses categorized the thought listings as either or not containing references to the identification of a goal conflict (inter-rater

agreement: 94%; all disagreement between coders was resolved by consensus), thus creating a dichotomous measure of goal conflict identification (0 = absent vs. 1 = present) per participant. Examples of references to a sense of conflict were: "I'd feel guilty" and "I'm aware that I'm giving up something else in return". We added another, more direct self-report measure of the extent of goal conflict participants perceived between giving in to the consumption temptation (i.e., buying the jeans) and maintaining the relationship with their friend/acquaintance, by asking participants: "What do you think that your friend [acquaintance] would think of it if you would buy the jeans?", ranging from *very positive* (1) to *very negative* (7). We measured participants desire to purchase by: "I experienced a sudden urge to buy", "I had a strong urge to buy impulsively", and "I felt a sudden urge to buy" (1 = *not at all* to 7 = *very much*; α = 0.9). Before participants finished the experiment by completing the CBS (M = 22.50, SD = 6.66; α = 0.7; Ridgway et al., 2008), they indicated how well they were able to imagine the described scenario (1 = *not at all* to 7 = *very much).*

6.2. Results and discussion

6.2.1. Manipulation check

An independent-samples t-test showed that participants in the close friend (M = 5.77, SD = 0.96) and acquaintance (M = 5.45, SD = 0.97) condition imagined the described scenario equally well (t(62) = -1.33, NS).

6.2.2. Goal conflict identification

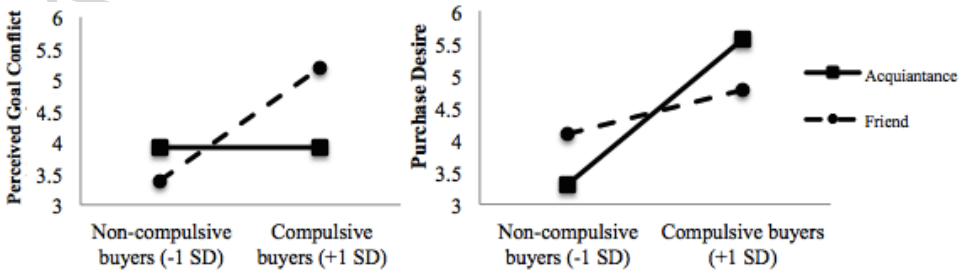
A logistic regression analysis on the dichotomous goal conflict identification measure with the friendship reminder procedure (0 = acquaintance, 1 = friend), compulsive buying tendency (standardized), and their interaction as predictors revealed no significant main effect of compulsive buying tendency (Wald < 1), but did reveal a significant main effect of friendship reminder procedure (B = 2.47, SE = 0.69, Wald = 12.94, Exp(B) = 11.79, $p < .0001$), indicating higher odds of perceiving a goal conflict with a friend than with an acquaintance. Furthermore, the interaction effect was also significant (B = 1.80, SE = 0.77, Wald = 9.36, Exp(B) = 6.06, $p < .05$), indicating that with a friend (relative to an acquaintance), a decrease in compulsive buying tendency decreased the odds of identifying a goal conflict. Also in line with our expectations, the opposite holds as well: with a friend relative to an acquaintance, an increase in compulsive buying tendency increased the odds of identifying a goal conflict.

We furthermore performed a regression analysis (Hayes, 2013; Process Model 1) on the self-report measure of the extent of perceived goal conflict with the friendship reminder procedure, the standardized compulsive buying tendency, and their interaction as predictors, showing no main effects of the friendship reminder procedure (B = 0.37, SE = 0.36, $t(60)$ = 1.03, NS) and compulsive buying tendency (B = -0.002, SE = 0.26, $t(60)$ = -0.07, NS). In line with our predictions, there was a significant crossover interaction between the friendship reminder procedure and compulsive buying tendency (B = 0.90, SE = 0.37, $t(60)$ = 2.46, $p < .05$). For non-compulsive buyers (-1 SD from the mean), although in the expected direction, the difference between the presence of a friend and acquaintance did not reach significance (B = -0.53, SE = 0.52, $t(60)$ = -1.02, NS). In contrast, and as predicted, compulsive buyers (+1 SD from the mean) who were in the presence of a friend showed a higher extent of goal conflict identification than

those in the presence of an acquaintance (B = 1.27, SE = 0.51, t(60) = 2.48, p < .05; Johnson-Neyman value 0.48).

6.2.3. Purchase desire

We performed a regression analysis (Hayes, 2013; Process Model 1) on purchase desire with the friendship reminder procedure, the standardized compulsive buying tendency, and their interaction as predictors, showing no main effect of the friendship reminder procedure (B = -0.003, SE = 0.27, t(60) = -0.01, NS), while the impact of compulsive buying tendency was significant (B = 1.13, SE = 0.19, t(60) = 5.91, p < .001), indicating that higher levels of compulsive buying tendency yielded higher purchase desire. In line with our hypotheses, we replicated our basic finding as the crossover interaction between the friendship reminder procedure and compulsive buying tendency was also significant (B = -0.79, SE = 0.27, t(60) = -2.89), p < .01). Confirming our hypotheses, for non-compulsive buyers (-1 SD from the mean), the presence of a friend *increased* purchase desire relative to the presence of an acquaintance (B = 0.78, SE = 0.38, t(60) = 2.04, p < .05). Conversely, for compulsive buyers (+1 SD from the mean) the presence of a friend *decreased* purchase desire relative to the presence of an acquaintance (B = -0.79, SE = 0.38, t(60) = -2.07, p < .05; Johnson-Neyman moderator values -0.96, 0.94 respectively; see Figure 5).



