Impulse Buying: Designing for Self-Control with E-commerce

by

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ABSTRACT

Impulse buying is a common but potentially problematic behavior that can leave consumers with financial hardship and feelings of regret. The goal of this dissertation is to understand how to support consumers who wish to gain greater control of their online impulse buying. This research first investigates how current e-commerce stores encourage impulsive spending by conducting a content analysis of 200 top-earning shopping websites (Study 1). We demonstrate that the use of impulse-driving features is common and we catalog the different types of features that are commonly used. Second, we take a user-centered approach by directly asking consumers what type of support they would like in tackling online impulse buying (Study 2). A survey of 151 frequent online impulse buyers reveals that consumers want tools that, for example, make costs more salient, encourage reflection, enforce spending limits, increase checkout effort, and postpone purchases. Consumers were not interested in social accountability tools or tools utilizing regret or guilt.

Relying on these insights, we designed and tested postponement, reflection, and distraction interventions to encourage self-control with e-commerce (Studies 3-5). Through an online experiment, we show that a 25-hour delay is effective at lowering consumer's felt urge to buy impulsively and also at lowering purchase intent (Study 3). Conversely, an in-lab experiment testing a 10-minute delay on Amazon purchases failed to show a statistically significant decline in the number of impulse products purchased or dollars spent impulsively (Study 4). We highlight that 100% of participants continued to shop during their 10-minute delay to help explain the lack of an effect. Finally, through an online experiment, we show that prompting consumers to spend approximately 3 ½ minutes listing reasons for and against buying a product or engaging in a distracting task reduces the felt urge to buy impulsively and purchase intent. We conclude by asserting that postponement is an effective self-control strategy if (a) the

delay is long enough to allow for the natural distractions of life to cool the impulse to buy or (b) is short but focused on either reflecting on the product or focused on something distracting, but not focused on browsing for additional impulse purchases. Taken together, this dissertation takes a consumer advocacy perspective by shedding light on potentially problematic design practices, by identifying opportunities for corporations to engage in more transparent design, and by providing design recommendations for technologies that help consumers achieve greater self-control with e-commerce.

CHAPTER I
Introduction

Impulse buying is commonplace. Recent industry research has shown that five in six Americans report making impulse buys, with the majority reporting an impulse buy in the last three months [140]. This impulsive consumer behavior plays out in a wide range of domains from traditional retail stores [28,55], e-commerce [145], social media [48], group-buying websites (e.g., Groupon) [152], television shopping [194], mobile devices [140], and alternative retail formats such as swap meets [31] and car-trunk sales [227].

However, there is concern that impulse buying can be problematic [76,145]. Consumers have reported various negative consequences to impulse buying including financial problems, spoiling personal goals (e.g., dieting goals), and being the subject of someone else's disapproval [212]. Impulse buyers can also experience guilt (i.e., about their behavior) and shame (i.e., about one's core self) [261]. Consumers cope with these negative outcomes in different ways: rationalizing the purchase as a deserved self-gift, focusing on the ability to return products, and comparing one's own shopping behavior with someone else's worse behavior [27]. Consumers also admit to sometimes lying about or hiding new impulse purchases [27,255]. Consumers can also experience less product satisfaction, especially when impulsively choosing vice products (e.g., chocolate bars) over virtue products (e.g., fruit salad) [66].

Yet, impulse buying does not yield exclusively negative outcomes; impulse purchases can often result in mixed emotions [27,93,174]. While the purchase may bring about feelings of regret and remorse, the purchase itself can feel pleasant, satisfying, or bring happiness at the time [26,94,175]. Impulse buying can also help consumers "feel better"

by lifting depressed pre-purchase moods [93]. Indeed, for some consumers, impulse buying is a tactic used to deal with feeling depressed, frustrated, or bored [93].

Unfortunately for those consumers, there is evidence that such coping strategies can backfire. Lab experiments have shown that consumers who acquire products to cope with a self-identity threat can actually experience a greater number of ruminating, negative thoughts and exert less self-control in subsequent self-regulation tasks [150]. Relying on consumption for mood regulation can also backfire due to *adaptation,* where the positive emotions associated with a purchase diminish over time (e.g., that new dress now just blends in with your wardrobe), and rising aspirations (e.g., now you need a new pair of shoes and jewelry to go with that new dress). This can lead to a cycle of acquisition and adaptation called the “hedonic treadmill” which arguably leaves consumers buying more but deriving less happiness from it [45].

Perhaps most concerning about using consumption for mood regulation, a behavior sometimes colloquially referred to as “retail therapy,” is the possibility for infrequent, impulsive behaviors to turn habitual, leading to more clinically compulsive shopping behavior [186]. Research has shown that engaging in online shopping for mood regulation is predictive of compulsive shopping tendencies [76]. The outlook for clinically compulsive consumers is not bright. Longitudinal studies following participants from adolescent years have shown that compulsive buying behavior is associated with lower perceived quality-of-life at early mid-life, even when controlling for psychiatric disorders, substance abuse, and other related factors [265]. Unfortunately, the prevalence of compulsive buying in the US and Germany is estimated at nearly 6% and 7% of the population respectively [139,173]. Interestingly, the prevalence of compulsive buying does not significantly differ by gender [139,173] but is more prevalent among younger populations and those reporting incomes less than $50,000 US dollars per year [139]. These data suggest that those who are less likely to be in a position to absorb the negative financial consequences of compulsive buying (i.e., the young and the less affluent) are also more likely to be compulsive buyers.

Notably, some consumers report a desire to curb their impulse buying [255]. However, retailers have little incentive to support this goal, and in fact utilize many marketing and design strategies that can encourage impulse buying [145]. And while a breadth of literature exists on behavior change technologies and self-control interventions, little work has tackled the specific domain of impulse buying. This dissertation addresses this gap by examining how shopping websites are encouraging impulse buying (Study 1), asking consumers what type of support they would like and what has worked and not worked for them in the past (Study 2), and by designing and testing interventions to reduce impulsive spending online (Studies 3-5).

CHAPTER II
Literature Review

2.1 Impulse Buying

2.1.1 Defining impulse buying

Early work in impulse buying conceptualized impulse buying in terms of planned or unplanned purchases; simply defined, “a purchase is unplanned if [the consumer] did not indicate a plan to purchase it” [137:28]. Methodologically, this meant asking shoppers entering a store which products they planned to purchase and then comparing that list with purchases actually made. Later research began to exclude purchases that were suddenly remembered as being needed (e.g., not planning on buying toilet paper but then suddenly remembering you need to buy some) [28]. Later conceptualizations of impulse buying accounted for the role of emotion and deliberation:

> “Impulse buying occurs when a consumer experiences a sudden, often powerful and persistent urge to buy something immediately. The impulse to buy is hedonically complex and may stimulate emotional conflict. Also, impulse buying is prone to occur with diminished regard for its consequences” [212:191].

Supporting qualitative research showed that participants described impulse buying as involving (1) a spontaneous, urgent, or preoccupying urge to buy, (2) varying levels of excitement, and, for some participants, feelings that the product was (3) personally meant for them (e.g., “preordained”) or was (4) “staring,” “shrieking at,” or “following” the person [212:194]. Impulse buying has also been described as purchasing “without carefully or thoroughly considering whether the purchase is consistent with one’s long-range goals, ideals, resolves, and plans” [23:670]. For example, individuals sometimes hold time-inconsistent preferences [108], where they impulsively choose smaller,

immediate rewards (e.g., a product) over larger but delayed rewards (e.g., financial wellness).

Piron's conceptualization of impulse buying was among the first to explicitly recognize the role of a triggering stimulus by defining impulse buying as (a) unplanned, (b) the result of exposure to some stimuli, and (c) decided "on the spot" [202]. More recent work has also focused on the felt urge to buy or "*consumption impulse,"* an urge that is experienced automatically and can vary in the degree of intensity felt [68]. Notably, Dholakia argued that while the consumption impulse occurs automatically, how an individual responds to that urge (i.e., their behavior) is not automatic. In other words, the impulse is automatic but the buying is not; it can be resisted.

2.1.2 Impulse buying, not compulsive buying

Impulse buying is distinct from compulsive buying. Compulsive buying is one type of compulsive consumption, defined as "a response to an uncontrollable drive or desire to obtain, use, or experience a feeling, substance, or activity that leads an individual to repetitively engage in a behavior that will ultimately cause harm to the individual and/or to others" [186:148]. Other examples of compulsive consumption include substance abuse, eating disorders, gambling, hoarding, and kleptomania. Just as with the difference between someone dieting and someone suffering from an eating disorder, the difference between impulsive and compulsive buying is not defined simply by frequency of the behavior but by the psychological motivations for the behavior and the negative consequences experienced.

In short, compulsive buying is, "chronic, repetitive purchasing that becomes a primary response to negative events or feeling," a chronic behavior that becomes difficult to stop and leads to harmful consequences [186:155]. So while compulsive buying can be thought of a "chronic behavior," impulse buying can be thought of as an "acute behavior", one that over time can potentially develop into a more problematic form of compulsive, chronic behavior ([186:156]. The focus of this dissertation is impulsive, not compulsive, buying.

2.1.3 When and for whom does impulse buying happen

2.1.3.1 *Individual differences*

Buying impulsiveness is “a consumer's tendency to buy spontaneously, unreflectively, immediately, and kinetically” [214:306]. Impulsive consumers are thought to be more likely to shop with open-mindedness to new, unplanned buying opportunities, and to act quickly on their buying impulses with little thought [214]. A commonly used measure of buying impulsiveness is Rook and Fischer’s Buying Impulsiveness Scale, a nine-item scale that includes items such as “I often buy things spontaneously” and “I often buy things without thinking.” Subsequent, validated scales have been introduced including the Impulse Buying Tendency scale [253].

Buying impulsiveness has been shown to be positively related to measures of general impulsivity [253,263], thrill seeking tendencies [253], and certain personality dimensions such as extraversion (positive relationship), and conscientiousness, need for structure, and need to evaluate (negative relationships) [240]. A recent meta-analysis identified an individual’s buying impulsiveness as one of the strongest predictors of impulse buying [11]. Other research has shown that individuals who rate high in buying impulsiveness are not only more likely to complete an impulse buy, they are also more likely to experience a buying impulse in the first place [28]. Other behavioral tendencies shown to predict impulse buying include a tendency and preference for gathering product information through touch (i.e., need-for-touch [197]), a variety-seeking propensity, tendency to make quick decisions, and propensity for spontaneous behavior [11].

The influence of *demographic variables* on impulse buying behavior is less clear. Meta-analysis results show that gender, age, and income were the least predictive antecedents of impulse buying behavior [11]. Results on gender are mixed with some research not finding statistically significant gender differences in impulse buying [74,240] and more recent data suggesting that men are more frequent online impulse buyers [165]. Survey data have also demonstrated inconsistent results regarding age, with one study demonstrating no significant correlation between age and buying

impulsiveness and another study showing a significant, negative relationship [240]. In terms of education, a national survey in the US revealed that impulse buying frequency is highest among consumers with “some college (or post- high school) experience” but no college degree [255]. Industry research has shown that while income level may not predict frequency of impulse buying, it can predict the amount of money spent on impulse purchases [140]. Finally, consumers from Western, individualistic countries (such as the US and Australia) are more likely to purchase impulsively than consumers from non-Western, collectivist countries (such as Singapore and Malaysia), despite having similar levels of individual buying impulsiveness [125].

Materialism, or the belief that acquiring material goods is central to happiness, well-being and success, is influential on impulsive buying behavior. Highly materialistic individuals are more likely to be impulsive buyers [74]. Further, attitudes about self-identity interact with materialism; highly materialistic individuals who also report a large discrepancy between their actual and ideal self-identity are more likely to be impulsive buyers [74]. Materialistic beliefs can also interact with *perceived economic mobility*, defined as “the personal belief about the degree to which a society enables its members to move up the economic ladder” [262:760]. Impulse buying is greatest for highly materialistic individuals who perceive low economic mobility, presumably because they believe a short-term sacrifice in spending will not make a difference in their upward mobility goals [262]. Accordingly, highly materialistic individuals are more likely to resist impulsive buying when they believe economic mobility is high, making resisting impulse purchases more worthwhile [262].

2.1.3.2 *External situational factors*

External situational factors occur independent of the consumer, in the consumption environment at large. Survey data have shown that consumers believe impulse buying is more likely when the following external situational factors are present: having money/credit available at the time, being offered a good deal or discount, shopping during the holidays or special occasions, and being with friends [263]. More specifically, the *amount of money* perceived to be available for spending has been shown to predict

positive affect, which in turn predicts experiencing a consumption urge and completing an impulse purchase [28]. Similarly, *time available* (as opposed to time pressure) has been shown to predict *browsing behavior* (i.e., examining merchandise without an immediate intent to purchase), which in turn predicts feeling an urge to buy and completing an impulse purchase [28]. Increased browsing on online stores has also been associated with increased online impulse buying [85].

Evidence also suggests that the *presence of others* can influence impulsive buying. Study participants who imagined a shopping scenario where they were accompanied by a group of friends reported a greater urge to purchase something and indicated more impulsive buying intentions, in comparison to participants who imagined shopping alone [157]. The effect was greatest when the group of friends was described as close or tight-knit and when the participant rated highly on susceptibility to social influence. Interestingly, the effect reversed, meaning impulse buying intentions decreased, when participants imagined they were shopping with their family members. Finally, impulse buying is more likely when a consumer has already purchased another product. The "*shopping momentum*" generated from an earlier purchase can increase the probability of purchasing a second, unrelated product [64].

2.1.3.3 *Stimuli as an external situational factor*

A buying impulse is thought to be triggered by exposure to stimuli [257] that enhances a consumer's perceived proximity to a product, creating feelings of partial ownership and potential loss if the product is not purchased [108]. Such stimuli can include elements of the *product presentation* that encourage *touching*, which directly enhances the proximity of a consumer to the product. A grocery store field experiment tested the effect of displaying signage that encouraged consumers to touch the produce [198]. In comparison to the no-sign condition, consumers who were exposed to a "feel the freshness" sign described their fruit purchases as more unplanned and impulsive. The *vividness* (i.e., the depth of sensory stimulation) and *interactivity* (i.e., level of control over) of the product presentation can predict impulse buying. Participants in an online experiment were assigned to one of three versions of a Ray-Ban® Sunglasses e-store

which featured either (a) static images of sunglasses, (b) a 360-spin rotation presentation of the sunglasses, or (c) a web-cam based virtual mirror that let the user visualize wearing sunglasses with full control (i.e., capturing live head movements). Results showed that consumers rated the virtual mirror and 360-spin score highest in vividness and interactivity, which in turn predicted self-reported feelings of wanting to impulsively purchase a pair of sunglasses.

Other presentational factors include “appetitive” or *arousing stimuli* (e.g., the smell of freshly baked cookies) [258], more *diverse product assortments* [152], the presence of *recommender agents* [114], and the *visual appeal* and *usability* of an e-store [191]. In addition, characteristics of the product itself can influence its likelihood of being impulsively purchased. Certain *types of products* are more likely to be purchased impulsively than others. Products related to self-presentation or self-expression (e.g., music, clothing, magazines, body care, and jewelry) were rated as more likely to be impulsively purchased by consumers than utility products (e.g., home goods and car equipment) [73]. Lower priced products are also more likely to be impulsively purchased [123].

Marketing stimuli that enhance the perceived *temporal proximity* of the product (i.e., the product can be acquired quickly) can also encourage impulse buying [108]. Notable examples include one-click shopping and same-day shipping. Communicating quick, easy credit or discounts can also encourage impulse buying (i.e., the consumer does not need to wait and “save up” to purchase). *Credit card stimuli* have been shown to predict making an unplanned donation to a charity [82]. Being offered *unexpected coupons* at the beginning of a shopping trip can predict impulse buying. Indeed, any stimulus that communicates the possibility of “*getting a good deal*,” a commonly cited trigger to impulse buying [93,263], is likely to enhance the perceived proximity of a product. Finally, *social stimuli* can enhance perceived proximity to a product when a consumer sees that their peers have acquired a product [108].

2.1.3.4 *Internal situational factors*

Internal situational factors represent the consumer's current internal state at the time of a consumption opportunity and can include, for example, a consumer's *current affect state*. *Positive affect* resulting from in-store browsing behavior, money available, and shopping enjoyment all predict feeling an urge to buy impulsively, which in turn is strongly associated with making an impulse purchase [28]. Retrospective survey data have also shown that impulse buying is predicted by positive pre-purchase moods [187]. However, there is also evidence that *negative affect* states can prompt impulse buying, as is evinced by consumers who report that they engage in impulse buying to lift depressed mood states [93]. Similarly, a consumer's *shopping intentions* can be influential on impulse buying. For example, impulse buying is more likely when a shopping run is considered to be a more comprehensive, "major trip" versus a more focused "fill-in" trip [137]. This distinction exists online as well, where an online shopper's *current shopping orientation* can influence impulse buying. For example, online consumers with a recreational shopping orientation, meaning their current shopping activities are hedonically motivated versus utilitarian, are more likely to sign-up for bargain alerts and new product notifications, which in turn predicts a higher tendency to make impulse purchases online [133].

2.1.4 How impulse buying happens

Efforts to explain impulsive buying behavior have primarily focused on *problematic* impulse buying. This focus may stem from a tradition in psychology and behavioral economics to investigate seemingly irrational behavior, namely making choices that run counter to long-term goals. Ainslie defined impulsiveness, generally, as the choice for lesser immediate rewards over greater rewards in the future [5]. Ainslie's experimental work with pigeons showed that impulsive preferences are a function of reward speed; pigeons more readily pecked a red key to receive 2 seconds of food access versus not pecking the key to receive 4 seconds of food after a three second delay. Immediate, impulsive choices are characterized as misleadingly attractive (i.e., "specious") and only "temporarily preferable" [5:473]. Other work has framed impulsiveness as holding time-

inconsistent preferences [108], a product of one's rapid, short-sighted mental system [167,228,232], and a break-down in self-control [23]. These various perspectives, reviewed below, offer different explanations for how impulse buying happens.

2.1.4.1 *Impulse buying explained by: proximity-induced reference point shifts*

Hoch and Loewenstein's definition of time-inconsistent preferences shares some similarities with Ainslie's definition of impulsiveness. Time-inconsistent preferences are choices "that would not have been made if it had been contemplated from a removed, dispassionate perspective", and that reflect a "temporary overriding of long term preferences" and a "momentary and involuntary departure from the consumer's dominant preferences" [108:493–494]. The authors argue that time-consistent preferences are the result of a shift in the consumer's reference point. Drawing on prospect theory, a consumer's reference point is "some psychologically relevant comparison point" that the consumer uses to calculate perceived value [108:494]. For example, a consumer's desire for purchasing a product may be derived by comparing (a) satisfaction with purchasing the product with (b) satisfaction of not-purchasing (the reference point).