Figures 4-5. Perceived goal conflict and purchase desire as function of friendship reminder and compulsive buying

6.2.4. Moderated mediation

To assess whether the impact of the interaction between friendship reminders and compulsive buying tendency on purchase desire is indeed mediated by the extent of identified goal conflict for more compulsive consumers as we hypothesize, we performed a moderated mediation analysis (Hayes, 2013; Muller, Judd, & Yzerbyt 2005; Process Model 8) using the continuous measure of perceived goal conflict as proposed mediator[3]. A bootstrapping procedure with 5000 re-samples showed a significant overall index of moderated mediation, as the 95% confidence interval of the indirect effect did not include zero: [0.005, 0.51]. Further analysis showed that, in line with the non-significant findings on (self-reported) perceived goal conflict for non-compulsive buyers (at -1 SD from the mean), the mediation analysis did not reach significance for non-compulsive buyers [-0.47, 0.08]. In contrast, for compulsive buyers (at + 1 SD of the mean), the impact of the friendship reminder on purchase desire was indeed mediated by the extent of goal conflict identification as the confidence interval did not include zero [0.004, 0.71].

6.2.5. Discussion

These findings provided evidence for our key postulates that reminders of friendship in the context of buying temptations are more likely to induce the identification of a goal conflict for compulsive than for non-compulsive buyers. We again found the predicted crossover interaction, not only on our measure of self-control exertion (experienced acute purchase desire), but also on the measures of goal conflict identification. Moreover, for compulsive buyers perceived goal conflict mediated the impact of the friendship reminder on purchase desire.

[3] We selected the continuous measure of perceived goal conflict since the dichotomous goal conflict index cannot function in a mediating role in Process' (Hayes, 2013) multiple regression-based approach.

Hence, the results of Study 4 support our hypothesis that the extent of goal conflict identification between giving in to buying temptations on the one hand and the perceived consequences for maintaining satisfactory relationships with close friends on the other, drives the impact of friendship reminders and buying compulsiveness on self-control.

7. Study 5

The goal of Study 5 was twofold. First, to study the neural correlates of friendship reminders on self-control exertion, thereby conceptually replicating the pattern of findings from the previous four studies. And second, to build upon Study 4 to find converging evidence for the role of goal conflict identification as the main driver underlying the effect of friendship reminders for (non-)compulsive consumers on self-control exertion. As such, this and the previous study replicate and extend the results of the previous three studies by showing how the extent of conflict identification underlies the crossover interaction between friendship reminders and compulsive buying tendency on self-control exertion. Moreover, the present study not only complements Study 4 in its relatively unique fMRI approach, but also in revisiting the other end of the self-control "tug-of-war" —the motivation and ability to restrain an acute impulse, i.e., the ability to inhibit a prepotent approach response toward buying temptations.

Using fMRI, conflict identification and control exertion can reliably be dissociated from each other as they rely on two separate neural systems (MacDonald et al., 2000). While consumers' conflict identification is closely associated with activation in the anterior cingulate cortex (ACC; BA's 24/32), their ability to inhibit prepotent responses and thus exert self-control is associated with the dorsolateral prefrontal cortex (DLPFC; BA 9; Batterink et al., 2010;

MacDonald et al., 2000; Simmonds et al., 2008). More specifically, the ACC or 'conflict detection center' serves a general role in identifying conflicting situations. It is known to detect incompatibilities in both the cognitive and social domain (Lieberman & Eisenberger, 2005; Robinson, Schmeichel, & Inzlicht, 2010). Moreover, several authors have suggested that the ACC not only plays a role in cognitive control but in self-control as well, affecting people's ability to identify possible goal conflicts between short term gratifications on the one hand, and the successful pursuit of valued long-term goals on the other (Goldberg, 2001; Hedgcock et al., 2012; Robinson et al., 2010). In contrast, the DLPFC is recognized as the brain area engaged with the actual implementation of control, both cognitive control as well as self-control (Goldberg 2001). It has been linked to the successful inhibition of approach responses to No-go trials in Go/No-go tasks (Batterink et al., 2010; Simmonds et al., 2008) and to choices that favor long-term goals over short-term gratifications (McClure, Botvinick, Yeung, Greene, & Cohen, 2007).