Hoch and Loewenstein argue that enhancing the perceived proximity of a product can shift the consumer's reference point for not-purchasing. This can be achieved by enhancing *physical proximity* (e.g., being able to touch and inspect a product up-close), enhancing *temporal proximity* (e.g., making the product immediately available), and through *social comparison* (e.g., seeing peers with the product). Increasing perceived proximity to the product prompts the consumer to "partially adapt the notion of owning or consuming the product" [108:494]. As a result, the consumer's reference point for not-purchasing shifts from a neutral value to a negative value; not-purchasing is now considered a loss or "deprivation." In turn, this shift results in an increased desired for the product. In short, enhancing perceived proximity to a product leads the consumer to adapt to feelings of partial ownership, making a non-purchase painful, quickly increasing the desire to purchase.

An example of this would be a consumer who sees an attractive purse for sale in a store window. If the consumer goes into the store, inspects the purse and looks at herself in the mirror carrying the new purse (increasing physical proximity), she may partially adapt to the notion of owning the purse. Now, not purchasing the purse becomes a more painful choice than if she had simply viewed the purse from behind glass. Feelings of potential *deprivation* create a sense of urgency to purchase the product to quickly squelch those negative feelings. This process can also be described by the Endowment Effect, which describes how simply possessing something increases its perceived value due to loss aversion ("giving up a nice bottle of wine is more painful than getting an equally good wine is pleasurable") [127:293]. The key differentiator is that the Endowment Effect explains the valuation of an owned product, while Hoch and Loewenstein focus on how mere proximity can encourage a rapid decision to acquire the product.

2.1.4.2 *Impulse buying explained by: hot/impulsive/doer system*

Impulse buying has also been explained by a host of dual-system models of self-control: the planner-doer model [232], the reflective-impulsive system model [228], and the hot-cool system model [167]. These models share similarities with other well-known cognitive models of decision-making and judgment, such as the Elaboration Likelihood Model for processing persuasive information [199], the Heuristic-Systematic Model of social information processing [47], and the automatic-deliberative information processing model [128]. Only dual-process models specific to *self-control* are reviewed here.

Planner-Doer Model:

Thaler and Shefrin's "two-self economic man" or planner-doer model aims to explain the seemingly paradoxical state of one person desiring two, conflicting things at the same point in time [232]. The two-self economic man consists of a *doer*, whose preferences are based on myopic considerations, and a *planner*, whose preferences are based on long-term considerations. The planner lives with the consequences of the doer's actions, and therefore is motivated to influence the doer's behavior. The planner system

is responsible for establishing long-term goals, rules, or commitment devices intended to curb the doer system's more impulsive and short-sighted tendencies (such as buying impulsively).

Reflective-Impulsive System:

Strack, Werth, and Deutsch's dual-system model explains consumer behavior as rooted in either the consumer's *reflective* or *impulsive system* [228]. The reflective system includes slower, rule-based reasoning and is responsible for more thoughtful evaluation. The impulsive system processes information more automatically, through the "fast and parallel spread of activation along associative links" [228:208]. Similar to Hoch and Loewenstein's concept of proximity-induced impulsivity, Strack and colleagues argue that the impulsive system is more likely to be activated by stimuli related to the physical senses and that the strength of activation can depend on how close (temporarily or spatially) the stimuli are to the perceiver. For example, the strong aroma of coffee and seeing a cup being poured may create stronger activation of the mental link to the pleasurable taste of coffee than simply seeing a picture of a cup of coffee being poured. In contrast, the reflective system is responsible for making evaluative judgments about the links being activated.

The two systems differ in how they influence behavior. The reflective system prompts behavior based on a careful assessment of how and if that behavior will affect a future state (e.g., will the coffee actually satisfy me?). The impulsive system prompts behavior through a more automatic activation of linked behavioral associations (e.g., I smell coffee, I like coffee, I'll drink the coffee). However, the reflective and impulsive systems are not thought to operate in complete isolation from each other. For example, the reflective system receives input from the impulsive system (e.g., activated behavioral schemas) and can employ self-regulation tactics to overcome the activation of goal-inconsistent behavior.

Hot-cool system model:

Metcalfe and Mischel's hot-cool model explains breakdowns in self-control, for example, when individuals are unable to delay instant-gratification for larger, delayed rewards [167]. The *cool system* is the cognitive, reflective, emotionally neutral, and slow "know" system. It "weav[es] knowledge about sensations, emotions, thoughts, actions, and context into an ongoing narrative that is coherent, goal sensitive, and strategic" [167:6]. The hot system is the emotional, reflexive, inflexible, and fast "go" system. It is "largely under stimulus control" [167:6]. The hot system is thought to respond more readily to "hot" stimuli properties (e.g., the sweetness and richness of chocolate cake), while the cool system is thought to respond more readily to "cool" stimuli properties (e.g., the shape of the cake or number of calories). Like the planner-doer and reflective-impulsive models, the hot-cool model characterizes the two systems as distinct but interacting. The cool system is metaphorically depicted as a network of elaborately connected cool nodes, allowing for complex relational thinking. In contrast, the hot system moves from a triggering stimulus to a "hot spot," which has no connection with other hot spots. The two networks can connect when elaboration among cool nodes leads to a hot spot or when hot spots connect to a network of cool nodes as a product of successful self-control.

2.1.4.3 *Impulse buying explained by: self-regulation failure*

Self-control or self-regulation has been defined as the "process that overrides the usual consequences of an impulse" [25:2] and "the self's capacity to alter its own states and responses" [23:670]. Self-regulation is thought to require three components: (1) standards (e.g., ideals and goals), (2) monitoring (i.e., of one's own behavior against standards), and (3) the ability to take action to shift behavior when it is not aligned with standards [25]. Baumeister and Heatherton also distinguish between: *under-regulation* and *mis-regulation* [25]. Under-regulation describes when an individual is not able to control the self, while mis-regulation describes when an individual is able to exert control but does so through ineffective means, consequently preventing the desired behavioral outcome.

Under-regulation can be caused by unclear or conflicting standards, a lack of monitoring of one's behavior against standards, or diminished capacity for self-regulation, as predicted by the theory of ego depletion or the *strength model of self-regulation*. The strength model of self-regulation views an individual's capacity for self-regulation as a limited resource, which, like a muscle's strength, can be temporarily depleted by each self-regulatory effort, is renewable over time, and can improve (strengthen) with practice. It is thought that this pool of energy is what "allows people to overcome incipient urges and substitute desirable behavior for an undesired one" [242:545].

Mis-regulation is thought to be linked to three main patterns of behavior. First, mis-regulation can occur when one operates with false assumptions about how to achieve a self-regulation goal. Mis-regulation can also occur when one sets unrealistic goals, such as striving toward total thought suppression. Unrealistic goals can also lead to *lapse-activated* self-regulation failure, where a minor transgression (eating one small cookie) is seen as a total failure, prompting an individual to cease all further self-regulation efforts (binge eating cookies the remainder of the day). Finally, mis-regulation can occur by over-prioritizing short-term affect regulation over long-term goals (e.g., procrastinating on a project to avoid the unpleasant stress of an impending deadline).

Impulse buying as self-regulation failure. Impulse buying has been explicitly characterized as a failure in self-regulation [23,242]. Baumeister identified impulsive purchasing as a result of either unclear or conflicting consumption/savings goals, a failure to monitor consumption behavior, or a lack of ability to exert the willpower necessary to change consumption behaviors, most notably, due to ego depletion. Research in the domain of financial savings has shown that households with established spending rules (i.e., rules / standards) spend less money than households without saving rules [209] and that bank customers who receive weekly text message updates on their savings balance (i.e., monitoring) are more likely to reach their savings goals [130].

Lab experiments have also provided evidence that ego depletion can impede self-control over impulse buying. Vohs and Faber demonstrated that when consumers were given unplanned purchase opportunities, ego depletion (resulting from attention-control, thought-control, or behavior-control exercises) led to greater willingness-to-pay dollar amounts, a greater number of products impulsively purchased, and a greater amount of money spent impulsively [243]. These results suggest that when an individual's self-regulatory resources are taxed, consumer self-control becomes more difficult, making impulse purchasing more likely. This is concerning for consumers given that research has shown that the act of shopping itself can be depleting of self-regulatory resources (i.e., the longer you shop, the less able you'll be able to resist shopping impulses) [241].

2.1.4.4 *Impulse buying explained by: constraining factors*

Dholakia's Consumption Impulse Formation and Enactment (CIFE) model provides perhaps the most integrated model of impulse buying [68]. The model includes three antecedents to feeling a consumption impulse (i.e., marketing stimuli, an individual's buying impulsivity, and situational/environmental factors), the recognition of any constraining factor, and cognitive evaluation leading either to a purchase or the use of resistance strategies to squelch the impulse (see Figure 1). The CIFE model predicts that if an individual recognizes constraining factors, they will experience some level of psychological discomfort that shifts them to "a more thought-based evaluation of the consequences of enacting the [impulse]" [68:963]. As a result, the consumer (quickly) forms either a positive or negative evaluation of enacting the impulse. With a positive evaluation, the consumer moves forward with the purchase, though he or she may feel a level of conflict in doing so. With a negative evaluation, the consumer engages their volitional system to enact resistance strategies against the impulse.

There is evidence in support of the CIFE model [68]. Two independent studies showed that when no constraining factors were presented in a hypothetical buying scenario, individual impulsiveness was a stronger predictor of impulse buying than evaluative ratings of the purchase. When constraining factors were present, evaluative ratings of the purchase were more predictive of impulse buying than individual impulsiveness.

This supports the CIFE model's prediction that when constraining factors are present, the consumer engages in more evaluative deliberation.

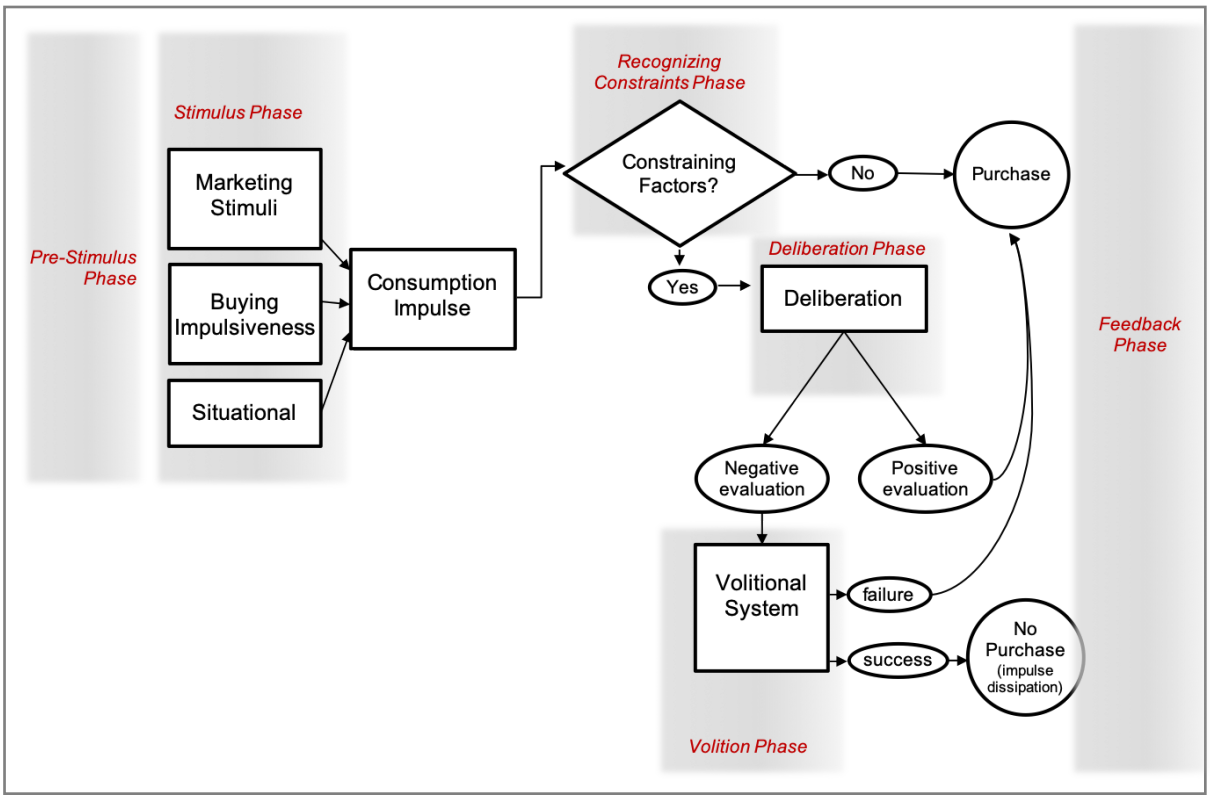

Figure 1: Illustration of Consumption Impulse Formation & Enactment (CIFE) Model [68] with phases highlighted

2.2 Strategies for Self-Control

"[One] controls himself precisely as he would control the behavior of anyone else—through the manipulation of variables of which behavior is a function" [223:228]. This section reviews strategies for self-control generally, but organized by the different phases of the CIFE impulse buying model (see Figure 1). Organizing strategies by phase helps illustrate where in the impulse buying process that each self-control strategy is most relevant. These phases include: the pre-stimulus phase, the stimulus phase, the recognizing-constraints phase, the deliberation phase, volition phase, and the feedback phase. Self-control strategies relevant to each phase are discussed, though many strategies can impact multiple phases in the impulse buying process.

2.2.1 Pre-stimulus phase

2.2.1.1 *Goal and rules*

The pre-stimulus phase occurs before an individual is confronted with a tempting stimulus, such as an enticing product or persuasive advertisement. It is during this phase that consumers can take proactive measures to guard against undesirable future behavior. One such measure is setting clear standards or goals [23]. Goal pursuit is thought to include two crucial steps: goal setting and goal striving [15,98]. *Goal setting* involves identifying and setting a goal (e.g., "I want to have a healthier body weight") and forming goal intentions ("I will exercise every day"). *Goal intentions*, in particular, have been the focus of much research in the area of goal pursuit [98] and are considered the "psychological bridge between goal setting and goal striving" [15:27]. Goal intentions have been defined as "self-instructions to attain certain outcomes or perform particular behaviors" [98:70] and are typically articulated as "I intend to do X".

Goal intentions are related, in form, to *rules*. Self-imposed rules or "private rules" [5,6] establish restrictions on one's own behavior. They can take the form "I do not X" or "I always X". Examples could include "I never buy the candy in the grocery store check-out line" or "I always get a second quote before buying a service." Effective rules are reasonably flexible (to account for circumstances out of the person's control) but do not

include overly permissive loopholes [5]. Returning to the planner-doer model, rules can help align behavior with the "choices the planner would make" [232]. An example of effective rules includes always setting aside a certain dollar amount each month or using one spouse's income for spending and the other spouse's income for savings; households with these savings rules have been shown to spend less money than households without savings rules [209].

One type of rule that has been shown to be particularly effective for goal attainment is *implementation plans.* Unlike goal intentions, implementation plans specify when and how the individual intends to achieve their goal. Implementation plans typically take an if-then or when-then format: "If situation Y occurs, then I will initiate the goal-directed behavior Z" [98:82]. For example, an individual with a goal to lose weight may decide, "If someone invites me out for dessert, I will invite them for a walk in the park instead." Forming an implementation plans requires the individual to foresee a situation that could result in goal-inconsistent behavior and then plan a more suitable (i.e., goal-directed) behavioral response. The effectiveness of such "action planning" is thought to depend on plan completeness (how fully developed the plan is), plan specificity (how precise each element in the plan is), plan novelty (how familiar or practiced the plan is), and how memorable / accessible the plan is [15].

While goal intentions alone (e.g., "I will exercise more") seem to fall short in consistently ensuring goal achievement, meta-analysis data provide evidence that implementation plans are effective, with a medium-to-large effect size on goal attainment (d = .65, 95% confidence level of .60 - .70) [98]. The domains in which implementation plans have been shown most effective include anti-racist, prosocial, and environmental behaviors. Academic achievement, health behaviors, consumer behaviors, and personal goals revealed medium-sized effects. Most notably for the field of impulse control and self-regulation, implementation plans had a large effect (d = .90) on suppressing unwanted attentional responses (e.g., controlling one's attention away from distracting temptations), and a medium effect (d = .54) on suppressing unwanted behavior responses (e.g., not yielding to a tempting but unwanted behavior).

However, the effectiveness of planning (in service of a goal) can depend on goal-distance [235]. Lab experiments that assigned participants to a planning condition (i.e., plan out how much of their upcoming tax return they would save), showed lower levels of goal attainment (i.e., percentage of tax rebate actually saved) for those who began farthest from their end-goal (i.e., those with less money already saved) in comparison to those who were closer to their goal. However, the authors also showed that manipulating *perceived* goal-distance improved goal attainment for individuals with the greatest goal-distance. Interestingly, participants who did not engage in the planning activity achieved similar levels of goal attainment regardless of goal-distance.

2.2.1.2 *Commitment devices*

A commitment device is a self-imposed arrangement that compels oneself into compliance with a goal and is typically designed to eliminate future, goal-inconsistent choices [14:28]. One type of commitment device is a *commitment contract* which is a promise (to engage or not engage in some type of behavior) that is backed-up with a contingent reward or punishment [14:xiv]. Commitment contracts can be created with yourself, requiring you to operate on an "honor" system [14:175], can be refereed by someone else, or can be structured as a competition among a group of people (i.e., commitment pools). Contingent rewards are designed to be too great to pass up, while contingent punishments are designed to make the cost of breaking the promise far too great. For example, one can enter into a commitment contract to stop watching television where he or she must pay a large sum of money for every TV show consumed (punishment contingent) or, alternatively, where he or she will be rewarded with a large vacation for not watching TV for one consecutive month (reward contingent). Returning to the dual-system planner-doer model, these rewards and punishments are used to shifts the "doer's" myopic preferences closer to that of the more conscientious, long-term minded "planner" [232].

Contingent rewards can include things like receiving money, enjoying hedonic experiences, giving money to an especially beloved organization or charity, or having a competitor (willingly) humiliate themselves in public [14:90]. Contingent punishments

can include things like paying money to someone or an organization that you especially dislike, making your failures public (especially when done in a humiliating way), or imposing an unfair punishment on someone else for each of your transgressions ("punishing innocents"). One noted distinction among commitment devices is when real, economic penalties and rewards are involved (i.e., "hard commitments") and when the primary consequences are psychological (i.e., "soft commitments") [41:672].

Joining peer support/accountability groups is an example of an effective commitment device with primarily psychological rewards and punishments. For example, a randomized field experiment showed that those who attended weekly peer support meetings where members shared their progress toward weekly savings goals were able to save more money than (a) participants who did not attend group meetings and (b) more than participants enrolled in a special high-interest rate savings account [130]. Being held accountable to goals in front of peers seems to have motivated more regular savings than even the financial incentive of a high-interest savings account.

A different type of commitment device is an arrangement that *restricts future options*. These devices can eliminate the access to or ability to acquire, for example, a temptation [108]. Classic examples include cutting up your credit cards to make spending more difficult and putting a lock on the refrigerator to restrict snacking. Consumers hoping to limit their consumption of vice products (e.g., cigarettes), sometimes engage in "rationing" where they purchase smaller-sized (yet more expensive per-unit) packages to slow their rate of consumption [251]. Children also use commitment devices; for example, a study with elementary school children showed that 68.5% of participants accepted an offer to immediately lock-up half of their chocolates so that they would be sure to have sweets for the next day [8]. Similar commitment devices have been tested with bank customers trying to save money [13]. In a natural field experiment, bank customers were invited to enroll in a savings-commitment product, which restricted access to all deposited money in the account. Customers choose between restricting access until a specified date or until a certain savings goal was reached; once a goal was set, it could not be changed. The results of the twelve-

month study showed that average savings balances increased by 81 percentage points for those enrolled in the account, relative to the control group not enrolled.

2.2.1.3 Avoiding ego-depletion

The final self-control strategy in the pre-stimulus phase is to avoid ego-depletion. The ability to self-regulate behavior is thought to depend on limited resources that can become taxed with over-use [25,242]. Failure to resist an impulse purchase can be explained as a breakdown in self-regulation, in some cases, brought on by insufficient resources to alter goal-inconsistent behavior [23]. Research has shown that efforts to control one's attention, thoughts, and behavior can negatively affect a consumer's subsequent attempts to resist impulse buying [242]. Other research has shown that the mere act of making choices, such as when shopping, can deplete self-regulatory resources [241].

2.2.2 Stimulus phase

The stimulus phase involves the consumer being exposed to a triggering stimulus. Self-control strategies that pertain to the stimulus phase include avoidance and selective attention. *Avoidance* involves trying to prevent exposure to stimuli to prevent a consumption impulse from forming. Hoch and Loewenstein describe this strategy as "distancing" where the consumer tries to avoid the physical or sensory proximity of a product by avoiding exposure all together or by removing oneself quickly from situations where product temptations have unexpectedly arisen [108]. Examples of this strategy include avoiding shopping malls and installing ad-blocker software on your computer.

Selective attention involves strategically focusing attention so as to lessen the pull of the temptation. In the classic delay-of-gratification marshmallow studies, the amount of attention paid to a short-term reward (i.e., a marshmallow) played a large role in whether a child was able to delay gratification and wait for larger rewards [170]. Children waited longer periods of time when the rewards were not physically visible or when they were told to think about "fun" distracting thoughts during the waiting period.

Children also waited longer periods of time when they were told to focus on the "abstract" or cool qualities of the reward (e.g., the shape of the treat) versus children who were told to focus on the "arousing" or hot qualities of the reward (e.g., the taste). The authors argue that focusing on the arousing qualities of a temptation tends to "elicit the completion of the action sequence associated with it, such as eating a food or playing with a toy" [170:935]. Similarly, Baumeister and Heatherton [25] describe a self-control strategy of "transcendence," or refocusing attention away from the immediate situation and toward a bigger-picture perspective. For example, a consumer engaging in transcendence might refocus his attention away from the alluring products on his mobile phone and up toward the larger environment around him.

2.2.3 Recognizing-constraints phase

After a consumer experiences a consumption impulse, the CIFE model posits that there is an automatic recognition of whether there are (or are not) constraining factors to enacting the impulse. This phase is referred to here as the recognizing-constraints phase. Because this phase is considered a more automatic process [68], effective self-control strategies are not enacted in this phase but can influence the outcome of this phase, most notably through *accessibility of costs, rules, and goals*. The more accessible that costs, rules, and goals are in the consumer's mind, the more likely they are to be identified as constraining factors.

Effective goal striving requires that goals and implementation plans are not only set but also remembered when needed [15]. One method for enhancing the accessibility of goals in the consumer's mind is through *goal priming.* In a lab experiment, participants were administered a visual acuity test which, unknown to participants, quickly flashed the word "save" (goal priming condition) or "table" (control condition) on the screen in between tasks. When participants were subsequently given a shopping scenario with 17 potential unplanned purchases, participants primed with a savings goal reported lower willingness to make unplanned purchases than participants in the control condition [246]. This suggests that even subtle cues or reminders of important consumption goals

may help the consumer identity those goals as constraints to enacting goal-inconsistent impulses.

Another method for keeping constraints accessible is to use commitment devices to make them unavoidable. A consumer who cuts up their credit cards will quickly recognize a constraint to impulse buying when they have no method to pay for the product. This realization may also remind the consumer of the underlying consumption goal that motivated the commitment device in the first place. Using commitment devices to create highly motivating rewards for resisting temptation or highly motivating punishments for giving-in the temptation may also make those rewards/punishments more accessible in the consumer's mind, making them more likely to be recognized as a constraint.

2.2.4 Deliberation phase

The deliberation phase occurs after a consumer has recognized constraints and results in either a positive or negative evaluation of enacting the impulse. Keeping costs, rules, and goals accessible is a strategy that can help encourage deeper, more systematic deliberation, specifically of constraints. The more *accessible costs, rules, and goals* are, the greater the number of constraints that an individual may be able to identify and think through. This deeper type of deliberation is a hallmark of cool-reflective-planner cognitive system, which prioritizes long-term goals and considerations [167,228,232]. Unlike emotional "hot spots" triggered by tempting stimuli, cool nodes (e.g., mental representation constraints and costs) are highly interconnected, facilitating a deeper, more inter-relational thinking process [228]. The greater the number of constraints accessible to the consumer, the greater the number of cool nodes activated and the more systematic and thorough the deliberation process.

Commitment devices that restrict options or impose large punishments/large rewards may shorten the deliberation phase by creating incentives too strong to argue with. A related self-control strategy is to *limit the amount of deliberation* once a constraining factor has been identified. This strategy, which has also been called "parsimonious

information processing" [68:964] minimizes the length or depth of deliberation once reasons for not enacting the impulse have been identified, especially when further deliberation may jeopardize goal-consistent behavior. Minimizing deliberation in this way or "inhibiting the processing of information that supports competing intentions" [15:29] can help the consumer avoid rationalizing one's way out of the constraint [68,108].

Motivated categorization is the strategic widening or narrowing of product categories defined as goal consistent or inconsistent. This strategy has been studied as an explanation for how certain individuals undermine their own consumption goals [203]. Research has shown that when individuals who measure low in self-control are tasked with a restriction goal, they are more likely to widen their classification of "necessity" products. In this case, necessity products normatively classified (through independent pre-testing) as luxury products—suggesting that these individuals categorization process was aimed at gaming the system [203]. A consumer can take advantage of this insight in the deliberation phase by conscientiously recognizing how he or she is classifying products as goal-consistent or goal-inconsistent.

2.2.5 Volition phase

The volition phase occurs after the consumer has deliberated, has assigned a negative evaluation to the impulse behavior, and then engages their volitional system to enact resistance strategies. One such strategy is to try to *regulate emotions*. Because negative affect states can trigger impulse buying [93]; finding other means to lift spirits may make an impulsive purchase less tempting [68]. A consumer may choose to hum a song that makes them happy in order to improve their mood and bolster resistance to impulse buying. Another form of this strategy is to manipulate emotional states such that they become incompatible with an impulsive behavior [6]. For example, focuses on feelings of anger with a particular retailer in order to curtail an impulse to purchase one of their products. Those feelings of anger will not be satisfied or resolved with a purchase from that retailer.

Deliberation during the volition phase is a second round of more thorough deliberation. Consumers can conduct a *cost assessment*, or a systematic consideration of the economic and psychological costs associated with an impulse purchase [108]. *Cost bundling* can make costs more salient by bundling small payment installments (e.g., “only $19.99 per month”) together into a more accurate, cumulative cost of the product. Cost assessments also consider for emotional costs. *Emotional forecasting* or anticipated emotions [17] involves thinking about the anticipated negative emotions that can result from an impulse buy, including, for example, regret, guilt, remorse, and shame [27,93,174,261]. Individuals who anticipated pride for resisting cheesecake ultimately ate less cake and reported fewer thoughts about the temptation in comparison to those who anticipated feeling shame for eating [195]. The authors contend that anticipating shame maintains a focus on “hot” or impulsive stimulus features, where anticipating pride activates the cool-reflective-planner system by directing attention to the self and away from the stimulus.

Priming elaboration is another deliberation strategy. For example, research has shown that language that highlights *non-obvious costs* are effective at curbing impulsive decisions, presumably because the appeals made participants think about costs that they had not previously considered [205]. Other research has demonstrated *priming elaboration of potential outcomes* as an effective self-control strategy. Participants were presented a scenario where they were told to imagine they had $15,000 in discretionary money and they could decide how much to spend and how much to allocate to retirement savings [182]. Only participants in the treatment condition were told to consider the potential positive and negative outcomes of investing or not investing in a retirement fund. Results showed that when participants were not primed to elaborate, individual differences predicted investment decisions (i.e., individuals with a tendency to elaborate allocated nearly twice as much money to retirement). However, among participants who were primed to consider outcomes, individual differences fell away—individuals who tend not to elaborate allocated the same amount of money to retirement as individuals who naturally tend to elaborate on potential outcomes. These results suggest that priming elaboration can be an effective strategy to enhance self-regulation,

particularly for individuals who are not naturally prone to elaborate on potential positive and negative outcomes.

Postponement refers to delaying the final decision on whether to follow through with an impulse or not. Postponement is considered a “desire reduction strategy” that delays a product decision with the hope that desire will be lower at a future point in time [108]. An example of this would be a consumer who places an impulse buy in their online shopping cart but strategically waits several hours or days to make the decision whether to actually complete the online order. This strategy is made available to consumers who purchase cars or products from persuasive door-to-door sales professionals through “cooling off” period laws [163]. The act of postponing can be thought of as decreasing the proximity of a product, which can act to re-shift the consumer’s reference point such that not-purchasing no longer feels like a loss [108]. Research in time-inconsistent preferences has shown that adding even a small delay to an immediate, small reward can shift preferences to larger, long-term rewards [225].

A related strategy is to use *substitution*, when a consumer gives himself a smaller immediate reward instead of the larger product temptation. The substitution may satisfy the consumer enough to reduce the desirability of the larger temptation [108]. An example of substitution in self-control experiments includes providing a non-functional key to press instead of a reward-associated key [5]. In an impulse buying context, this strategy could include purchasing a less goal-inconsistent product, for example, purchasing a small candy bar instead of a large chocolate cake as a means to at least partially satisfy the impulse.

Finally, taking a *promotion self-regulatory focus* can be an effective self-control strategy. Self-regulatory focus describes the orientation that an individual takes during goal-pursuit and can include a promotion-focus (i.e., an orientation toward something) or a prevention-focus (i.e., an orientation away from something). Research suggests that individuals with a promotion focus may be better able to resist temptation. In one study, participants were primed with either a promotion or prevention focus through an essay

writing task and then given a hypothetical consumption scenario about buying a slice of cheesecake [69]. Promotion-primed individuals reported less likelihood to purchase the cheesecake in comparison to prevention-primed individuals. These results suggest that thinking about what a consumer hopes to achieve (e.g., “I won’t buy because I really want to save my money for an exciting vacation”) is more effective than focusing on what they hope to avoid (e.g., “I won’t buy because I don’t want to go into debt”).

2.2.6 Feedback phase

The feedback phase occurs under two conditions: (1) when an impulse purchase is made and (2) when no purchase is made. Both conditions can result in a set of affect and behavioral outcomes that act as feedback to the consumer and can even trigger subsequent impulse buying behavior [257]. *Monitoring* one’s behavior against standards, ideals, and goals is considered a key criteria to successful self-regulation [25]. Monitoring behavior is what provides the individual the signal or cue that a behavior shift may be needed in order to remain in-line with goals or standards. Further, monitoring unwanted behavior can be perceived as a tax on that behavior, creating additional incentives not to engage in those behaviors [232]. While a monitoring strategy is most applicable to the feedback phase of impulse buying, it can apply to and affect nearly all aspects of the process from the pre-stimulus phase, where understanding one’s own behavior will inform the selection of pre-arranged resistance strategies, to the volition phase, where monitoring one’s own behaviors can signal the need to implement alternative resistance strategies when necessary.

2.3 Conclusion

Taken together, the literature reviewed in this chapter helps explain what impulse buying is and provides theories for how it happens. The literature also provides various strategies for encouraging self-control, strategies that have been most commonly tested in the domains of healthy eating, exercise, and saving/investing behavior. Self-control with impulse buying has received less attention. Hoch and Loewenstein’s long-standing theories on impulse buying provide a host of promising self-control strategies that have gone largely untested. Further, there is virtually no research addressing self-control with

online impulse buying. While the self-control literature commonly centers around tempting food (e.g., a bowl of candy), online shoppers must contend not only with the "bowl of candy" but also with strategic design elements that push them to consume quickly. This dissertation tackles these gaps by researching (a) the design features on websites that can encourage impulse buying, (b) the types of tools that consumers desire to help them with impulse buying, and (c) the efficacy of self-control strategies/interventions in the face of tempting online impulse purchases.

CHAPTER III
Current Design Practices and Consumer Needs

This chapter[1] paints the current landscape of design practices and consumer needs related to online impulse buying. We present two studies here. Study 1 examines e-commerce design practices that can encourage impulse buying. Our content analysis of 200 top e-commerce websites confirms that sites use design features that can encourage impulse buying and characterizes the different types of features that are most common. Study 2 shifts the focus to consumers and the support that they desire in the face of these widely-used design tactics. Our survey of 151 frequent online impulse buyers highlights the types of tools that consumers would like (and would not like) access to in order to exert greater self-control with e-commerce. This research lays the foundation of this dissertation by informing the design of the self-control technologies and strategies that are tested in Chapters IV-V.

3.1 Content Analysis of E-Commerce Design (Study 1)

Online impulse buying is a regular topic in the popular press, which reports on the thousands of dollars consumers "waste" annually [247] and prescribes tips on how to avoid impulsive spending [44,218,231]. Yet little research has investigated the types of features that e-commerce sites utilize to encourage this behavior. Early research on "unregulated buying on the Internet" analyzed eight e-commerce sites and found more features that disrupt self-regulation than encourage it [141]. Other work has highlighted the use of "dark patterns"— design features intended to trick and trap users [99]. Analysis of dark pattern exemplars revealed features that utilize nagging, obstruction,

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sneaking, interference, and forced action. Dark patterns related to e-commerce included, for example, sneaking products into shopping carts and obstructing price comparison tools [99]. More recent work analyzed over 11,000 shopping websites and found deceptive dark patterns in over 11% of sites and that dark patterns are more likely to appear on popular shopping sites [162].

The goal of this research is to investigate which features are being utilized by current e-commerce sites that can encourage impulse buying. Therefore, this study asks (RQ1): Do current e-commerce sites include features that can encourage impulse buying? And if so, (RQ2) What types of features do e-commerce sites currently use that can encourage impulse buying?

3.1.1 Encouraging Impulse Buying

While many factors can encourage impulse buying (e.g., individual differences [29,215] and current mood [94]), this research focuses on factors related to the product or shopping environment. Hoch and Loewenstein theorized that enhancing perceived physical proximity to a product creates feelings of partial ownership and potential loss if the product is not ultimately purchased [109]. Accordingly, a shopper who tries on a new winter coat is more likely to purchase “their” coat than a shopper who only sees that coat in a store display. Enhancing the vividness and interactivity of online product presentations can help the consumer feel physically closer to the product [244]. In the case of a sunglass e-store, having 360-spin view options or a web-cam mirror to “try on” sunglasses predicted feelings of wanting to impulsively purchase [244]. Shopping through Facebook live video helped consumers feel as though they were shopping in a physical store, increasing impulse buying behavior [147]. Perceived temporal proximity, or how quickly a consumer believes they can acquire a product, can also encourage impulse buying. Immediate rewards are often favored over delayed rewards, even when delayed rewards are larger [109]. The availability of next- or same-day shipping and easy credit (i.e., not having to wait and “save-up” for a purchase) provides the promise of near-instant gratification for online consumers [213,264].

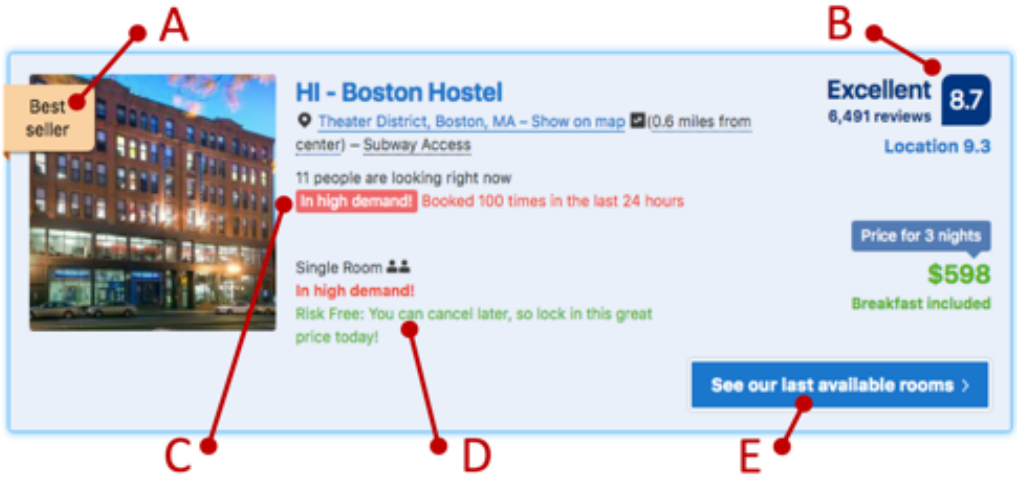


Figure 2: Screenshot from Booking.com illustrating feature (A) bestseller tag, (B) ratings and number of ratings, (C) number of customers interested and selling fast tag, (D) free cancellation, and (E) low stock warning.

Lowering the perceived risks of shopping can also encourage impulsive purchasing. Impulse buyers often rely on generous return/refund policies—especially when impulsively buying apparel [129]. Products promoted as “on sale” [124] or that are perceived as a “good deal” can trigger an impulse buy [94,264]. Similarly, being offered unexpected or surprise coupons at the beginning of a shopping trip can result in a greater number of, and greater amount spent on, unplanned purchases [106].