In sum, conflict identification is associated with increased ACC activation, while failures of conflict identification have been associated with reduced activation in the ACC (Inzlicht & Gutsell, 2007; MacDonald et al., 2000). Furthermore, successful inhibition of prepotent responses is associated with DLPFC activation (Batterink et al., 2010; Knoch & Fehr, 2007; Liddle, Kiehl, & Smith, 2001; Simmonds et al., 2008), while failures of response inhibition have been associated with reduced activation in the DLPFC (Hare, Camerer, & Rangel, 2009; Hedgcock et al., 2012; Liddle et al., 2001; MacDonald et al., 2000; Menon, Adleman, White, Glover, & Reiss, 2001). Hence, translated to the issue under consideration, we hypothesized that non-compulsive buyers when faced with buying temptations would show *decreased* ACC and DLPFC activation, indicating *reduced* goal conflict identification and prepotent response

inhibition. In contrast, compulsive buyers should show the opposite and hence would show *increased* ACC and DLPFC activation under these conditions, indicating *increased* goal conflict identification and successful approach response inhibition towards buying temptations.

7.1. Participants and design

After approval by the medical ethical committee, forty female undergraduate students (mean age 20.35 years, *SD* = 1.82) participated in the fMRI experiment, receiving 20 Euros for their participation. We screened all participants to ensure they could safely undergo the procedure in the MRI scanner, were right-handed, had normal or corrected-to-normal vision, and were using the contraceptive pill, to control for idiosyncratic differences in neural responses throughout the menstrual cycle (Dreher et al., 2007). All participants were native in the language the study was conducted in and indicated a preference for buying clothing items while shopping.

Using a Go/No-go task procedure in line with Study 1, the experiment employed a repeated measures design, with friendship (not reminded vs. reminded of friendship) and product type (neutral vs. tempting) as within-subjects factors and compulsive buying tendency as a continuous moderator. Friendship reminder and product type were manipulated whereas compulsive buying was measured. Similar to Study 1, we used basic furniture as neutral products on Go trials and clothing items as our tempting products on No-go trials.

7.2. Procedure

Before the fMRI session, all participants provided written informed consent. Participants were placed inside the MRI scanner with their head securely placed in a head coil to prevent excessive movement. Stimuli were projected on a screen outside the scanner, visible to participants via a mirror located above their eyes. Participants could respond with their right hand, pushing a button on a response box.

During the fMRI scan, which lasted for approximately one hour, participants took part in four sessions. They started with two subsequent sessions in which they performed two Go/No-go tasks (a target and a control version). Afterwards, they proceeded with a friendship reminder procedure, before taking part in another two sessions performing two Go/No-go tasks (target and control). After participation in all four Go/No-go tasks, participants were helped out of the scanner and indicated their willingness to pay for a random sample of the clothing and furniture items, functioning as manipulation checks for the desirability of both product categories. As a manipulation check for the friendship reminder procedure, they indicated their agreement with: "During my description of the situation in which I felt strong friendship, I re-experienced the bond with this friend," ranging from (1) *totally disagree* to (7) *totally agree*. We lack data of one participant on this variable. Participants then completed the CBS (M = 21.05, SD = 6.83; α = 0.8; Ridgway et al., 2008).

7.3. Friendship reminder procedure

The friendship reminder procedure was similar to Study 1. Because of the (physical) limitations of the scanner, participants now orally described a situation in which they felt strong friendship. They were instructed to use the following words: *we, together, friendship* and *bond*

and to keep telling about the friendship experience for five minutes. To encourage participants to describe a real and personal friendship, it was stressed that they would not be recorded and could only be heard by the experimenters. If participants finished their description before five minutes had passed, they were asked to keep thinking about the friendship.

7.4. Go/No-go tasks

Participants performed Go/No-go tasks that were similar to the Go/No-go task of Study 1 in terms of instructions and nature of stimuli, but were adapted to the needs of fMRI data acquisition and analysis in terms of timing and number of stimuli (Wager, Sylvester, Ching-Yune, Lacey, Nee, Franklin, & John, 2005). More specifically, we adopted a mixed block/event-related design following Petersen et al. (2012) and Visscher et al. (2003). This type of design has been demonstrated to be optimal for Go/No-go tasks in fMRI (Vissher et al., 2003) as it allows for the simultaneous modeling of the transient, trial-related activity and the sustained, block-related BOLD activity (Peterson et al., 2012).

All participants participated twice in both a target and a control Go/No-go task, requiring speeded responses on Go trials and response inhibition to No-go trials. In both the target and control Go/No-go task, 80 pictures (trials) were presented in randomized order. As in Study 1, in the target version of the Go/No-go task, the Go trials (70% of all trials) consisted of pictures of neutral products (i.e., basic, non-luxurious furniture), whereas the No-go trials (30% of all trials) consisted of pictures of tempting products (attractive women's clothing, like dresses and high-heeled shoes). In the control version of the Go/No-go task the Go and No-go stimuli were mirrored compared to the target version (i.e., the Go trials (70%) consisted of clothes and the

No-go trials of basic furniture). To control for potential confounds, half of the participants (randomly assigned) started the fMRI session with the target version and continued with the control version of the Go/No-go task (path A, see Figure 6). The other half started with the control version and continued with the target version (path B, see Figure 6). After the friendship reminder, participants again participated in a target and control version of the Go/No-go tasks, similar to the two Go/No-go tasks before.