Social influence, or cues that “leverage the behavior of other users” [40], can also encourage impulsive purchases. Impulse buys can be brought on by social comparison, when, for example, consumers see their peers purchasing a particular product [109]. Friend posts on social network sites about products or local establishments (e.g., restaurants) predict similar online purchases and visits to similar establishments [266]. On social media marketplaces, the more “likes” that a product receives [49,147] and the larger the live video audience [147], the more likely a consumer is to experience an impulsive urge to buy. E-commerce sites have also found success increasing revenue through the use of social proof cues, such as highlighting “popular” products [40].

Field experiments have shown that more time spent browsing in-store leads to more impulse purchases[29,193]. Similarly, time spent browsing an online store positively affects a consumer's felt urge to buy impulsively [238,267]. The effect may be explained by greater exposure to novel products and marketing stimuli. Consumers assigned to shop in an unfamiliar grocery store contended with unfamiliar store layouts, increasing their exposure to in-store marketing stimuli, leading to increased impulse buying [193]. Similarly, exposure to online product recommender systems can increase a consumer's number of unplanned purchases [115].

Add-on benefits describe when a purchase is made more attractive by bundling it with add-ons, such as free gifts. Consumers have reported that entry into a sweepstakes or the promise of a "free gift with purchase" have triggered an impulse purchase [134,264]. The shopping momentum effect describes how making an initial purchase creates a "psychological impulse" to make additional purchases [65]. Recent work has shown that making an unplanned purchase increases the probability of making subsequent unplanned purchases, especially for those with medium (versus small) sized budgets [95]. Perceived product scarcity is the "perception of a product shortage" conveyed to consumers through "limited-quantity" messaging [4]. One way that e-commerce sites enhance perceived product scarcity is through "stock pointers" (e.g., only 1 left in stock) [40]. When consumers perceive that a product of interest is almost out of stock, they experience an urge to purchase that product immediately [104]. Urgency, in contrast, is based on limited-time availability messaging that, for example, urges a consumer to take action before a deadline, sometimes implemented on e-commerce sites with a countdown clock [40]. Research has shown that limited-time offers are one of the most commonly self-reported triggers of online impulse buying [154].

The presence of product advertising has long been associated with impulse buying behavior and can include stimuli such as mass advertising [226] and in-store marketing materials [193]. Other miscellaneous factors that have been shown to encourage impulse buying include visually appealing website design [190], diverse product

assortments [153], appetitive stimuli (e.g., “mouthwatering photography”) [259], and user- friendly website navigation [190].

3.1.2 Method

Content analysis is a well-established “observational” research method used to systematically evaluate the content of different types of communication [136]. We conducted a content analysis of 200 e-commerce sites to systematically assess the presence of features related to impulse buying.

3.1.2.1 *Sample Selection*

The U.S. Census Bureau segments the “Electronic Economy” into 4 sectors: Manufacturing, Retail, Services, and Wholesale [269]. This work focuses primarily on Retail, as well as the travel services segment of Services, both of which cater to consumers. We analyzed the top 200 retail websites from Internet Retailer’s 2017 Top 500 Report, an annual industry report of the top internet retailers in the United States by online revenue [208]. We chose the top 200 sites to capture a range of websites but without having to code all 500. We excluded purely informational corporate websites and non-functional websites (i.e., out of business). We added eBay, a large online auction site, and the top earning U.S. based travel websites, which were not included in Internet Retailer’s report, to our sample. The final sample includes 186 retail sites (e.g., Amazon.com, OfficeDepot.com, PetCo.com) and 14 travel sites (e.g., Expedia.com, Booking.com, Airbnb.com).

3.1.2.2 *Website Archiving*

All websites were archived in PDF format in April 2018, over the course of seven days. A research assistant visited all websites using a Chrome browser on an HP desktop computer. Because some e-commerce sites track user behavior in order to personalize content, sites were visited in “incognito” mode to prevent our sample from reflecting the personalized content of one person. The research assistant used each website’s navigation bar to drill down to a specific product type. When possible, products were

selected from a list of product types that are more likely to be purchased on impulse (i.e., lower-cost items such as books, toys, small electronics, makeup, clothing, accessories, and home décor [72,124]). For specialty websites that specialized in a particular product type (e.g., 1800Flowers.com), that product was selected. The average price of the product captured was $29.22 (*SD*=$67.14, *min*=$0.69, *max*=$599).

A full-page screen capture was taken of (a) the home page, (b) all pop-up windows and special interactivity, such as quick-view buttons, (c) a fully expanded homepage navigation bar, (d) any “sale” or “deal” pages, (e) a product listing page (e.g., all winter scarves), (f) a product details page (e.g., for one particular scarf), (g) any product interactivity such as video, zoom, spin, or virtual dressing rooms, (h) the shop- ping cart, and (i) the first checkout screen. The full checkout process was not captured because that would have required making a purchase. No paid membership accounts (e.g., Amazon Prime) were used. The average number of pages captured per website was 9.26 (*SD*=1.98, *min*=4, *max*=14).

3.1.2.3 *Coding Procedure*

We developed a codebook based on themes identified from our review of prior work in impulse buying. Keeping these themes in mind, the lead author visited several e-commerce sites (independent from the study’s sample) and generated an initial list of features that can encourage impulse buying. For example, the literature suggests that social influence can encourage impulse buying [49,147,266] and therefore features such as product recommendations based on what “other customers” purchased were added to the codebook under the social influence theme. The list was expanded to also include features that can encourage deliberative decision-making (e.g., product comparison tools). The research team then reviewed, discussed, and revised the initial list of features. The list was then reviewed and expanded by an independent group of six doctoral students. The list of features was then reviewed one last time and finalized by the research team.

The codebook excluded features that were not conducive to a binary (present/not present) measurement (e.g., visually appealing). The final codebook included 12 themes: physical proximity, temporal proximity, lower risk, social influence, browsing, add-on benefit, perceived scarcity, urgency, shopping momentum, advertising, investment, and deliberation. We added the "investment" theme for a small number of features that did not map to any themes identified in prior work. Investment features require an investment from the consumer (usually time or effort) in exchange for information or functionality that can encourage impulse buying in the future (e.g., completing a personalization quiz). Themes were represented by a total of 71 parent codes (i.e., features) and two child codes. Websites were coded using Atlas.ti for whether a feature was or was not present on a website.

3.1.2.4 *Inter-Rater Reliability and Analysis*

Inter-rater reliability (IRR) was established and measured following Lombard et al. [156]. The lead author first trained a research assistant on a small sample of websites independent from the study's main sample (N=3, representing 1.5% of full sample size). The two researchers then completed independent pilot coding of two new websites (also not part of the study's main sample), compared coding, discussed points of disagreement, and refined the codebook. The two researchers then conducted independent coding of 20 websites (10% of the full corpus [62,156]) randomly selected from the study's sample of 200 websites. IRR for the two coders was Cohen's Kappa of .83, demonstrating sufficient agreement between coders [156]. One coder completed the remaining 180 websites in a random order. We conducted all statistical analyses (frequency counts and comparison of means) using SPSS.

3.1.3 Results

3.1.3.1 *Websites Use Impulse Buying Features*

Research question 1 asked whether current e-commerce sites include features that can encourage impulse buying—our results show that they do and that the use of those features was common among the websites sampled. Among all websites sampled

(N=200), an average of 19.36 features (*SD*=5.64, *min*=4, *max*=34, *median*=19) were present out of a possible 64 features. 75% (N=150) of websites had at least 16 features that can encourage impulse buying. 100% (N=200) of websites included at least 4 features than can encourage impulse buying. Websites also included deliberation features (*M*=1.97, *SD*=1.48, *min*=0, *max*=6, *median*=2, out of a possible 7 features). 75% (N=150) of websites included at least 1 deliberation feature. 16% (N=32) of websites included no deliberation features.

Theme	Feature	Count
Lower risk	member/rewards program discounts	183
Lower risk	discounted price	167
Social influence	product ratings/reviews	164
Lower risk	sale page/list	163
Physical proximity	interactivity	160
Lower risk	return/refunds	151
Social influence	number of ratings/reviews	145
Social influence	share cart or product (no counter)	128
Deliberation	wishlist	126
Temporal proximity	quick add-to-cart button	125
Browsing	product collection(s) for browsing	119
Social influence	bestseller tag	118
Advertising	internal ads	117
Urgency	limited-time discount (no countdown clock)	116
Physical proximity	multiple product pictures	113
Lower risk	third-party seal	108
Browsing	similar products recommendations	103
Temporal proximity	expedited shipping (all)	103
	expedited shipping (next day) (count=52)	~
	expedited shipping (same day) (count=9)	~
Shopping momentum	discounted shipping with minimum spent	96
Physical proximity	preview products specs	88
Shopping momentum	add-on product recommendations	87
Browsing	product quickview button	76
Shopping momentum	discount for add-on products	72
Lower risk	discount for providing email address	67
Temporal proximity	store pick-up	67
Add-on benefit	free gift with purchase	65
Lower risk	discount/promo code (not for shipping)	58
Browsing	general product recommendations	57
Deliberation	product comparison tool	57
Deliberation	helpful review voting	56
Deliberation	product Q&A section	56
Advertising	external ads / sponsored products	55
Temporal proximity	checkout popup	51
Deliberation	save-for-later list	47
	continued on right column →	

Theme	Feature	Count
Perceived scarcity	exclusive product	46
Deliberation	rating distribution	42
Social influence	others bought recommendations	42
Social influence	positive review highlighted	41
Social influence	show real customers using product	41
Browsing	others viewed recommendations	39
Physical proximity	video/animation of product	39
Perceived scarcity	limited-quantity for sale (not low-stock)	36
Browsing	personalized recommendations	34
Perceived scarcity	exclusive price	34
Perceived scarcity	low stock warning	34
Temporal proximity	easy credit/payment terms	34
Investment	requires account to buy	29
Perceived scarcity	sold out/back-ordered tag	29
Urgency	order deadline for shipping	28
Urgency	limited-time discount (with countdown clock)	27
Urgency	lock in discount now feature	26
Lower risk	price match guarantee	25
Investment	sign up for price alerts	15
Social influence	referral discount	15
Perceived scarcity	selling fast tag	14
Shopping momentum	discount for auto-reorder	14
Social influence	share cart/product (with counter)	14
Add-on benefit	donation with purchase	13
Social influence	number sold/number of customers	13
Urgency	limited-time product availability (no clock)	12
Lower risk	trial period	11
Social influence	number customers interested/watching	11
Deliberation	negative review highlighted	10
Investment	personalization quiz	10
Lower risk	free reservation cancelation	7
Social influence	shows social media friends have purchased	5
Physical proximity	virtual dressing room	3
Shopping momentum	first purchase discount	3
Temporal proximity	quick checkout button	2
Urgency	limited-time product availability (with clock)	2
Add-on benefit	sweepstakes with purchase	1

Table 1: Frequency count of websites (max=200) that included at least one instance of each impulse buying feature (code)

3.1.3.2 *Most and Least Common Features*

Research question 2 asked what types of features do e-commerce sites currently use that can encourage impulse buying. The most common impulse buying features, found in 75% of websites, included member/rewards program discounts, discounted prices,

product ratings/reviews, sale pages, product interactivity (e.g., photo zoom/spin), and returns/refunds. The least common features included entry into a sweepstakes with a purchase, displaying a countdown clock for limited-time product availability, quick check-out buttons, a discount for the first purchase made on the site, virtual dressing rooms, and showing that social media friends have purchased the product. Fewer than 3% of websites included any one of these features. See Table 1 for a report on all features.

3.1.3.3 *Most and Least Common Themes*

When features were analyzed at the theme level, we found that features that lower the perceived risk of transacting on an e-commerce site (e.g., discounts, returns/refunds, and third-party seals such as Verisign™) were the most common theme—100% (N=200) of websites sampled included features in this category. Another common theme of feature included those that rely on social influence, such as product ratings/reviews, sharing carts/products, bestseller tags, and product recommendations based on what "other" people bought—96% (N=192) of websites sampled included features in this category. Features that enhance a user's perceived physical proximity to a product were also common, such as product interactivity (zoom/spin of product photos), multiple product photos, previews of product specs such as different colors, and product videos or animation—91% (N=182) of websites included features in this theme. Features that enhance the perceived temporal proximity to a product (e.g., same day delivery, store pick-up, quick add-to-cart buttons, quick check-out pop-ups) were also common—more than 90% (N=181) of websites included this theme.

Other common themes included those that try to generate shopping momentum (e.g., add-on product recommendations) and that encourage browsing (e.g., curated product collections). These two themes were each present in at least 82% of websites sampled. Features that encourage more deliberative decision making, rather than impulsive purchasing, were also a common theme, with 84% (N=168) of websites including at least one feature that encourages deliberation.

Such features included wish lists, save-for-later lists, product comparison tools, and product Q&A sections. Less common themes included features that enhance a user's sense of urgency (N=138, 69.0%) (e.g., limited-time discounts with countdown clocks), relied on advertising (N=135, 67.5%) (e.g., sponsored products), or enhanced the perceived scarcity of a product (N=124, 62%) (e.g., low stock warnings, exclusive product offerings). The least common themes of impulse buying features included those that provided an add-on benefit for purchasing (e.g., free gift with purchase) and those that relied on the user to make a time investment (e.g., signing up for price alerts)—fewer than 40% of websites included features in either of these two themes.

Impulse Buying Theme	Count (websites)		Count (features)
Lower Risk	200	(100%)	930
Social Influence	192	(96%)	737
Physical Proximity	182	(91%)	403
Temporal Proximity	181	(90.5%)	382
Deliberation	168	(84%)	394
Shopping Momentum	167	(83.5%)	272
Browsing	164	(82%)	428
Urgency	138	(69%)	211
Advertising	135	(67.5%)	172
Perceived Scarcity	124	(62%)	193
Add-On Benefit	73	(36.5%)	79
Investment	46	(23%)	54

Table 2: Frequency count of websites (max=200) that included at least one instance of each theme of impulse buying features

3.1.3.4 *Top Websites*

Table 3 lists the top 18 websites (roughly top 10%) based on number of impulse buying features. The top 18 websites all included at least 27 features (*M*=29.33, *SD*=2.47) that can encourage impulse buying. Macys.com, OpticsPlanet.com, Amazon.com, Newegg.com, and Target.com topped the list, each including more than 30 impulse

buying features on their sites. The top 18 websites also included on average 2.78 features (*SD*=1.26, *min*=1, *max*=6, *median*=3) that can encourage deliberation.

	2016 Web Sales	Merchandise Category	Merchant Type	Deliberation Features (count)	Impulse Features (count)
macys.com	1 billion+	Mass Merchant	Retail Chain	3	34
opticsplanet.com	$250M-$500M	Sporting Goods	Web Only	4	34
amazon.com	1 billion+	Mass Merchant	Web Only	6	33
newegg.com	1 billion+	Computers/Electronics	Web Only	3	32
target.com	1 billion+	Mass Merchant	Retail Chain	3	31
officedepot.com	1 billion+	Office Supplies	Retail Chain	2	30
jcpenney.com	1 billion+	Apparel/Accessories	Retail Chain	3	30
ebay.com	1 billion+	Mass Merchant	Web Only	2	29
bedbathandbeyond.com	$500M-$1billion	Housewares/Home Furnishings	Retail Chain	3	28
travelocity.com	NA	Travel	Web Only	2	28
midwayusa.com	$250M-$500M	Sporting Goods	Web Only	1	28
bestbuy.com	1 billion+	Computers/Electronics	Retail Chain	4	28
ae.com	$500M-$1billion	Apparel/Accessories	Retail Chain	1	28
staples.com	1 billion+	Computers/Electronics	Retail Chain	4	27
build.com	$500M-$1billion	Hardware/Home	Web Only	3	27
williams-sonoma.com	1 billion+	Housewares/Home Furnishings	Retail Chain	2	27
ebags.com	$125M-$250M	Apparel/Accessories	Web Only	1	27
nyandcompany.com	$125M-$250M	Apparel/Accessories	Retail Chain	3	27

Table 3: Top websites by number of impulse buying features

3.1.3.5 *Number of Features by Product Type*

Product type was pulled from Internet Retailer's Top 500 Report [208], which classified websites into one of 15 categories: Apparel/Accessories (N=61); Automotive (N=8); Books/Music/Video (N=5); Computers/Electronics (N=10); Flowers/Gifts (N=5); Food/Drug (N=9); Hardware (N=10); Health/Beauty (N=15); Housewares (N=13); Jewelry (N=6); Mass Merchant (N=18); Office Supplies (N=4); Specialty (N=9); Sporting Goods (N=10); Toys/ Hobbies (N=3). We added a final category, Travel (N=14), for a total of 16 product categories. Because the assumption of homogeneous variances was violated (Levene's, *p*=.02), a Welch ANOVA was used to assess differences between product types. There were no statistically significant differences in the number of impulse buying features between websites with different product types, Welch's F (15, 35.62)=1.66, p=.11.

3.2 Survey of Consumer Needs (Study 2)

Consumers report that regret is one of the most common outcomes of impulse buying [165]. The goal of this exploratory survey is to understand the preferences of consumers who engage in online impulse buying but who wish to curb that behavior. To that end, we ask (RQ3) what types of tools do consumers wish they had available to them to help curb their online impulse buying and (RQ4) what self-control strategies have consumers successfully and unsuccessfully used in the past to control their online impulse buying? The survey is inspired by a user-centered design approach [245], reaching out to consumers to inform the development of technology interventions that support them.

3.2.1 Method

We conducted an exploratory, anonymous, online survey of online impulse buyers who wished to curb their online impulse buying. The goal of the survey was to understand what tools consumers want to help them exert greater self-control with e-commerce. The survey also asked about any strategies, successful and unsuccessful, that consumers have used in the past. The 21-item survey was administered through the web platform Qualtrics and ran for 5 days in September 2017. This study was deemed exempt by the research team's Institutional Review Board.

3.2.1.1 *Procedure and Measures*

Participants were recruited on shopping groups and self-improvement threads on Facebook, Reddit, and Craigslist. We selected these channels in order to reach frequent online shoppers who also wanted to cut back on their online spending. With permission from group moderators, we posted ads that invited individuals to participate in an online survey for a one-in-ten chance to win a $15 e-gift card. Recruitment ads linked to a brief questionnaire that screened for (a) living in the United States, (b) age, (c) frequency of online purchases, (d) frequency of making unplanned, impulsive purchases online, and (e) a desire to curb online impulse buying. Responses to both frequency questions were made on a five-point scale, which included 1=never, 2=a few times a year, 3=a few times a month, 4=a few times a week, 5=every day.

Participants who did not live in the U.S., were younger than 18 years, had never purchased something online, had never made an unplanned, impulsive purchase online, or did not have a desire to reduce their online impulse buying did not qualify to participate. All others were directed to an informed consent form. Participants were then asked four free-response (text) questions. To aid recall, participants first listed the types of things they have impulsively purchased online in the past. Participants then listed any (a) successful and (b) not successful strategies that they have used in the past to resist making impulse purchases online. Finally, participants were asked, “If you could talk to the designers of an app or online tool that is meant to help you control the amount of impulse buying you do online, what would you tell them to design/build/create for you?” (adapted from [71]).