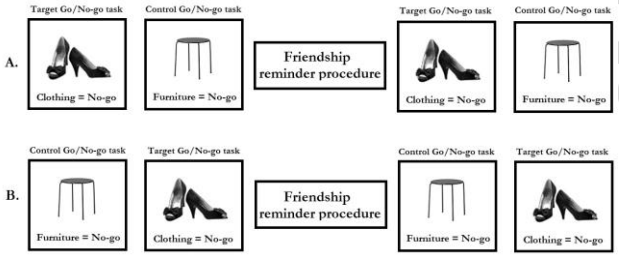


Figure 6. Sequence of the four Go/No-go tasks and friendship reminder procedure dependent on path A or B

All pictures were presented on a light grey background, using E-prime 2.0. Each Go/No-go task consisted of 10 trial-blocks and 11 fixation-blocks. Each trial-block consisted of eight (randomly presented Go or No-go) trials (500 ms) alternated by eight inter-trial intervals consisting of a fixation cross (2080 ms). The fixation blocks showing a fixation cross (20 sec), served to start and finish the Go/No-go tasks and to separate the 10 trial-blocks from each other. No additional jittering was applied.

7.5. fMRI data acquisition and preprocessing

Functional data were collected using a Philips 3T Intera MRI scanner with a 32 channel head coil. We first recorded a T1-weighted anatomical image (170 axial slices, voxel size 1 x 0.6 x 1 mm) for each participant, providing a high-resolution image of the anatomy of the brain over which the functional data would be overlaid (Yoon et al., 2006). Following the anatomical

image, functional data were recorded based on Echo Planar Imaging (39 axial slices, TE = 30 ms, TR = 2000 ms, FA = 70 degrees, FOV = 224 x 136.5 x 224 mm with in-plane resolution of 3.5 x 3.5 and slice thickness of 3.5 mm). For each participant four runs of functional data were recorded (one for each Go/No-go task), each run comprising 215 volumes and lasting circa 7 minutes. Data preprocessing was performed using FSL version 5.0 (Jenkinson, Beckmann, Behrens, Woolrich, & Smith, 2012), correcting for the following types of task-unrelated variability: motion correction (using MCFLIRT; Jenkinson et al., 2012), non-brain removal (Brain Extraction Tool), spatial smoothing (kernel size 10 mm FWHM), and high-pass filtering (set at 100 sec, to filter out scanner drifts). Spatial normalization (i.e., correcting for variability in brain size and shape by mapping the data on a 'standard' brain template; Yoon et al., 2006) was performed by registering the anatomical image of participants to a MNI–152 stereotactic template, using an affine procedure with a 12 parameter fit. The data of two participants required further normalization using nonlinear registration (FNIRT).

7.6. fMRI data analysis

Statistical analyses were performed in three stages. During the first stage, general linear models were built and convolved with a single gamma function to compensate for the haemodynamic delay. In line with our mixed block/event-related design, four Fixed Effects General Linear Models (FFX GLM) were built per participant: before and after the friendship reminder for both product types. Each of these FFX GLMs comprised two regressors: The first regressor represented the block condition for all stimuli presented during a trial-block, to capture the sustained effects of the task at hand (Petersen et al., 2012). The second regressor was built

specifically using the onsets and durations of the No-go trials (lasting 2580 ms each), measuring the inhibition (transient) effect on the No-go trials. Contrasting the second regressor versus the fixation baseline allowed us to study the inhibition effects that are central to this research, revealing which brain areas were activated during No-go trials above and beyond what was activated during fixation baseline. Following Batterink et al. (2010) we choose to compare No-go trials versus baseline, rather than No-go versus Go trials, to prevent the incorrect conclusion that certain brain areas do not play a role in response inhibition because they are involved in response selection as well (Simmonds, Pekar, & Mostofsky, 2008). Since we adopted a block design we did not model response correctness.

In the second stage, we took the beta values of the second regressor of all four FFX GLMs to a "within-subject between-sessions" FFX GLM (following Visscher et al., 2003 and Petersen et al., 2012). This model thus only contained information about the transient effect from each of the four sessions. Within this model, we calculated, per participant, main effects of friendship reminder procedure and product type, and the interaction effect between friendship reminder and product type using the following formula: [inhibition during clothing pictures after the friendship reminder procedure – inhibition during clothing pictures before the friendship reminder procedure] – [inhibition during furniture pictures after the friendship reminder procedure – inhibition during furniture pictures before the friendship reminder procedure].

Since our predictions were limited to specific anatomical regions, we adopted a region-of-interest (ROI) approach, testing our hypotheses only in those specific regions rather than across the entire brain (Batterink et al., 2010; Dietvorst et al., 2009; Poldrack, 2007). We constructed the ROIs using fslmaths, employing a sphere with a 5 mm radius in line with the coordinates identified in previous research. Specifically, we used the coordinates defined by

Kerns et al. (2004) and MacDonald et al. (2000) for the ACC (transformed from Talairach to the following MNI coordinates: x = 1, y = 8, z = 44, and x = 4, y = –1, z = 47 respectively) and the coordinates defined by Batterink et al. (2010) and Simmonds et al. (2008) for the DLPFC (MNI coordinates: x = -6, y = 30, z = 57; x = -3, y = 39, z = 51; x = 21, y = 48, z = 39 and transformed from Talairach to the following MNI coordinates: x = 24, y = 50, z = 41 respectively; see Figure 7).

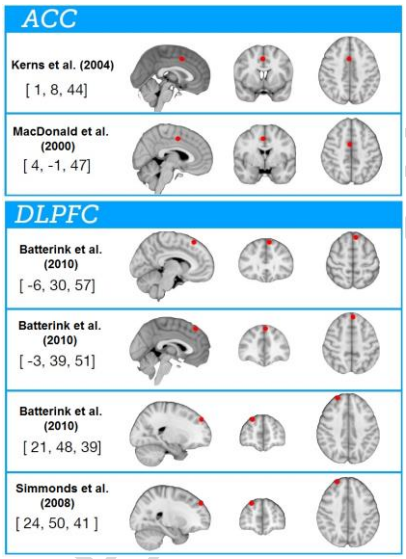


Figure 7. Locations of the a priori ROIs

In stage three, the correlational analysis, we calculated four beta estimates per participant (one for each FFX GLM model), representing the average percentage signal change within each ROI (Dietvorst et al., 2009; Nichols et al., 2017). Using these four betas we calculated the friendship reminder × product type interaction per participant using a mixed effects model in Matlab, and subsequently examined their correlations with participants' compulsive buying score. Significance was determined at $p < 0.05$ (corrected for multiple comparison).

7.7. fMRI results and discussion

7.7.1. Manipulation checks

A paired-samples t-test showed that participants were on average willing to pay more for the clothing items (M = 21.86 Euros; SD = 11.17) than for the furniture items (M = 16.79; SD = 14.45; $t(40) = 2.68$, $p = .01$). Using willingness to pay as an indicator of desirability, this result suggests that we successfully manipulated a tempting versus neutral product category. A one-sample t-test using the scale's mid-point as a benchmark confirmed that participants had re-experienced the bond with their friend during their description of the friendship experience (M = 5.56; SD = 1.02; $t(38) = 9.57$, $p < .001$). The friendship reminder procedure can thus be considered successful.

7.7.2. Behavioral results

We performed a regression analysis (Judd, Kenny, & McClelland, 2001; Judd, Kenny, & McClelland 2001; Montoya and Hayes, 2017; MEMORE, Model 2) on inhibition failures during clothing trials with the friendship reminder procedure as within-subjects factor and the standardized compulsive buying tendency as predictor, showing the predicted crossover interaction between the friendship reminder procedure and compulsive buying tendency (B = 1.84, SE = 0.59, $t(38) = 3.12$, $p < .01$).

In line with our results from Study 1, non-compulsive buyers (-1 SD from the mean) made *more* inhibition failures on clothing trials after (M = 16.31) compared to before the friendship reminder (M = 14.45; B = -1.87, SE = 0.83, $t(38) = -2.25$, $p < .05$). In contrast, compulsive buyers (+1 SD from the mean) showed the opposite pattern and made *less* inhibition failures on clothing trials after (M = 13.59) than before being reminded of friendship (M = 15.40;

B = 1.82, *SE* = 0.82, *t*(38) = 2.19, *p* < .05; Johnson-Neyman moderator values -0.82, 0.87 respectively)[4].

7.7.3. Goal conflict identification

Correlation analysis showed that compulsive buying tendency was significantly positively correlated with activation during inhibition (No-go) trials as a function of the friendship reminder × product type interaction in the regions of interest previously implicated in goal conflict identification (ACC, see Table 2)[5]. That is, the lower (higher) the compulsive buying tendency, the lower (higher) the ACC activation when asked to inhibit responses towards pictures of tempting clothing items (versus neutral furniture) after being reminded of friendship (versus not being reminded of friendship). Hence non-compulsive buyers showed *reduced* ACC activation compared to the average participant, while compulsive buyers showed *increased* ACC activation compared to the average participant under these conditions.

Region name	**BA**	**MNI coordinates (x, y, z)**	**Source**	**Main effects Friendship reminder**			**Main effects Product type**		
				β	*SD*	*p* ≤	*β*	*SD*	*p* ≤
ACC	24/32	1, 8, 44	Kerns et al. (2004)	23.85	9.74	0.33	35.50	9.74	0.27
		4, -1, 47	MacDonald et al. (2000)	26.60	7.85	0.30	45.18	7.85	0.17
DLPFC	9	-6, 30, 57	Batterink et al. (2010)	6.40	1.49	0.08	15.60	1.49	0.05
		-3, 39, 51	Batterink et al. (2010)	18.65	2.80	0.06	30.30	2.80	0.04
		21, 48, 39	Batterink et al. (2010)	18.30	3.38	0.18	22.47	3.38	0.01
		24, 50, 41	Simmonds et al. (2008)	3.24	1.35	0.41	4.00	1.35	0.33

Table 1. Results of Regions of Interest analyses: main effects of friendship reminder procedure and product type on and neural activity during inhibition trials

[4] When using response latencies as dependent variable the interaction between the friendship reminder procedure and compulsive buying tendency did not reach significance (*t* < 1, NS).