Participants were then asked about specific web/app features. First, participants selected one response to a multiple-choice question that asked, “I would like to use an app or online tool that makes me wait 1 – 2 (a) minutes, (b) hours, (c) days, (d) weeks, or (e) months before I can checkout”; participants were also given the option of selecting “I don’t want an app / tool that makes me wait to checkout.” Next participants were presented a list of 19 web tools and were asked to select all that they “would like to use” when trying to control impulse buying online. The list of tools was developed to represent self-control strategies such as goal setting [24], monitoring [24], avoidance [109], cost assessments [109], and commitment devices [109]. Example tools included, “Reminds me of my goals, such as to save money” and “Reminds me of my past regretted impulse buys online”.

Participants then completed a modified version of the Impulse Buying Tendency (IBT) scale (adapted to focus on online buying) [252]. The IBT scale is a validated, widely-used five-item scale with items such as “When I see something online that really interests me, I buy it without considering the consequences” and “When I go shopping online, I buy things that I had not intended to purchase.” Responses were made on a seven-point Likert Scale anchored by either *Strongly disagree/Strongly agree* or *Very*

rarely/Very often. The survey concluded with demographic questions about gender, income, race, and employment status.

3.2.1.2 *Participants*

Out of 255 participants who completed the screening questionnaire, 151 qualified for and completed the survey. Participants were 18-65 years old (*M*=36.33, *SD*=10.43, *median*=36) with 86.1% (N=130) identifying as women. Most (67.5%) reported annual household incomes less than $75,000/ year. Half of participants (51.6%) earned an Associate degree or higher. Participants worked full-time (38.4%), were stay-at- home parents (27.2%), worked part-time (19.9%), were unable to work or retired (12.6%), were students (9.3%), were out of work (4.6%), or were military (1.3%). They were primarily Caucasian (81.5%) and married or living with a partner (72.2%).

Participants were frequent impulse buyers, with 84.8% making impulse purchases online at least a few times per week. Our sample skewed higher than average (*M*=25.44, *SD*=5.62, *median*=26, *range*=6-35) on the Impulse Buying Tendency (IBT) scale, where scores can range from a minimum of 5 to a maximum of 35. Prior work in convenience student populations and shopping mall visitors reported average IBT scores ranging from 14.73 (*SD*=4.16) to 21.30 (*SD*=6.95) [252]. In our sample, 71.5% had average IBT scores of 22 or above. The most common products that participants reported buying impulsively online included clothing, household items, children's items, beauty products, electronics, and shoes. Some participants reported specific vendors (e.g., "*anything from amazon*"; "*small stuff from ebay*"), while others noted that they had purchased a wide variety of items on impulse, including "*almost anything that seems like a great deal*" and "*if they sell it, I buy it*". Finally, several participants described their past purchases as items they did not "*need*", for example "*a random car part I didn't need*" and "*unnecessary house hold items*".

3.2.1.3 *Analysis*

Descriptive statistics (e.g., frequency counts) were used to analyze results from multiple-choice questions. For qualitative analysis, the lead author read through all open-ended text responses to identify high level themes, followed by a second reading to develop an initial codebook for each of the four questions. The research team reviewed, discussed, and revised the codebook. Responses from each question were coded by the lead author or a research assistant using the coding software, Atlas.ti. The number of codes per question ranged from 24-32 codes.

3.2.2 Results

3.2.2.1 *Desired Self-control Tools*

Survey responses revealed seven categories of desired self-control tools: making costs more salient; encouraging reflection; enforcing spending limits; increasing checkout effort; forcing postponement; avoidance; and reducing product desire. For each category we report results from open-ended text responses, followed by any relevant quantitative results.

<u>Make Costs More Salient.</u> Participants reported wanting features that help make costs more salient while shopping online. Suggested tech features included tools that track total spending, show alternative uses of money, or reframe costs in personally relevant ways. For example, "*Something with a log that shows recent impulse buys, along with a total of money spent and equivalence to something else (ex: $50 spent = approximately 10 specialty coffees or 8 Chipotle burritos)*". Participants wanted a tool that "*makes me calculate the number of hours I need to work to pay for the product*" (54.3%, N=82), a tool that "*reminds me of my spending budgeting*" (51.7%, N=78), or a tool that "*reminds me of my goals, such as to save money*" (49.7%, N=75). Less frequently desired tools included reviewing "*all the online purchases I have already made that month*" (40.4%, N=61), a tool that "*reminds me of past regretted impulse buys online*" (21.2%, N=32), or a tool that "*shows me pictures of the negative outcomes of over-shopping (e.g., landfills, sweatshop labor, poverty)*" (17.9%, N=27).

Encourage Deliberation or Reflection. Participants described wanting features that encourage deliberation or reflection by, for example, completing a needs assessment before making a purchase: "*Asking what I would use it for and if I truly need it*"; "*Ask me a series of questions, do you need? What will you use it for?*"; and "*Do I need it? Do I love it? Does it spark joy?*". Other participants wanted to be prompted to reflect on their current possessions: "*Ask me do you really need that. How many do you have now?*". Participants also desired tools that "*make me list reasons why I need the product I am trying to buy*" (43.0%, N=65); or "*makes me rate (from 1-10) how much I want to buy each product in my shopping cart*" (43.0%, N=65). Features that promote a simple awareness of impulse buying behavior were less popular, such as a feature that "*gives me a physical warning, like a mobile phone vibration, when I'm about to checkout*" (26.5%, N=40).

Enforce Spending Limits. Participants also reported wanting tech features that enforce spending limits such as tools that restrict the number of products purchased or the amount spent per website, per product, or within a specific time period (e.g., daily, weekly, or monthly). For example, "*I'd like to see an app where I can put $X and that is all I can spend. Once it's gone, I have to wait until the next month. Any time you don't spend the monthly allowance the extra rolls to the next month*". While spending restrictions were not included as a suggested tech feature in the survey's close-ended questions, 28.5% of participants (N=43) indicated that they wanted a tool that "*lets me shop and create wish lists but stops me from actually buying*".

Increase Checkout Effort. Participants reported wanting tools that make checking out more difficult. Suggested features included (a) require shoppers to click through more steps to complete a purchase, (b) require users to confirm their purchase multiple times, (c) force users to manually enter shipping and payment information for each purchase, and (d) require users to complete puzzles or math problems before checkout. For example, "*Ask 'are you sure' a gazillion times, or have captchas*."

Force Postponement. A commonly requested tool was one that required shoppers to wait a certain amount of time before being able to checkout. For example, "*A firewall that forces you to wait X number of minutes (30? 60?) between when you finalize your cart on a website and when you can process your purchase*". Most participants, 80.1% (N=121), indicated that they would like to use an app that requires at least a 1-2 minute wait before checkout. Distraction features (i.e., distracting consumers away from the purchase), a closely related strategy to postponement, were less popular. For example, only 28.5% (N=43) of participants indicated they would like a feature that "*shows me pictures of things I care more about than shopping (e.g., friends and family)*."

Avoidance. Other participants wanted features that help them avoid experiencing shopping temptations in the first place, such as blocking specific websites, making access to specific websites more difficult with passcodes or puzzles, blocking online advertising, imposing shopping time limits, or warning the shopper by flagging products that are likely to be impulse buys. For example, "*it would put [impulse] products in a red mode and if its a product that I don't impulsively buy, would be in green*". Participants also indicated an interest in avoidance features that "*warn me when I have been shopping online for too long*" (41.7%, N=63) or "*sends a reminder warning whenever I click on an online advertisement*" (23.8%, N=36).

Reduce Product Desire. Some participants wanted tools that helped reduce their desire for products by emphasizing negative product attributes or by providing more objective product presentations. For example, "*Honest descriptions as far as what something really does and is made of* ". Participants wanted tools that "*highlight the most negative product reviews*" (55.6%, N=84), that "*shows me the product in a less glamorized way*" (41.7%, N=63), and that hides text like "*limited time offer or only a few left in stock*" (35.1%, N=53).

Unpopular Self-control Tools.

Social accountability tools were not popular among participants. Only two participants out of 151 explicitly requested such tools (e.g., "*An app that texts my husband every*

time I make an online purchase") and only 25.2% (N=38) of participants indicated that they would like a tool that "*won't let me buy without the approval of someone I designate*". Even less popular social tools included "*posting to social media or emailing a friend every time I... "*(a) "*impulsively buy something online*" (12.6%, N=19) or (b) "*resist buying something online"* (9.3%, N=14).

3.2.2.2 *Participant Strategies for Self-control.*

Participants reported the successful and unsuccessful strategies that they had used in the past to try to resist impulse purchases online.

Successful Strategies. Three strategies were commonly cited as successful (and were not commonly cited as unsuccessful): reflection, spending limits, and postponement. Participants described how they would try to reflect on actual their "*needs*"; for example, "*I try to really think whether I need the item and how often I will use/wear it. Do I really need the item right now?*". Others called this type of reflection "*doing a wants vs. needs assessment*". Some specifically reflected on their needs by taking a mental inventory of what they already owned or by talking it over with someone before making a decision.

Another successful strategy was to implement spending limits. Participants described how they limited the funds available to themselves for online shopping (e.g., "*I try to keep very little money on the card I use for online purchases*") or restricted access to their own payment sources (e.g., "*hiding my bank card*"). General "*budgeting*" strategies were also mentioned as successful, such as "*creating a budget and only allowing a certain amount of 'miscellaneous' purchases*". Other tactics to limit spending included creating no-buying periods (e.g., no online purchases this week) and sticking to a shopping list. Most strategies to limit spending did not mention a mechanism for enforcing those limits.

Postponement was one of the most commonly cited successful strategies and was described generally as "*sleeping on it*" or "*waiting one day to purchase*". Other participants described how they used a website's shopping cart to postpone and

ultimately resist online purchases (e.g., "*Putting the item in my cart and walking away from my tablet for a while. Then coming back refreshed and deciding against the item*"). Product wish lists have also been used to avoid impulse buying: "*Making wish lists on Amazon of things I want to buy at the time until the feeling goes away*". Some participants used postponement to create additional time to deliberate: "*I'll select an item and add it to my cart then go do something else. It gives me extra time to think about it*". While most postponement strategies involved revisiting the product at a later time, other participants used postponement as a way to forget about the temptation all together: "*let it sit in the basket and forget that i put it there*". Finally, closely related to postponement, some participants cited distraction as a successful self-control tactic, for example, "*watching Netflix to keep my mind elsewhere*" or "*I have taken a nap or two to resist the urge*".

Avoidance (Successful and Unsuccessful). Avoidance was commonly cited as both a successful and an unsuccessful strategy for curbing impulse buying online. Participants described how avoiding technology in general (e.g., phones, computers, and the Internet), avoiding online shopping (e.g., specific websites, online sales, or online "window shopping"), avoiding online groups that encourage shopping (e.g., deal-hunter shopping groups), and avoiding social media in general were strategies that were effective for them in the past. As one participant described, "*Don't go on Facebook — that's where most ads are*". Other participants found success with removing shopping apps from their phone and unsubscribing from promotional emails and sale notifications. Conversely, avoidance was also one of the most commonly cited strategies that participants found to be ineffective. Avoiding technology, online shopping, shopping groups, and social media were all commonly cited as ineffective. Out of the 53 participants who cited avoidance as effective and the 28 participants who described avoidance as ineffective, 11 (13.6%) were participants who cited avoidance as being both a successful and unsuccessful strategy. For example, one participant reported "*Staying off Amazon and Wish[.com] completely is my only chance...*" as a successful strategy but also reported "*Actually staying off the sites... I'm no good at it*" as an unsuccessful strategy.

Unsuccessful Strategies. Relying purely on willpower was commonly cited as an unsuccessful strategy and was not mentioned by any participants as a successful strategy. Participants described this strategy as "*Just telling myself i won't buy anything*", "*self-control*", "*Resisting on my own*", or "*Trying to browse websites without purchasing anything. Just looking at items is too hard for me! I always see something I think I have to have*". Some participants noted how difficult it was for them to use willpower to ignore temptations: "*tried to just ignore the impulse, but it did not work*" and "*ignoring emails about deals. You will sometimes get convinced even if you're just ignoring*."

3.2.2 Discussion (Studies 1 and 2)

Concerns are growing about design practices that prioritize business goals over the welfare of users [9] and that trick users into doing things that may not be in their best interest [38,99]. The current research investigates e-commerce practices that are unintentionally manipulative at best and, at worst, deliberatively deceptive and unethical. This work falls among, and in support of, critical research in HCI that takes a strong position in favor of ethical design practices (e.g., value-sensitive design [88], critical design [22], and reflective design [217]). Taking a consumer advocate perspective, this work also contributes to the growing body of "transformative consumer research" that aims to prioritize consumer well-being [168]. With the goal of promoting more responsible design choices, Study 1 identifies the most problematic websites and their impulse design features, whether well-intentioned, ill-intentioned, or the result of design "blind spots" [217]. This work calls for e-commerce firms to explicitly consider the well-being of consumers and to provide greater transparency around design features that may encourage impulsive consumer choices.

However, at present, corporations have little incentive to discourage impulsive consumer decisions [141]. At the same time, consumers report that they would like to reduce their impulse buying [256] and likely cannot "afford" to wait for corporations to change their design practices. Further, some design features that encourage impulse buying are also integral to the user experience. For example, while low stock warnings

might unintentionally compel impulsive purchases, they can also help consumers avoid missing out on products they need. Study 1 surfaces these potentially problematic features to empower consumers even against otherwise helpful features. Study 2 goes further to explicitly reach out to users/consumers to understand what types of tools they desire to help them curb impulse buying online. Below, we synthesize results from Study 1 and 2 to propose a variety of technology-based interventions and opportunities for e-commerce transparency that prioritize users'/consumers' desires for self-control while minimizing their vulnerabilities to existing designs.

Features that lower the perceived risks of shopping online were present on every website sampled, primarily in the form of discounts. Consumers are more likely to impulsively purchase things that they perceive as "good deals" [264]. We found that online impulse buyers recognize this vulnerability and would like tools that make costs more salient. While apps such as Mint and Cinch help users track their high-level financials, for online impulse buyers, tools that provide running totals across websites and automatic budget warnings while shopping online may prove to be more valuable. Similar persuasive technologies have been explored to track and provide feedback on eating [53,112,116] and exercise [206] behaviors. Tools could also reframe costs in terms that are personally relevant. For example, a pop-up during checkout could present product prices in terms of hours needed to work (e.g., this product costs the equivalent of 3 hours of work), other favorite products (e.g., "eight Chipotle burritos"), or savings goals (e.g., 10% of the cost to fly to Italy). Conversely, tools that highlight the potential emotional costs of an impulse buy are not likely to be effective. Few participants (21%) wanted to be reminded of their past regretted buys and research suggests that anticipating negative emotions (shame) is less successful as a self-control tactic than anticipating positive emotions (pride for resisting) [196].

Online impulse buyers also want tools that encourage deliberation, a strategy that participants experienced success with in the past. Recent work in HCI described a browser extension, called Mindful Shopping, that encourages reflection through, for example, guided meditation, before completing purchases [151]. Other tools may be

able to detect when an e-commerce site is offering especially deep discounts and, at checkout, require reflection—e.g., reasons for needing the product, how/when/why they will use the product, negative outcomes for purchasing, or how many of the item they already own—especially for those consumers who do not tend to elaborate on outcomes [105]. However, tools should avoid reflection about personal possessions that are used primarily for pleasure. Recent work has shown that while reflecting on recently used utilitarian possessions lowered the likelihood to make an impulse purchase, reflecting on hedonic possessions increased the likelihood to purchase [67].

Features that enhance the perceived temporal proximity of products were common among websites sampled. When consumers believe their impulses can be quickly satiated, impulse buying is more likely [109]. Online impulse buyers indicated they would like tools that help temper the promise of instant gratification, by making it more difficult to check-out. Similar to “dark patterns” that obstruct actions such as opting out of email campaigns [99], online impulse buyers would like tools that obstruct online shopping. These tools could add “friction” [234] to slow down seamless checkout processes by requiring more clicks, confirmations, security checks, or even simple puzzles. Tools could block the ability to save billing and shipping information and disable features that nudge consumers quickly through the checkout process (e.g., quick-add-to-cart, quick-checkout, and one-click buy buttons).

Leveraging social influence, a common type of feature among websites sampled, can encourage herd behavior among consumers [51] and inspire impulse buying [109]. Interestingly, participants did not request tools that specifically address social influence. However, online impulse buyers wanted tools that reduce product desire by, for example, providing more objective product information. Some relevant tools already exist. For example, Fakespot and ReviewMeta help users identify potentially fake reviews and provide adjusted product ratings [39]. For e-commerce firms there is an opportunity for greater transparency by disclosing more details about product recommendations (e.g., how are “other” and “similar” customers defined?) and customer statistics (e.g., what does it mean that a certain number of customers are

“interested?”). When sites like Macys.com highlight the number of customers who have purchased a product, users may benefit from also knowing how many customers ultimately returned the product. On the other hand, online impulse buyers were not in favor of social accountability tools, such as requiring users to post on social media about their impulsive purchases. Indeed, prior work has shown that the prospect of public accountability through social media posts reduced willingness to make exercise goal commitments [177].

While perceived scarcity and urgency features were less frequently utilized on e-commerce sites, participants would like tools that address these features, suggesting that participants perceive them to be effective at encouraging impulsive purchasing. To address scarcity and urgency features, tech interventions could hide “limited-time” or “only a few left in stock” messaging on websites, disable countdown clocks, or locate alternate vendors for products that are presented as exclusive, selling fast, or running low in stock. For e-commerce firms, the opportunity for transparency is in providing more details about inventory replenishment (e.g., “only 2 left in stock—will be restocked in 24 hours”).

Other interventions could require a delay (i.e., postpone the decision to purchase) or impose spending limits; participants reported having success with both strategies in the past. One postponement tool available is Finder.com’s Icebox which requires at least a 24-hour delay in purchases. Future iterations could integrate deliberation prompts during the waiting period. Tools that impose spending limits could track a consumer’s spending across websites and devices to block purchases after reaching a predetermined budget. Participants described wanting postponement and spending limit tools that are forced and automatic, not requiring the user to open an app and proactively manage their purchase cravings (c.f., [117]). It seems that participants, who commonly described using “willpower” as ineffective, recognize that proactively engaging with self-control tools may require more willpower than they have available.