[5] For the main effects of the friendship reminder procedure and product type per ROI we kindly refer to Table 1.

Region name	BA	MNI coordinates (x, y, z)	Source	Interaction effects Friendship reminder × product type			Correlation friendship reminder × product type with compulsive buying tendency	
				β	*SD*	*p* ≤	*r*	*p* ≤
ACC	24/32	1, 8, 44	Kerns et al. (2004)	17.06	6.16	0.01	0.38	0.04
		4, -1, 47	MacDonald et al. (2000)	23.06	9.05	0.01	0.34	0.02
DLPFC	9	-6, 30, 57	Batterink et al. (2010)	12.25	7.50	0.05	0.21	0.04
		-3, 39, 51	Batterink et al. (2010)	23.06	9.05	0.01	0.14	0.03
		21, 48, 39	Batterink et al. (2010)	15.22	5.34	0.01	0.16	0.05
		24, 50, 41	Simmonds et al. (2008)	10.28	4.26	0.01	0.13	0.07

Table 2. Results of Regions of Interest analyses: significant positive correlations between compulsive buying tendency and neural activity during inhibition trials as a function of friendship reminder and product type

Following previous research that identified the ACC as the conflict detection center in the brain (Botvinick, Cohen, & Carter, 2004; Botvinick, Nystrom, Fissell, Carter, & Cohen, 1999; Hedgcock & Rao, 2009; Kerns et al., 2004; MacDonald et al., 2000), the current findings identify the underlying mechanism of the interaction effect between friendship reminders and compulsive buying tendency identified in the previous studies. That is, the results confirm our hypothesis that being reminded of friendship reduces goal conflict identification for non-compulsive buyers, whereas it increases goal conflict identification in consumers classified as compulsive buyers.

7.7.4. Self-control exertion

Correlation analysis showed that compulsive buying tendency was significantly positively correlated with activation during inhibition (No-go) trials as a function of the friendship reminder × product type interaction in the region of interest previously implicated in self-control exertion (DLPFC, see Table 2)[5]. Similar to the ACC, the results showed that the lower (higher) the compulsive buying score, the lower (higher) the DLPFC activation when

asked to inhibit responses towards tempting clothes (versus neutral furniture) after being reminded of friendship (versus not being reminded of friendship). Hence, non-compulsive buyers showed *reduced* DLPFC activation compared to the average participant, while compulsive buyers showed *increased* DLPFC activation under these conditions.

As previous research has identified the DLPFC as the brain area involved with the actual inhibition of (consumption) impulses (Batterink et al., 2010; Hare et al., 2009; Liddle et al., 2001; MacDonald et al., 2000; Menon et al., 2001; Simmonds et al., 2008), the current findings are fully in line with our findings of Study 1 in which we identified a crossover interaction consisting of an adverse effect of friendship reminders on behavioral self-control exertion (lower inhibition of prepotent responses toward attractive clothing stimuli) for non-compulsive buyers, and a beneficial effect of friendship reminders on self-control exertion for compulsive buyers.

7.7.5. Discussion

When asked to inhibit their impulses towards buying temptations, non-compulsive buyers showed lower levels of activation in the ACC and DLPFC after friendship reminders, whereas compulsive buyers showed higher levels of activation in these brain areas associated with goal conflict identification and overt self-control exertion respectively. These findings provide neural support for our key postulates that in the face of temptations, friendship reminders decrease the self-control of non-compulsive buyers by decreasing goal conflict identification, whereas friendship reminders enhance the self-control of compulsive buyers by increasing goal conflict identification. As such, the present results converge with the previous findings of Study 4 in highlighting the critical role of the extent of goal conflict identification in underlying the impact of friendship reminders on self-control exertion for non-compulsive and compulsive buyers.

Moreover, the present results replicate the basic crossover pattern postulated as our key hypothesis and observed systematically in this and the previous studies.

8. General Discussion

Drawing from the literature on social influences on self-control, we aimed to reconcile past conflicting findings and proposed that friendship reminders may help or hinder self-control, depending on whether or not they represent a goal conflict. That is, the conflict between giving in to (buying) temptations on the one hand and the perceived consequences for maintaining satisfactory relationships with close friends on the other. We proposed that such reminders of close friendships may reduce the extent of an experienced goal conflict for non-compulsive, 'regular', buyers, while they increase the salience of such a conflict for their compulsive counterparts. Consequently, to the extent that the identification of such a conflict is a necessary and sufficient antecedent of the actual exertion of overt and intentional self-control, we should observe less self-control among non-compulsive but more self-control for compulsive buyers. The findings of a series of five studies were in line with our predictions and were robust across various methodological and conceptual variations. Indeed, we found the predicted crossover interaction between friendship reminder procedure and buying compulsivity on self-control exertion and the underlying role of goal conflict identification among a total of 437 respondents, for self-report, overt behavior indices using prevalidated inhibition tasks and functional neuroimaging, zooming in on both the impulse and inhibition sides of the self-control "tug-of-war", both within and beyond the buying domain, and for different reminders of friendship, including, but not limited to, the real physical presence of a close friend.

More specifically, in line with our predictions, behavioral and fMRI studies provided converging evidence that for non-compulsive buyers, friendship reminders decrease self-control, whereas they increase self-control for non-compulsive buyers. That is, for 'regular,' non-compulsive buyers, friendship reminders reduce goal conflict identification and hence, friendship reminders will produce less controlled (more disinhibited) behaviors. In contrast, as their excessive buying tendencies are in conflict with maintaining the relationships they have with close friends, friendship reminders do increase goal conflict identification for compulsive buyers and as such self-control exertion among this group.

8.1. Scientific, societal and managerial relevance

Our findings both replicate, reconcile, and extend previous research and theory. With the finding that friendship reminders decrease self-control for non-compulsive buyers, we conceptually replicate past findings that suggest that consumers tend to eat, drink, spend, and generally indulge more in the safety and comfort that the (psychological) presence of friends seem to offer (DeCastro, 1994; Hofmann et al., 2012; Kurt et al., 2011; Luo, 2005; Redd & DeCastro, 1992; Zhang & Shrum, 2009). By finding that compulsive buyers display higher levels of self-control when they are reminded of friendship, we show the flipside of the coin and show when and why such reminders may do the opposite and actually aid in self-control. A perhaps ironic observation is that our findings show the 'dark side' of one of the key assets of friendships: the experience of safety and comfort that they offer. On the other hand we also demonstrate the 'bright side' of a downside of friendships: their inherently optional nature (at least when compared to family members, see Chopik, 2017), may exacerbate the sense of threat

for compulsive buyers, but this also boosts motivation and actual display of self-control among these consumers. Our work thus extends the literature on compulsive buying, that is heavily focused on the motives and consequences of compulsive buying (Dittmar, 2005; Dittmar & Drury, 2000; Faber & O'Guinn, 2008), but has neglected the role of social factors in the self-regulatory behaviors of these consumers. Moreover, by focusing on how and when friendship reminders affect consumer self-control, we extend and replicate research on social influences on consumer behavior more in general. Specifically, the current studies respond to a call by Finkel and Fitzsimons (2011), arguing for research addressing the interpersonal aspects of the self-control process to add to our knowledge on the social basis of self-control. Also, the current studies add by combining a behavioral and neuroscientific approach to study consumer self-control, demonstrating convergent validity (Yoon, Gonzalez, & Bettman, 2009). Whereas previous research on the effectiveness of interventions aiming to improve goal conflict identification and/or self-control exertion is largely based on inferences from self-report measures (Hedgcock et al., 2012), the current research employs a more direct and comprehensive approach by directly measuring the impact of such an intervention on behavioral measures indicative of self-control in real-life situations (Batterink et al., 2010) as well as on the associated brain areas. This is especially relevant as self-report measures provide a more retrospective account and at best give estimations of what may happen in the consumer' brain, whereas fMRI provides real-time observations of the cognitive processes that underlie the (self-reported or observed) behaviors (Craig, Loureiro, Wood, & Vendemia, 2012; Huettel et al., 2009). Indeed, Heatherton and Wagner (2011) highlight the importance of neuroscientific methods in uncovering the workings and failures of (consumer) self-control.

In addition, the current research is also of value to marketing practitioners. In addition to enhancing sales among non-compulsive buyers, the use of friendship reminders will allow marketing managers to adapt their strategies for compulsive buyers towards a "loyalty borne of genuine need, rather than habitual dependence" (Dodd, Linaker, & Grigg 2005, p. 382). A structural focus on long-term customer relationships has been shown to be more profitable than maximizing current sales at the expense of the consumer (Reinartz, Krafft, & Hoyer, 2004). Moreover, another financial motivation for firms to limit compulsive buying tendencies stems from observations that compulsive buyers often regret their purchases and return a substantial part of them (Friese, 2000; Hassay & Smith, 1996). As such, reducing compulsive buying behavior will substantially reduce handling costs for organizations, the significance of which is illustrated by research estimating that a 1% decrease in return rate among U.S. consumers will reduce annual costs of logistics with an average of $17 million for large retailers (Accenture, 2011). Our research highlights an efficient approach that marketing practitioners could consider in order to change compulsive buying into less disturbing, more fulfilling buying behavior among consumers chronically challenged in self-control. Possibly, such an approach that involves subtly reminding these consumers of the value of their long-term friendships may be rewarded by them with increased and more "authentic" brand and product loyalty, something that future research might address.