One of the most common types of features were those that enhance perceived physical proximity to the product. While these types of features (e.g., product photography) can encourage impulsive purchasing [244], they are also integral to the user experience, and therefore, we do not recommend removing these features. However, online impulse buyers want tools that help reduce product desire by, for example, showing products in a more objective light. Online impulse buyers who are especially swayed by glamorized product presentations may benefit from tools that showcase consumer-generated photography and provide comparison tools that highlight discrepancies between that photography and the professional photography shown on e-commerce sites. Participants also reported wanting tools that help them avoid product temptations. Such tools could hide (a) messaging about add-on benefits (e.g., free gift with purchase), (b) advertising (e.g., ad-blockers for sponsored products), (c) browsing features (e.g., product recommendations), (d) investment features (e.g., sign up for price alerts), and (e) shopping momentum features (e.g., suggested add-on products during checkout). Similar tools exist for social media; the Rather plugin allows users to replace unwanted Facebook content with content that the user would rather see (e.g., pictures of cute animals). E-commerce blockers could replace unwanted features or messaging with content that reminds users of their spending goals.

3.2.2 Limitations and conclusion

Study 1's website archiving process introduced certain limitations. First, no paid membership accounts were used, which means features such as Amazon Prime's one-click-buy were not captured. Second, because purchases were not completed, this work does not capture features that appear after a purchase is made. Third, given our sample size (N=200 websites), it was not feasible to archive more than one product per website. It is likely that some websites utilize different web features for different types of products (e.g., 360-spin views of shoes but not DVDs). However, our systematic archiving process likely captured the most commonly used features per site.

In Study 2, our sample of impulse buyers was comprised primarily (86%) of women. While meta-analysis data show that gender is not predictive of impulse buying behavior

[11], more recent data suggests men may be more frequent online impulse buyers [165]. Additional research on the preferences of men may be warranted. Participants in Study 2 were recruited through social media, which excludes online shoppers who are not social media users. Study 2 was only open to adults living in the U.S.—results may differ in other markets.

Finally, this research was conducted outside of a corporate context. Many of the findings and proposed interventions are difficult, or impossible, to implement without the cooperation of e-commerce sites. Though not the primary focus of the current study, greater transparency, ethical practices, or even regulation of sites like Amazon.com or Macys.com may be necessary for supporting consumer rights. While e-commerce sites are designed to encourage impulsive purchasing, there are promising technology interventions that may be able to support consumers by promoting more deliberative and less regretted choices.

3.2.3 Supplemental materials

Study instruments are available in Appendix 1. All data, archived PDFs of websites, and codebooks are available at the University of Michigan's Deep Blue Data repository (https://doi.org/10.7302/d8tf-3q07).

CHAPTER IV
Postponement

Impulse buying involves an urge to purchase *immediately* [212]. The consumer feels a sudden and powerful urge to buy something “on the spot” [202]. Postponement (also referred to here as a time delay) is one way that consumers can overcome these powerful urges. Postponement is the “the intention or act of putting off consumption without external reward for incurring the delay” (cf. delay of gratification) [166:21]. Hoch and Leowenstein theorized that when a consumer delays consumption, the feelings of deprivation for not purchasing can be transient and dissipate over time [108]. They argued that while the urge to purchase can be powerful and urgent in the moment, it can eventually recede and even disappear. Frequent online impulse buyers recognize that postponement can be an effective self-control strategy. Study 2 demonstrated that these consumers have found success using postponement strategies in the past and that they desire tech-based tools that utilize time delays. In the following we review the research on the effectiveness of postponement as a self-control strategy and present two experiments that directly test the effect of time delays on the felt urge to buy and on impulse purchases.

4.1 Postponement and Self-Control

The evidence supporting postponement as a self-control strategy is promising. Mead and Patrick tested postponement in the context of unhealthy food temptations [166]. In their diary study, participants who formulated a postponement plan (e.g., “I will tell myself I can eat cookies some other time”) reported lower desire for, waited longer to consume, and consumed less of their junk food temptation in comparison to participants who did not formulate a postponement plan [166]. Interestingly, participants consumed more junk food when they were told that a postponement strategy was required (and

yoked from another participant) in comparison to participants who were never told it was required. The authors also demonstrated postponement to be more effective than a total prohibition strategy. Lab study participants who formulated a postponement strategy (i.e., told themselves “I can have M&Ms some other time”) consumed less from a bowl of candy than participants who told themselves “No, I will not have M&Ms” [166]. Arguably one shortcoming of this research is that it tests postponement implementation plans, rather than testing actual time delays. Implementation plans typically take an if-then format, for example, “If situation Y occurs, then I will initiate the goal-directed behavior Z” [98:82]. In the case of Mead and Patrick’s experiments, the implementation plan takes the form: “If I’m offered M&Ms, I will tell myself that I can have M&Ms some other time”. Nonetheless, this work provides some promising initial support for postponement as a self-control tactic against temptation and leads us to ask the following research question:

(RQ) How does postponement affect impulse buying behavior?

In the following, we review the prior work that begins to answer this question by reviewing how postponement can generally (1) provide more time to “think,” (2) create a delay in acquisition, which can reduce a product’s subjective value and shift consumer preferences back to long-term goals, and (3) provide time for the emotions that encourage impulse buying to cool.

4.1.1 Postponement provides more time to “think”

4.1.1.1 *More time for deliberation*

Postponing a decision can mean spending more time deliberating either consciously or unconsciously. Unconscious processing theory argues that decision quality can improve when one steps away and allows their mind unconsciously engage in “deliberation without attention” [70]. Conscious cognitive processing has been described as having two modes: the fast intuitive mode and the slow deliberative mode [126]. As reviewed in Chapter II, impulse buying and yielding to temptations can be characterized as a product of rapid, intuitive processing that can be is emotionally charged [167]. Providing more time to reflect can encourage slower, more deliberative thinking that is less

vulnerable to bias and less emotionally charged, which can improve decision quality [126].

4.1.1.2 *More time to experience an "interrupt"*

Self-control failure has been described as failure of transcendence, when an individual's attention is so immersed in the current situation that the individual does not experience the triggering stimuli within a larger context [25]. Consumers have described the felt urge to buy impulsively as an intensely preoccupying "mind filling" experience [212]. Others have described feeling strongly that the purchase was "pre-ordained" or meant-to-be because they were in the right place at the right time [212]. In contrast, consumer behavior theory describes how a consumer's information processing and decision-making can be suddenly "interrupted" [33]. The "interrupt" typically takes the form of unexpected changes in the consumer's environment (e.g., a visually eye-catching product packaging), but can also include the consumer recognizing some conflict (e.g., between external and internal information sources) [33] or from "cognitive associations" in memory of, for instance, risk or danger [221]. For example, when reaching for a tempting impulse buy, a consumer can suddenly experience an interrupt where they hesitate because of the memory of a past regretted purchase.

When experiencing an interrupt, the consumer must decide whether their current activities make sense or if they need to adapt or change behavior, reorder goals, or redirect attention [33]. The nature of an "interrupt" is brief but can signal to the consumer that there is need for additional deliberation, primarily to asses if there are any constraining factors that would work against the purchase [68]. If during the "interrupt" the consumer can recognize a constraining factor (e.g., money available), the consumer can then engage in a more thorough cognitive evaluation of those factors (i.e., enact deliberative decision-making processing [228]) and, finally, attempt to activate their volitional system to resist the impulse if deemed necessary [68].

If a consumer can enact their impulses immediately (e.g., through one-click purchasing), there is little to no time available to experience an interrupt. By extending the time

between the felt urge to purchase and finalizing the sale, the consumer is more likely to recognize, remember, or experience some internal or external stimuli that interrupts the purchase process. The interrupt can then act to help consumers transcend a “mind filling” impulse. Even if the consumer does not do a thorough costs/benefits analysis, experiencing even a slight interrupt may help consumers transcend the moment just enough to question if an impulse purchase is truly, for example, “preordained”.

4.1.2 Postponement shifts preferences to long-term, reduces subjective value

Impulses favor immediate gratification and can lose their attractiveness with greater temporal and spatial distance [111]. Impulsive choices are often characterized as “specious” or misleadingly attractive and only “temporarily preferable” [5]. They are often an example of time-inconsistent preferences where long-term preferences are temporarily overridden by immediate temptations and smaller immediate rewards are chosen over long-term but larger rewards [108]. In the case of impulse buying, encountering an attractive product or deal can lead a consumer to spend money on an otherwise unneeded product, overriding long-term preferences of achieving financial wellness or of being able to afford other things (e.g., a vacation, a car, a home).

Individuals not only have time-inconsistent preferences, they also engage in time discounting. Time discounting describes how individuals place a higher value on rewards when immediately available and discount the value of that reward if it is only available in the future [87]. In some cases, the discount rate is steepest in the near-future and then slows in the distant future (i.e., hyperbolic discounting) [87]. For example, an attractive product is most appealing right now but becomes less appealing if it can only be acquired sometime in the future [144]. Interestingly, products related to expressing one’s identity (e.g., clothing) have significantly steeper discount rates than more utilitarian, non-expressive goods [75].

However, there is evidence that adding even a small delay to an immediate reward can shift preferences back to long-term preferences [225]. Lab participants exposed to white noise initially preferred an immediate 90-second break from the noise over a longer

120-second break that would begin after 60 seconds of white noise. However, when a 15 second delay was added to both options, a greater percentage of participants choose the longer 120 second reward [225]. Accordingly, applying a delay to potential impulse purchases may help the consumer shift their preferences back to long-term saving or spending goals. Further, time delays push the acquisition of a desired product into the future, where consumers may discount the attractiveness of that product.

4.1.3 Postponement allows impulse-driving emotions to cool

Consumers experience a range of emotions [16], which are considered situational variables that can act as an "immediate antecedent" to general consumer choices [30]. Positive emotional states have been associated with spending more money than originally planned [219]. Experiencing positive affect from in-store browsing predicts feeling an urge to buy impulsively and completing an impulse purchase [28]. When presented with an impulse buying opportunity, impulse buyers experience greater emotional activation than non-buyers, as measured by both facial gesture analyses and self-reports [250]. For example, impulse buyers' facial expressions have displayed higher levels of glee, amusement, excitement, and surprise [250]. The design of online stores (e.g., layout [149], ease of use [60,149], size of online assortment [239]) can also elicit emotions such as arousal and pleasantness, which in turn predicts a felt urge to buy impulsively from that website. While negative emotions, such as feelings of deprivation for not purchasing, have been theoretically linked to impulse buying [108], a study of impulse buying antecedents only found positive affect (i.e., excited, enthusiastic, proud, inspired) to significantly predict more felt urges to buy impulsively; negative affect (i.e., distressed, upset, irritable) did not significantly influence impulse buying urges [28].

Emotions can have a rapid onset, sometimes so quickly that the individual may be unaware of their onset [80]. Emotions can also be transient and are more likely to last minutes or hours (versus days or weeks) [80,236,237]. Different emotions tend to last longer than others; emotions triggered by events of high importance to the individual tend to last longer [237]. Negative emotions such as sadness also tend to last longer

[236,237]. The effect emotions have on behavior also tends to be transient. Field studies have shown that individuals who received a surprise gift (i.e., were placed into a positive emotional state) were more willing to help a stranger but only up until twenty minutes after receiving the gift—at which point the authors speculate the positive emotional state had dissipated [119]. Postponement strategies take advantage of the transient nature of emotions, allowing them to cool or dissipate before acting.

Postponement has also been shown to help individuals overcome emotional reactions in favor of economically rational decision-making, specifically in Ultimatum Games [43,101,184]. In an Ultimatum Game (UG) there are two actors: a proposer and a responder. The proposer offers a specific split of money (e.g., splitting $10). If the responder accepts the offer, both actors are paid accordingly. If the responder rejects the offer, both actors receive no money. A rational decision would be for the responder to accept any offer (receiving even $1 is more profitable than receiving nothing). However, research has found that responders frequently reject low offers (e.g., $1-$2) [101]. The “irrational” rejection of low offers has been explained by feelings of anger and perceiving the offer as unfair [200]. Grimm and Mengel demonstrated that when responders were made to delay their decision by 10 minutes, the acceptance rate for low offers increased from 0-15% to 60-80% [101]. Other work also found lower rates of rejection when a 15-minute time delay was imposed on responders [184]. The authors speculate that time delays allow more time for deliberative reasoning [184] and for emotions to cool [101,184]. Postponement or a “cooling off period” has similarly been recognized as an effective way to curb counterproductive feelings of anger during negotiations [3].

4.1.4 Postponement Hypotheses

Taken together, the existing literature supports postponement as a strategy that can help individuals overcome temptation by allowing for more deliberation, shifting focus to long-term preferences, decreasing the subjective value of products, and providing time for emotions to cool. We hypothesize that postponement will have the effect of dampening impulsive buying behavior, including the intensity of the felt urge to buy, the

intention to buy, and actual impulse purchases. The felt urge to buy impulsively is a spontaneous and sudden state of desire that is experienced when encountering an object in the environment; the felt urge precedes any actual impulse action(s) [28:172]. The felt urge to buy impulsively (also referred to as a "consumption impulse") is believed to occur automatically and can vary in intensity [68]. Specifically, we hypothesize that postponement will have the following effect on impulse buying behavior:

H1: Felt urge to purchase impulsively online will decline after a time delay. [Study 3]

In addition to testing how postponement affects the felt urge to buy, this work aims to understand how postponement can affect behavior. Looking at behavioral intention is one way to predict future behavior and meta-analysis results have shown that behavioral intention is at least somewhat predictive of actual behavior (with intentions explaining 19%-38% of the variance in behavior) [230]. Following prior work that has investigated purchase intent (e.g., [2,78,79,157]), we investigate intent to purchase within an impulse buying context.

H2: The intent to purchase (in an impulse buying context) online will decline after a time delay. [Study 3]

Finally, this work aims to understand how postponement affects actual impulse buying behavior [28]. Prior work has demonstrated the link between the felt urge to purchase and completing impulse purchases—the more urges felt to buy impulsively during a shopping trip, the greater the number of impulse purchases made [28]. Therefore, we hypothesize that:

H3: The amount of impulse buying completed online will be less when a time delay is imposed on purchases. [Study 4]

In the following we present two studies. Study 3, an online experiment, compares how consumers' felt urge to purchase impulsively and purchase intent change after an approximately 25-hour time delay. Study 4 is a lab experiment testing an online tool that imposes a 10-minute delay on consumers' Amazon purchases.

4.2 Postponement Experiment: Urge to Buy (Study 3)

Study 3 was designed as a preliminary test of whether postponement reduces the felt urge to buy impulsively [H1] and purchase intent [H2]. The focus of this experiment is *unguided postponement*, meaning a delay period without prompting any reflection exercises, distraction tasks, or other activities.

4.2.1 Method

4.2.1.1 *Procedure and measures*

This within-subjects experiment was conducted in January 2018, using an online survey platform (Qualtrics), and included two parts. Part 1 of the study displayed six products (see the Stimuli section for details). This procedure creates an impulse buying situation by providing an unplanned product choice exercise and an unexpected and unsolicited product assortment (i.e., the product options did not originate from a specific subject's preferences nor from a subject's digital product search) [105,185,189]. Participants were asked to "Take some time to look at the products listed below." Below the products, participants selected the product that they felt the strongest urge to buy from a multiple-choice listing. Next, participants rated their felt urge to buy impulsively by responding to "At this moment, the urge to buy the product that I selected can be described as:" using a seven-point Likert-like scale ranging from (1) *I feel no urge to buy this product*, to (4) *I feel a moderate urge to buy this product*, to (7) *I feel a very strong urge to buy this product* (adapted from [69]). Participants then rated their purchase intent for the product by responding to "The likelihood that I would purchase this product is:" using a seven-point Likert scale anchored by (1) *very low* and (7) *very high* (adapted from [77,100,203]). Finally, participants were asked to identify their gender. Part 1 concluded by informing participants that Part 2 would be emailed to them within 48 hours.

Part 2 was emailed in waves, every 24 hours for any new participants who completed Part 1. We discontinued sending Part 2 after four days, when no new additional participants completed Part 1. No participants were emailed Part 2 more than one time.

The exact length of the postponement period (i.e., the time that elapsed between completing Part 1 and Part 2) depended on how quickly participants saw and responded to the email invitation to complete Part 1 and Part 2 (see the Results section for details).

Part 2 was personalized to display the product that each participant had specifically selected in Part 1. Instructions stated, “In Part 1 of this study you selected the following product:”. Then participants were presented with the same felt-urge-to-buy question and purchase intention question as displayed in Part 1. Because individuals like to be consistent with their prior beliefs and behaviors [83] and within-subjects experiments can be vulnerable to learning effects [32], we were careful to not provide cues or reminders as to how participants answered these questions initially.

Participants were then asked whether they looked for the product in stores or online after seeing it in Part 1 (Yes/No) and whether they ended up buying the product or something very similar (Yes/No). Participants then indicated how often they make unplanned, impulse purchases online (Never; A few times a year; A few times a month; A few times a week; Every day). Finally, participants responded to demographic questions that asked about marital status, race/ethnicity, employment status, and annual income. See Appendix 2 for survey instruments and materials.

4.2.1.2 *Stimuli*

Products were chosen to represent primarily hedonic [212], self-expression (e.g., clothing and accessories) [73], and lower cost products [123], which are more likely to be purchased on impulse. Further, knowing that the online survey would be distributed to university undergraduate students, products were selected with this demographic in mind. The selection of products was shared for feedback with a small convenience sample of undergraduate and master’s students, who all indicated they would plausibly consider purchasing at least some of the products displayed. The six products included: university branded sunglasses, a coffee mug from a popular television show, a Bluetooth-enabled winter hat, a color-changing coffee mug, a coin purse in the shape of a cat, and a poster of a popular television series. All products were found on

Amazon.com but were displayed without reference to any particular vendor. Products were displayed with a product name, a product photo, price, original list price, and percentage discount. Because providing price discounts is a common way to encourage impulse buying, all products were displayed as being available at a 50% discount (following [185]). All products cost between $2.49 and $5.49 with the discount applied and participants were told that prices included any taxes and shipping fees (see Figure 3). In Part 2 of the study, participants were sent a customized survey that displayed the product that they specifically selected in Part 1. The product was displayed in the exact manner in which it was displayed in Part 1, though it was presented alone without the other product options.