8.2. Limitations and future research

A frequently encountered limitation of neuroimaging research is its sample size. Because data collection is extraordinarily expensive (around $500 per hour) and time consuming, sample

sizes in neuroscientific research tend to be small. Our sample size of 40 participants is large compared to other fMRI studies (e.g., Dietvorst et al., 2009; Hedgcock et al., 2012; Yoon et al., 2006), including similar paradigms (Batterink et al., 2010). Even though our sample size is large enough to render reliable insights (Thirion, Pinel, Roche, Dehaene, & Poline, 2006), our sample is limited to female undergraduate students and results may thus not be generalizable to other demographic groups. Note however that around 90 per cent of compulsive buyers are female (Dittmar et al., 2007) and that the age of our sample matches the onset age of compulsive buying (late teens or early twenties; Black, 2007), supporting the external validity of our sample.

Our theoretical reasoning implies that ACC activity impacts DLPFC activity, which subsequently affects inhibitory behavior, as supported by existing literature. Although we did examine activation in both the ACC and DLPFC, it should be noted that we did not examine the causal relationship between both regions, or their impact on overt behavior. That is, one would ideally then like to test for a pattern of *sequential* moderated mediation with friendship (not reminded vs. reminded of friendship) as within-subjects factor, compulsive buying tendency as continuous (between-subjects) moderator, neural activation in the ACC as a first mediator, neural activation in the DLPFC as second mediator and number of inhibition failures on clothing trials as dependent variable. Unfortunately, the current 'state of the art' (i.e., PROCESS, or the more recent MEMORE macro, Montoya & Hayes, 2017) does presently not allow for moderated mediation analyses in within-subjects/repeated measures designs with a continuous between-subjects moderator (please see Montoya & Hayes, 2017, p. 20/22) and so such testing should await future research.

Furthermore, care should be taken when inferring cognitive processes based on changes in brain activation. Since activity in a single brain area is associated with several processes,

activation in a particular area is not uniquely associated with a particular psychological process (Hedgcock et al., 2012; Yoon et al., 2009). We consider this problem of reverse inference partially mitigated as our hypotheses center on well-defined brain areas that have been reliably implicated in goal conflict identification and self-control exertion (Batterink et al., 2010; Kerns et al., 2004; MacDonald et al., 2000; Simmonds et al. 2008). Moreover, we used neuroimaging data (Study 5) to test predictions derived from behavioral and self-reported data (Studies 1-4), further mitigating the problem of reversed interference (Huettel et al., 2009).

It is interesting to note that for compulsive buyers we consistently found that friendship reminders increase self-control. Moreover, we demonstrate that this effect occurs exclusively with reminders of friendship; the (imagined or real) presence of acquaintances and strangers, or non-social but otherwise positive circumstances did not yield the same effects on compulsive buyers' self-control. For non-compulsive buyers, while the results also consistently show that friendship reminders produce lower self-control, the reference point varies slightly over studies. We observe less self-control for these participants when compared to a neutral control condition (Study 1), when compared to a positive event condition (Study 2), and sometimes when compared to an acquaintance/stranger condition (Study 4). However, as to the latter observation, in Studies 2 and 3 we observe similar levels of self-control between the presence of a friend and acquaintance/stranger conditions. One of the reasons for the mixed results when comparing the friendship with the acquaintance/stranger conditions might be the type of self-control we examined. While the few previous studies that distinguished between both social groups focused on eating behavior (Clendenen et al., 1994; Salvy et al., 2007), we selected (over) spending as our target behavior. It may well be that while overeating (or drinking) may invariantly trigger a more negative impression among strangers than among friends and so may spur impression

management concerns aimed at controlling these behaviors, this may not be the case when it comes to excessive spending. Indeed, if anything, the connotation of excessive spending may also have a more positive aspect as it may signal wealth and status. As such, impression management concerns among non-compulsive buyers may still play a role in their spending behavior, but possibly these concerns may act to further *disinhibit*, rather than control their spending in the real or imagined presence of mere acquaintances and strangers, something that future research may profitably explore.

The current research focused on the mental activation of the concept of friendship. If a friend was present in a shopping situation, it was not because (s)he had an active support role. As a meaningful extension, studying the dynamics of self-control in situations where consumers who are vulnerable to consumption temptations are directly supported by friends, may be a fruitful direction for future research. For example, some interventions focusing on compulsive consumers involve support groups. Future research may investigate under which particular circumstances compulsive consumers' self-control benefits from the active support provided by friends in real life situations.

Further research may test as well whether friendship reminders also improve self-control in other domains where problems with inhibiting impulses underlie the phenomenon, such as obesity and substance addiction.

In sum, the current research employed an interdisciplinary approach by using behavioral and neuroscientific methods to study when and why friendship reminders increase or decrease consumer self-control. The studies provide converging evidence that friendship reminders may lead to more controlled behavior for compulsive buyers, as their excessive buying behavior may be in conflict with the relationships they have with friends. For non-compulsive buyers, there is

no special conflict between their friendships and encountered consumption temptations. Sporadic disinhibited consumption may even be good for the relationship (Luo, 2005). For these consumers we observe a tendency consistent with previous findings: non-compulsive buyers behave in a less controlled manner in the (psychological) presence of friends. Thus, for both type of consumers there seems truth in the belief: *a faithful friend is the medicine of life*.

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