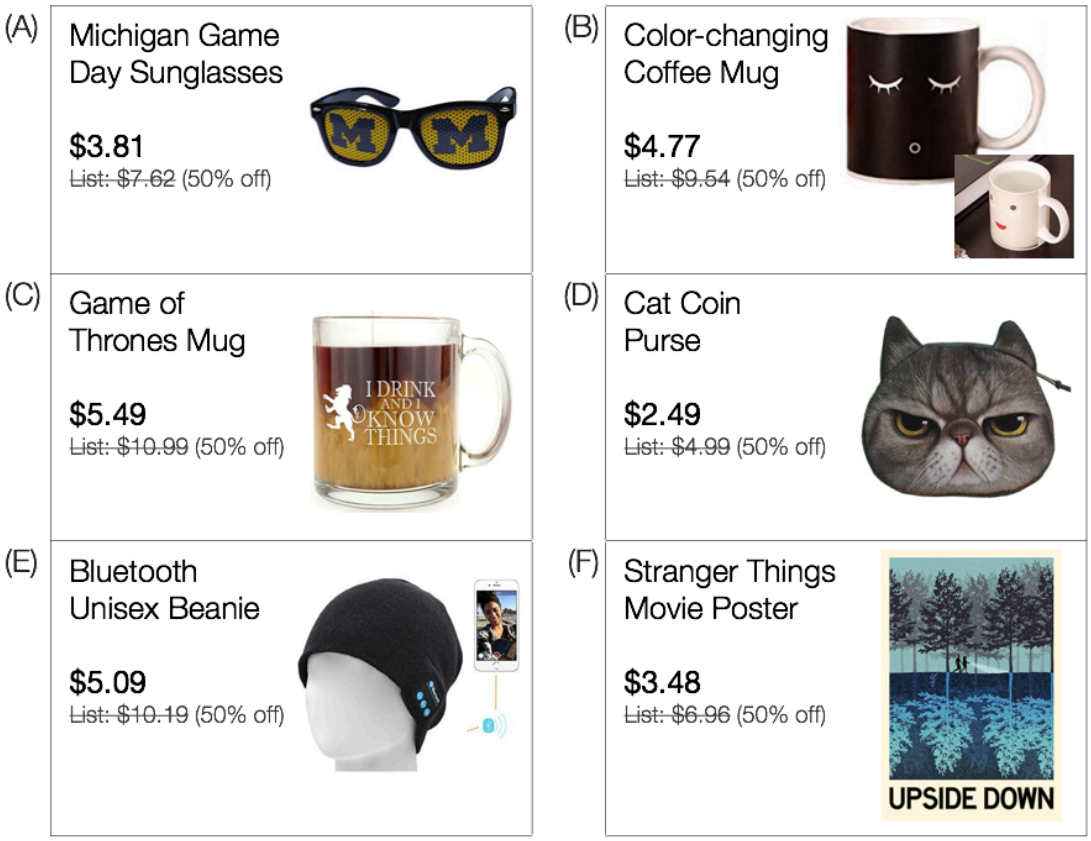


Figure 3: Online presentation of choice options in Part 1 of Study 3

4.2.1.3 *Recruiting*

Undergraduate students from a large Midwestern university were recruited for this study. Young people are frequent online shoppers [63]. Millennials are more likely than older generations to make impulse buys daily [165] and a recent industry poll showed that 95% of younger Millennials (born in or after 1992) have reported making impulse purchases [59]. An email invitation to participate in an online study about shopping was sent to 800 undergraduate students through the University Registrar's office. Participants first completed a two-question screening questionnaire. If participants reported that they lived in the United States and were at least 18 years old, they qualified to participate and were directed to the online study. Out of the 800 invitations sent, 182 participants completed Part 1 (22.75% response rate) and out of those 182 participants, 169 completed Part 2 (92.85% completion rate). Participants who completed the study were compensated with a $5 Amazon e-gift card. This study was approved by the research team's Institutional Review Board.

4.2.1.4 *Analysis and data cleaning*

A total of 169 participants completed the study. Five participants were removed from analysis because they indicated that they had purchased the product that they selected in Part 1 (or something very similar) before completing Part 2. For those participants, a measure of felt urge to purchase or intent to purchase would be meaningless or misleading given that they had already purchased the product. The final sample size for analysis was N=164.

To test Hypothesis 1 and Hypothesis 2, we conducted paired samples t-tests for pre- and post- values of our two main dependent variables, felt urge to buy impulsively [H1] and purchase intent [H2]. We conducted bivariate linear regressions to explore whether the length of the time delay had an effect on changes in felt urge or intent. Finally, exploratory analyses examined potential differences in dependent variables by product type selected (using ANOVA omnibus comparison of means) and gender (independent samples t-test).

Data and scripts. Data and SPSS scripts are available at the University of Michigan's Deep Blue Data repository (https://doi.org/10.7302/xj8r-sy16).

4.2.1.5 *Participants*

Participants were between 18-29 years old (*M*=19.88, *SD*=1.63, median=20) and were 60.4% (N=99) female. Participants identified as White/Caucasian (61%, N=100), Asian (30.5%, N=50), Hispanic/Latino (3%, N=5), Native American (1.2%, N=2), or Other (4.3%, N=7). For employment status, most participants identified as students (70%, N=147), working part-time (26.7%, N=56) and/or working full-time (1%, N=2). Nearly all participants reported never being married (95.7%, N=157). A substantial number of participants (25%, N=41) reported not knowing their household income. While 41.4% (N=68) reported household incomes over $75,000/year and 33.6% (N=55) reported household incomes less than $75,000/year, it is not clear if participants were reporting their parent's household incomes or their independent incomes. For frequency of making impulse purchases online (*M*=2.31, *SD*=.66), participants reported making impulse purchases a few times/week (1.8%, N=3), a few times/month (36.6%, N=60), a few times/year (52.4%, N=86), or never (9.1%, N=15). No participants reported making impulse buying purchases online every day.

4.2.2 Results

4.2.2.1 *Hypothesis testing*

H1 supported: A paired-samples t-test revealed that felt urge to buy impulsively was lower after the postponement (*M*=2.80, *SD*=1.39) in comparison to before the postponement (*M*=3.23, *SD*=1.36), a statistically significant decrease of 0.43, $t(163) = 4.73$, $p < .001$.

H2 supported: A paired-samples t-test revealed that purchase intent was lower after the postponement (*M*=2.48, *SD*=1.37) in comparison to before the postponement (*M*=2.66, *SD*=1.42), a statistically significant decrease of 0.18, $t(163) = 2.35$, $p = .02$.

	Variable	Decline in mean (pre minus post)	Sig.
H1	Felt urge to buy	.44	p < .001 ***
H2	Purchase intent	.19	p = .02 *

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 4: Decline in average felt urge to buy (H1) and purchase intent (H2)

4.2.2.2 *Exploratory analyses*

Effect of length of postponement. Participants completed Part 2 on average 24.82 hours (*SD*=11.75, min=2.33, max=106.08) after completing Part 1. A bivariate linear regression revealed that time elapsed (*b*=-.007, *t*(162)=-.96, *p*=.34) was not a significant predictor of the change in felt urge to buy (pre-urge minus post-urge), *F*(1,162) = .92, *p* =.34. Similarly, a bivariate linear regression revealed that time elapsed (*b*=-.01, *t*(162)=-1.55, *p*=.12) was not a significant predictor of the change in purchase intent (pre-intent minus post-intent), *F*(1,162) = 2.40 *p* =.12.

Participants who shopped for but did not buy the product. As a reminder, participants (N=5) who reported that they had purchased the product that they selected in Part 1 (or something very similar) before completing Part 2 were removed for analysis. In addition, a small percentage of participants (4.3%, N=7) reported shopping for (but not purchasing) the product they selected in Part 1 before completing Part 2. Results remain unchanged when excluding these participants from analysis for both felt urge to purchase impulsively (pre-urge *M*=3.17, *SD*=1.33; post-urge *M*=2.73, *SD*=1.35; mean decrease of .44; *t*(156) = 4.76, *p* <.001) and purchase intent (pre-intent *M*=2.59, *SD* = 1.38; post-intent *M*=2.41, *SD*=1.32; mean decrease of .19, *t*(156)=2.43, *p* = .016).

Individual differences. Linear regression and correlations were run to explore whether age, gender, impulse buying frequency, or education level were related to changes in felt urge to purchase or purchase intent. No significant relationships were found.

Similarly, there was no significant difference between the six products in the change in felt urge to purchase, $F(5, 158)=.415$, $p = .84$, nor a significant difference in the change in purchase intent, $F(5, 158)=.29$, $p = .92$.

4.2.3 Discussion

The goal of this study was to conduct a preliminary test of whether postponement is an effective method for reducing the felt urge to buy impulsively and purchase intent. To summarize we find that:

- Felt urge to buy impulsively declines after an approximately 25-hour delay period.
- Purchase intent declines after an approximately 25-hour delay period.

These results provide support for the effectiveness of postponement as an intervention for addressing online impulse buying. Postponement has been investigated in the domains of unhealthy eating [166], financial decisions [105], and negotiations [43,101,184]. The goal of the present research was to help consumers exert greater control over impulse buying online and as such, we extend the postponement literature into this domain. We also provide experimental data that support Hoch and Loewenstein's long-standing theory [108] that the urge to purchase can decline over time. We also build on the self-control work done by Mead and Patrick [166] by shifting the focus from postponement implementation plans (i.e., "If I'm offered M&Ms, I will tell myself I can eat them some other time") to testing an actual time-delay imposed in real-time.

However, there are remaining questions about how to implement a postponement intervention for real-world application. Most importantly, the current study provides little insight into what participants did during their time delay. The delay period was unguided, meaning participants were not required to complete any specific activities. Participants were aware that the second part of the study would arrive within 48 hours (though they did not know its contents). In anticipation of Part 2, it is possible that participants reflected on the product that they selected. For example, during the 25 hours between Part 1 and Part 2, participants may have come up with reasons to like or dislike the product or may have realized that they already own a similar product. In

addition, given the lengthy postponement period, it is likely that participants were significantly distracted from the product for portions of the delay, for example, during time spent sleeping. The “deliberation without attention” literature would also suggest that participants may be have been unconsciously thinking about the product during the delay period [70].

The only indication we have of participants’ behavior during the delay comes from self-reports of whether participants shopped for or purchased the product before Part 2 of the study. Of the total 164 participants, only 4% (N=7) shopped for the product, 1% (N=2) purchased but did not shop for the product, and 2% (N=3) both shopped for and purchased the product before completing Part 2. This means that the vast majority (N=152, 93%) of participants were not shopping for or purchasing the product during the delay period. Real-world application of postponement may prove most effective if shopping is discouraged during the delay or if a guided postponement period is provided where the user is intentionally distracted from the product or is prompted to reflect. Study 4, which tests a postponement period in a lab setting, begins to address this open question by directly observing how consumers behave during a delay period.

4.2.4 Limitations and future work

This experiment was designed as a preliminary test of postponement’s effect on felt urge to buy and purchase intent. As such, we used low-fidelity materials. Participants viewed product choices as part of an online survey, with static images, no product descriptions, reviews, or interactivity. Participants only viewed and selected from six products, while most e-stores typically offer hundreds of different products. Further, participants provided self-reported measures of felt urge to buy and intent, rather than making actual impulse purchases. Future work can have participants interact and/or shop with a real or simulated website to more accurately recreate the decision-making environment for online shoppers. Part 2 of the study displayed an image of the participant’s product choice from Part 1 (as a reminder) and then collected the post measures for each dependent variable. We did not display images of the five products

that the participant did not select. Felt urge and purchase intent could be swayed by the presence of prior, foregone options; future work can investigate this open question.

While care was taken to mitigate learning and demand effects of repeated measures, we cannot rule out the possibility that some participants remembered how they responded in Part 1 and/or guessed the study's hypothesis and modified their behavior accordingly. Finally, this experiment tested the effect of postponement with undergraduate students who were on average approximately 20 years old. This sample could represent more active impulse purchasers than other demographics [165] and therefore these results may not generalize to other populations. On the other hand, we did not recruit nor exclude participants based on their online impulse buying behavior and, therefore, we found lower self-reported frequencies of impulse buying online (M=2.31, SD=.66) than in Study 1's survey of frequent online impulse buyers (M=3.77, SD = .78).

4.3 Postponement Experiment: Impulse Purchases (Study 4)

Study 4 builds on Study 3 by testing the effectiveness of postponement on actual online impulse buying. To test this, we designed and built a behavior change technology, internally called Purchase Pause. Purchase Pause is a "friction technology" that modifies the Amazon user interface and enforces waiting periods in order to slow down the purchase process and encourage more deliberative purchase decisions. Following is a review of behavior change technology and how such technologies have been designed to encourage, for example, greater self-control. We highlight the lack of research on postponement technologies.

4.3.1 Behavior change technology

Behavior change refers to efforts aimed at changing an individual's behaviors, thoughts, or emotions in service of a specific goal, such as improved personal wellbeing. Behavior change research has largely focused on personal health in the areas of physical activity and diet [57,81,89,148,178], smoking cessation [35,96,188,204], disease management [84,161], and stress reduction and mental health wellness [138,172,192]. Other research has tackled safety issues such as texting and driving [169], encouraging environmentally-friendly practices [12,21,90], and managing time spent with technology [135,142,254].

Behavior change is a complex process that unfolds over time [204]. The Transtheoretical Model of Behavior Change describes that process as including six stages: precontemplation, contemplation, preparation, action, maintenance, and termination [204]. After becoming aware of a problematic behavior or situation (precontemplation) and then weighing the pros and cons of changing one's behavior (contemplation), an individual enters the preparation phase which involves forming an intention to change one's behavior. Meta-analysis has shown that change in intention can lead to change in one's behavior [248]. The action phase is when observable changes in behavior occur, such as eliminating daily cigarettes or reducing caloric intake for weight loss. Individuals then enter the maintenance phase where they actively

try to avoid relapses back into the undesired behavior. Few individuals reach the final phase, termination, where no effort is required to avoid relapsing [204].

One traditional approach to motivate behavior change has been to use wide-scale marketing campaigns to persuade individuals to, for example, adopt environmentally-friendly behaviors; though these types media campaigns are not always effective [12]. More recently, behavior change interventions have emerged embedded within digital, mobile, and sensor technologies. These behavior change technologies have been referred to as “behavioral intervention technologies” (BITs) [171] and “digital behavior change interventions” (DBCIs) [201]. Behavior change technologies are systems or interaction designs that leverage specific (and sometimes multiple) interventions to help users modify their behavior, such as to build and maintain new habits [142], and generally are designed to help people change aspects of their everyday behaviors [58].

The design of many of the technologies, though not all [159], has been informed by a wide range of theories ranging from goal-setting theory [15,155], self-regulation theory [23], the strength-model of self-control [179], theory of planned behavior [7], social cognitive theory [20], and the transtheoretical model of behavior change [204]. Within the human-computer interaction field, behavior change technologies typically draw on Fogg’s framework of persuasive technology [86]. Persuasive technology is defined as computing technology that is intentionally designed to change a person’s attitude or behavior in a predetermined way, without coercion or deception [86]. The attempted change is voluntary, not forced upon the individual [86]. Persuasive technology tries to make the desired outcome or behavior easier to achieve through different types of interventions, such as: reduction (making a complex task simpler), tunneling (leading users through a predetermined sequence of steps), tailoring (providing personally relevant information to change attitudes and behavior), suggestion (making suggestions at opportune moments), self-monitoring, surveillance by others, and positive conditioning [86]. One example is a “mobile health advisor” that sends real-time reminders to take breaks from continuous computer work to avoid repetitive stress injuries [36]. Another example is a mobile phone game designed to promote energy

conservation by tracking the home's electricity meter readings and assigning "missions" such as adjusting the heating in the home and unplugging stand-by appliances [21].

Individuals who are motivated to modify their behavior can utilize persuasive technologies as commitment devices for behavior change [14]. As a reminder, a commitment device is a self-imposed arrangement that compels oneself into compliance with a goal. They typically involve contingent rewards and/or punishments and are designed to eliminate future, goal-inconsistent options (e.g., someone cutting up their credit card to making spending more difficult) [14]. The rewards and punishments are used to shift myopic, sometimes impulsive, preferences closer to that of a more conscientious, long-term minded "planner" [232]. Rewards and punishments can be "hard" economic consequences or can be "soft" commitments which are primarily involve psychological consequences [41].

In contrast to self-imposed commitment devices, nudges are a more paternalistic approach for encouraging behavior change, sometimes implemented without the user's knowledge, but with the intention to promote the user's or the collective's well-being [1,233]. Nudges often rely on techniques such as framing, feedback, and strategic system defaults, in such a way that favors the option most beneficial to the user or community [1,233]. For example, providing users with performance feedback has been shown to increase participation in the MovieLens online community, especially for those users who initially contributed at below-average rates [50]. Strategic system defaults, such as a default opt-out option for agreeing to have your online activity tracked, can be used to nudge users toward more protective privacy settings [1]. Rearranging cafeteria food options can nudge students to select more healthy foods at lunch when dessert is not presented first and French fries are not displayed at eye level [233].

4.3.1.1 *Behavior change technology for self-control*

Behavior change technology utilizes self-control strategies (see Chapter 2 for a review) as embedded interventions or features to encourage greater self-control across a variety of domains. One such example is the Chocolate Machine, a table-top device that

dispenses chocolate every 40-60 minutes; users can either eat the chocolate or put it back into the machine [132]. The design of the Chocolate Machine draws on ego-depletion theory, which asserts that self-control behaves like a muscle; exerting self-control can be depleting in the short term but can strengthen self-control over time [179]. An in-home field experiment with the Chocolate Machine showed that while the perceived self-control required to resist eating the chocolate was initially high, it declined significantly over a 14-day period [132].

The arguably "addictive" nature of mobile devices, social media, and e-commerce [10] has been met with a variety of self-control, productivity, and mindfulness apps and tools. Recent work reviewed over 300 apps and browser extensions available for "digital self-control" [159]. Among the apps and extensions, the most prevalent features for encouraging self-control included blocking or removing distractions (e.g., site-blockers), self-tracking (e.g., recording the user's activity and providing visualizations of that data), goal advancement (e.g., reminders of specific time goals), and reward/punishment (e.g., through gamification) [159]. For example, TimeAware provides feedback on personal computer usage and found that displaying computer usage with a negative frame (i.e., tracking "distracted time") led to greater productivity gains than displaying usage in a positive frame (i.e., tracking "productive time") [135]. Other self-control apps have been shown to reduce time spent with distracting technologies (e.g., social media) but did not improve time spent with productivity technologies (e.g., word processing) [254]. These findings highlight the importance of taking a holistic approach to behavior change—multiple interventions, or even rotating interventions [142], may be needed to support the complex nature of behavior change.

4.3.1.2 *Behavior change technology for personal finances*

Research on self-control with finances has focused on encouraging saving behavior and contributions to retirement funds. More users reach their savings goals when they use a retirement planning interface that presents potential savings and losses information [103]. Adding crowd-sourced annotations to financial prospectuses can improve novice investors' financial decision making [102]. Qualitative research into how individuals track

their personal finances revealed that despite the availability of digital financial tracking tools, such as Mint, people still rely on hand-written or digital spreadsheets to manage their finances [131]. For some users, privacy concerns keep them from adopting those technologies [131]. For other users, system features, such as auto-categorization of expenses, make the already complex and emotional task of managing finances more frustrating [131].

Behavior change technology that focuses on self-control over spending and shopping are largely absent from the literature. One exception is research on Mindful Shopping, an early-stage prototype designed for managing Compulsive Buying Disorder, a clinical disorder that is typically treated with psychotropic medication and/or cognitive-behavioral therapy [151]. The Chrome extension allows users to create a shopping list, stipulate a budget, and set a shopping timer in addition to providing real-time interventions such as enforcing a one-minute relaxation break, abruptly closing the shopping webpage, or guiding the user to complete a meditation exercise. Efficacy data are not yet available.

4.3.1.3 *Behavior change technology featuring postponement*

Several behavior change technologies have utilized postponement as an intervention for encouraging self-control. A review of commercially available productivity apps revealed that five out of 367 tools included a feature that enforces a time lag before loading distracting content or applications [159]. Similarly, research that tested the efficacy of rotating among 27 different self-control interventions included a “gatekeeper” intervention that enforces a ten second delay to opening websites like Facebook [142]. A usability test of the Mindful Shopping prototype showed that users rated its one-minute wait and relax intervention as among the most useful features of the tool [151]. A similar tool made available by Finder.com, called Icebox, aims to discourage online impulse buying by having users put products “on ice” for at least 24 hours before being able to purchase them [54].

Taken together, the behavior change literature has two gaps: (1) understanding tools focused on controlling spending and (2) understanding postponement interventions for self-control. Study 4 addresses these gaps by testing a behavior change technology that either delays purchases (delay condition) or does not delay purchases (control condition). We predict the following differences between the two conditions:

> *H3(a): The average number of products bought impulsively will be less for participants who have their purchases delayed (delay condition) than for participants who do not (control condition).*
>
> *H3(b): The average dollar amount spent impulsively will be less for participants who have their purchases delayed (delay condition) than for participants who do not (control condition).*
>
> *H3(c): The percent of products added to the shopping cart that are ultimately purchased will be less for participants who have their purchases delayed (delay condition) than for participants who do not (control condition).*

4.3.2 Method

4.3.2.1 *Overview*

Study 4 is a between-subjects, in-lab experiment comparing two conditions: a delay (treatment) condition that delays purchases by 10 minutes versus a control condition (no delay). Similar to Vohs and Faber's in-lab impulse buying procedure [242], participants were given $20 to spend or to take home with them. To create an impulse buying scenario, participants selected from an unexpected and unsolicited product assortment [105,185,189]. Purchases were delayed by an internet browser extension that interacted with Amazon.com. Following we describe the tool and procedure.

4.3.2.2 *Tool description*

The Chrome browser extension, internally referred to as Purchase Pause, was developed for use with Amazon.com and includes two versions, a delay version and a control version. The delay version imposes a 10 minute-delay on all purchases. Delaying decisions by 10 minutes can allow hot emotions to cool, facilitating more economically rational decision-making [101]. The extension begins by hiding all

“Proceed to Checkout” and “Buy Now” buttons throughout the Amazon user interface. When the user adds a product to their shopping cart, Purchase Pause automatically moves that product from their cart to Amazon’s “Save for Later” list (which is, by default, visible on the same page, underneath the shopping cart). Below all products in the Save for Later list, the extension replaces the “Move to Cart” option with a “TIME REMAINING” link. Users can click on this link to see how much time is remaining until they can move the product back into their shopping cart (and checkout if they still wish to do so). The number of minutes and seconds remaining is only displayed on the screen for five seconds each time the link the clicked. A countdown clock was not permanently displayed in order to avoid creating a sense of urgency, a design feature sometimes used in e-commerce to encourage impulse buying (See Study 1).

When users visit their shopping cart, a pop-up notification informs them that their product has been moved to the Save for Later list and that they can click to see the how much time is remaining until they can move it back to their shopping cart. After a product has been in the Save for Later list for 10 minutes, the TIME REMAINING link is replaced with Amazon’s Move to Cart link. If the user chooses to move the product back to their shopping cart, the Proceed to Checkout button re-appears and users can purchase the product. In contrast, the control version of the extension provides a typical Amazon shopping experience. No buttons are hidden, products are not moved to the Save for Later list, and users can purchase products immediately, without a time delay, as they normally would. Both versions of the extension unobtrusively record user activity, such as which products are added and deleted from the shopping cart and which products were purchased. See Appendix 3.1 for visuals of the tool.

4.3.2.3 *Procedure*

The experiment ran from March through October 2019. The study began with an online screening questionnaire to determine eligibility (see Recruiting section for details), after which participants scheduled an appointment to complete the study. The experiment took place in a closed office with only one participant scheduled per session. The participant and researcher sat at separate computer stations across from one another.

The experiment included four parts: (1) a self-regulation depletion exercise, (2) a shopping exercise, (3) the main survey, and (4) a post-survey. Instructions for all in-lab exercises were provided both on paper and verbally. See Appendix 3.2 for copies of the instructions and instruments used in this study.

Part 1: Self-regulation depletion exercise. There is evidence that impulse buying is more likely when self-regulation resources are depleted [23,25,242]. In order to increase the likelihood that participants would at least consider yielding to the temptation of an impulse purchase, all participants completed a variation of Wegner's White Bear thought-suppression exercise [249]. Following Vohs and Faber [242], participants were given paper and pen and asked to write down all the thoughts that entered their mind, with one exception—participants were asked to not think about a white bear. Participants were instructed to place a checkmark on the side of their paper if they did think of a white bear, and then continue writing their thoughts. All participants were given six minutes for the writing exercise.

Part 2: Shopping exercise. All participants completed a shopping exercise on a desktop computer. Prior to the participant arriving, the researcher activated Purchase Pause, which randomly assigned each participant to either the control or delay condition. Participants were told that they had $20 to spend or to take home with them at the end of the study. Participants could spend some, all, or none of the $20 and could purchase as many products as they wished as long as they stayed within their budget. To further entice participants into impulse buying, participants were given a 25% discount coupon for their entire order. The coupon also included a cheat-sheet of total dollar amounts before and after the 25% discount is applied. Participants were instructed to look through the approved product list on Amazon, add or delete any products they wanted from their shopping cart, and if they wished to checkout, to click Proceed to Checkout (after which their order could not be changed). Participants were given unlimited time to shop. Participants in the treatment condition were given one additional set of instructions. Those participants were informed that each product that they added to their shopping cart would be automatically moved to a save for later list and they would have

to wait 10 minutes before being able to buy that product. Participants were instructed that “While you wait, you can continue shopping, add or remove items from your shopping cart, or enjoy free time to do something else.”

The approved product list was drawn from Amazon’s Explore product section, which features unique, popular products (see Appendix 3.3). The approved product list included 250 products that included a wide variety of products including home goods, make-up, toys, exercise accessories, clothing and accessories, games, and novelty products. Products were all under $26 dollars and ranged from $5.78-$25.99. All products were Amazon Prime products that defaulted to free, two-day shipping. The product list was regularly monitored for discontinued products. If a product was discontinued, it was replaced with a similar alternative (both in product type and price). A pilot test with 9 doctoral students was run to test the product list, coupon discount amount, and general procedure.

While the participant shopped, the researcher observed their behavior on a monitor that mirrored the participant’s screen. This observation was disclosed in the study’s informed consent form but was not emphasized verbally in order to mitigate a possible Hawthorne effect [160]. The researcher, who sat just outside of the participant’s direct line of sight, discretely took notes on how participants in the treatment condition spent their time during any postponement periods. In particular, the researcher noted whether they continued shopping (i.e., browsed other product options), checked their phone, or did any other activity. Researchers also recorded the total time participants spent shopping, stopping the clock if they did any other activity (such as responding to their phones). If participants indicated that they did not want to purchase anything, the researcher moved them onto Part 3. If the participant purchased something, the researcher walked them through the shipping and checkout process.

Part 3: Survey. Participants completed the survey on the same computer that they completed the shopping exercise. First participants completed a modified version of the five-item Impulse Buying Tendency (IBT) scale [122], adapted for online buying. Next,

participants indicated their motivation level to reduce online impulse buying and their perceived self-efficacy for resisting online impulse buying. Prior work has shown that postponement can be an effective self-control tactic, particularly for highly motivated individuals. For example, formulating a postponement plan (e.g., “If I have the urge to eat [target temptation], then I will tell myself I can eat it some other time”) increases the length of time that highly motivated individuals avoid consuming the temptation (but not for individuals low in motivation to forgo the temptation) [166]. Similarly, self-efficacy (i.e., the confidence in one’s ability to execute a target behavior) can influence how much effort an individual will expend, how long they will persist, and how well they cope with obstacles related to a target behavior [19]. Participants then reported their gender, annual household income, race, employment status, marital status, education, whether any of the products they purchased during the study were products they were already planning on purchasing (adapted from [28]). This concluded the survey for participants in the control condition.

Participants in the treatment condition were asked an additional set of questions, beginning with whether they added any products to their shopping cart and whether they recall being made to wait 10 minutes before being able to checkout. For participants who did not add products to their cart or did not recall experiencing a delay period, the survey concluded. Participants who answered yes to these questions, were asked about their experience during the waiting period. Participants were asked “During your shopping cart’s waiting period, did you change your mind and decide not to buy one or more products?” (Yes / No / I don’t know) and if yes, “Why did you decide not to buy that/those products?” (open-ended free response).

Participants then indicated their agreement with the following three statements: “Waiting 10 minutes to checkout helped me make better purchase decisions,” “Waiting 10 minutes to checkout was not helpful for me,” and “If it were possible, I would like to continue using an online shopping tool that makes me wait before I can checkout”. Responses were provided on 7-point scales ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The survey concluded with two open-ended free response questions

that asked participants to describe what, if anything they liked or did not like about having to wait to checkout. At the conclusion of the survey, participants were paid cash for any unspent portion of their $20 budget from shopping exercise.

Part 4: Post-Survey. Three-four weeks after completing the in-lab experiment, participants who purchased products were invited via email to complete a short post-survey for a 1 in 10 chance to win a $25 e-gift card to Amazon. The post-survey displayed the name, price, and picture of each product that the participant purchased during the study and asked participants to indicate their level of regret for purchasing the product. This study was deemed exempt by the research team's Institutional Review Board.

4.3.2.4 *Measures*

Impulse Buying Tendency Scale:
Participants completed a modified version of the five-item Impulse Buying Tendency (IBT) scale [122], adapted for online buying. Sample items included "I am a person who makes unplanned purchases online" and "When I go shopping online, I buy things that I had not intended to purchase." Responses were made on a seven-point Likert Scale anchored by either *Strongly disagree/Strongly agree* or *Very rarely/Very often*.

Motivation level:
Motivation level was assessed by one item, which asked "How motivated are you to reduce your amount of online impulse buying?" on a seven-point scale from (1) *completely unmotivated* to (7) *completely motivated* (adapted from [118,166]).

Self-efficacy:
Self-efficacy was measured by asking participants to indicate "How confident are you in your ability to resist online impulse buying," with responses on a seven-point scale from (1) *completely unconfident* to (7) *completely confident* (adapted from [118,146]).

Purchase regret:

Purchase regret was measured with 1 item, “How much do you regret purchasing this product” with responses made on a seven-point scale anchored by (1) *not at all* and (7) *completely* [120].

4.3.2.5 *Recruiting and sample size*

An a priori power analysis utilizing a 95% confidence level, power of 80%, assuming equal variance between groups, and predicting a medium-sized effect (d=.5) [56], determined that a minimum of 64 participants were required per condition, for a total minimum sample size of N=128. Similar to Study 3, participants were recruited from a large Midwestern university. In order to achieve a more diverse sample than Study 3, students as well as staff members were recruited. An email invitation to participate in a study about shopping was sent through the University Registrar’s office in 4 waves of 1,000 invitations, beginning in March 2019. Recruitment emails linked to an online survey that screened participants for eligibility. Participants were eligible to participate if they (a) were at least 18 years old and (b) make impulse purchases online at least a few times per month. If eligible, they were directed to a webpage to schedule their study session.

4.3.2.6 *Participants*

In total 134 participants completed the in-lab study. Three participants were excluded from analysis because the Chrome extension was not running for their session (due to researcher error). The final sample of participants includes N=131 participants (delay condition: N=66; control condition: N=65). Participants were between 18-62 years old (*M*=30.37, *SD*=11,64, median = 27 years) and 78.6% identified as a woman (N=103). Most participants reported having some college credit (31.3%, N=41) or having a bachelor’s degree (29%, N=38). Most participants reported working full-time or part-time (72.52%, N=95) and 12.2% (N=18) reported being a student. Our sample was primarily white (64%, N=89), Asian (20.1%, N=28), and Black (10.1%, N=14). Participants scored *M*=3.48, *SD*=1.39, range 1 -7 for perceived self-efficacy in ability to curb online impulse

Gender	20.6% 78.6% 0.8%	(N=27) (N=103) (N=1)	Man Woman Preferred not to self-describe
Income	12.2% 17.6% 15.3% 37.4% 17.6%	(N=16) (N=23) (N=20) (N=49) (N=23)	<$30K $30K-$49,999 $50K-$74,999 $75K-$149,999 >= $150K
Marital status	26.7% 9.9% 6.9% 56.5%	(N=35) (N=13) (N=9) (N=74)	Married Living with partner Divorced Never been married
Education	0.8% 9.2% 31.3% 0.8% 4.6% 29.0% 21.4% 3.1%	(N=1) (N=12) (N=41) (N=1) (N=6) (N=38) (N=28) (N=4)	Some high school, no diploma High school degree or equivalent Some college credit, no degree Trade/technical/vocational training Associate degree Bachelor's degree Master's degree Doctorate degree
Race	64.0% 1.4% 10.1% 0.7% 20.1% 1.4% 2.2% _____ 6.1%	(N=89) (N=2) (N=14) (N=1) (N=28) (N=2) (N=3) _____ (N=8)	White Hispanic Black Native American Asian Pacific Islander Other _____ Self-identified as two or more races
Employment	51.7% 12.1% 0.7% 34.2% 0.7% 0.7% _____ 12.98%	(N=77) (N=18) (N=1) (N=51) (N=1) (N=1) _____ (N=17)	Full-time Part-time Stay at home parent Student Military Unable to work _____ Self-reported two or more employment statuses
Frequency of impulse buying online	0% 4.6% 80.9% 11.5% 3.1%	(N=0) (N=6) (N=106) (N=15) (N=4)	Never (*not eligible to participate) A few times per year A few times per month A few times per week Every day

Table 5: Demographics of participants (N=131) in Study 4

buying and *M*=3.5, *SD*=1.4, range 1-7 for self-reported motivation to curb impulse buying online. Participants were online impulse buyers with 95.42% (N=125) making online impulse purchases at least a few times per month. Participants scored *M*=22.50, *SD*=5.22, range: 7-33 on the Impulse Buying Tendency scale. Income data are reported in Table 5 but with the caveat that our sample includes undergraduate students and it is not clear whether they reported their own or their parent's household income.

In total, 61 participants (46.56%) made a purchase (N=29, 43.94% in the delay condition; N=32, 49.23% in the control condition). As a reminder, if a participant indicated that they were already planning on purchasing the product before seeing it during the study, that purchase was not considered an impulse purchase. Only 40 participants (30.53%) made an *impulse* purchase (N=16, 24.24% in the delay condition; N=24, 36.92% in the control condition). Participants spent on average 15.10 minutes shopping (*SD*=7.25, range 3-34 minutes) and visited on average 25.85 product pages (*SD*=14.42, range=1-69). Participants bought on average 0.35 impulse products (*SD*=.58, range 0-3 products), spending an average $3.43 (*SD*=$5.70, range=$0-$20.14) on impulse purchases. Participants in the delay condition clicked to checked the amount of time remaining in their postponement period on average 1.79 times (*SD*=2.53, range: 0-14 clicks). Additional reporting of participant demographics is shown in Table 5.

4.3.2.7 *Analysis*

Main analyses (hypothesis testing). This study's hypotheses were preregistered (see Appendix 3.4). All quantitative analyses were conducted using the statistics software package, SPSS. This research is focused on impulse buying, therefore self-reported planned purchases were excluded from analysis (including 30 planned purchases: 12 from the control group and 18 from the delay group). Note that purchases and not participants were excluded from analysis.

Independent samples t-tests were used to test H3(a) and H3(b) which predicted that the average number of products bought impulsively and the average dollar amount spent

impulsively will be less for participants in the delay condition in comparison to control. A two-proportion Z-test was used to test Hypothesis H3(c), which predicted that the percentage of products that were added to the shopping cart and were ultimately purchased will be less for participants in the treatment condition.

Secondary analyses. Descriptive statistics were run to analyze participants' evaluations of the postponement tool. Linear regression was used to explore the role that demographics, motivation levels, and self-efficacy levels play in impulse buying behavior.

Qualitative analysis. Open-ended text responses were analyzed using an inductive approach. The lead author read through all responses three times, noting themes and drafting a codebook book representing the types of responses generated by participants. Finally, the lead author independently coded all responses including 20 text responses about why participants changed their mind and did not buy (6 codes), 36 text responses about what participants liked about waiting (6 codes), and 36 text responses about what participants did not like about waiting to complete their purchase (8 codes).

Data, scripts, and codebooks. All data and SPSS scripts are available at the University of Michigan's Deep Blue Data repository (https://doi.org/10.7302/xj8r-sy16).

4.3.3 Results

4.3.3.1 *Hypothesis testing*

H3(a) not supported. Hypothesis H3(a) predicted that the average number of products bought impulsively would be lower for participants in the delay group in comparison to the control group. An independent samples t-test did not reveal a statistically significant difference between delay participants (M=.26, SD=.47) and control participants (M=.45, SD=.66), $t(129)=1.87$, $p = .064$. This represents a non-significant mean difference of .19 products with a 95% Confidence Interval of [-.01, .39].

H3(b) not supported. Hypothesis H3(b) predicted that the average dollars spent on impulse purchases would be lower for participants in the delay group in comparison to the control group. And independent samples t-test did not reveal a statistically significant difference between delay participants (M=$2.45, SD=$4.96) and control participants (M=$4.34, SD=$6.25), $t(129)=1.82$, $p=.07$. This represents a non-significant mean difference of $1.80 with a 95% Confidence Interval of [-.16, 3.75].

H3(c) not supported. Hypothesis H3(c) predicted that the proportion of products purchased out of those added to the shopping cart would be lower for the delay group than the control group. A two-portion Z test did not reveal a statically significant difference between the delay participants (14.91%)(N=17 purchases / 114 adds to cart) and control participants (23.2%)(N=29 purchases / 125 adds to cart), $z = 1.62$, $p = .11$.

In addition, an exploratory analysis was run to check for a difference in the percentage of participants in each condition who made an impulse purchase. The proportion of participants who made an impulse purchase did not differ by condition, X^2 (1, N = 131) = 2.48, $p = .12$.

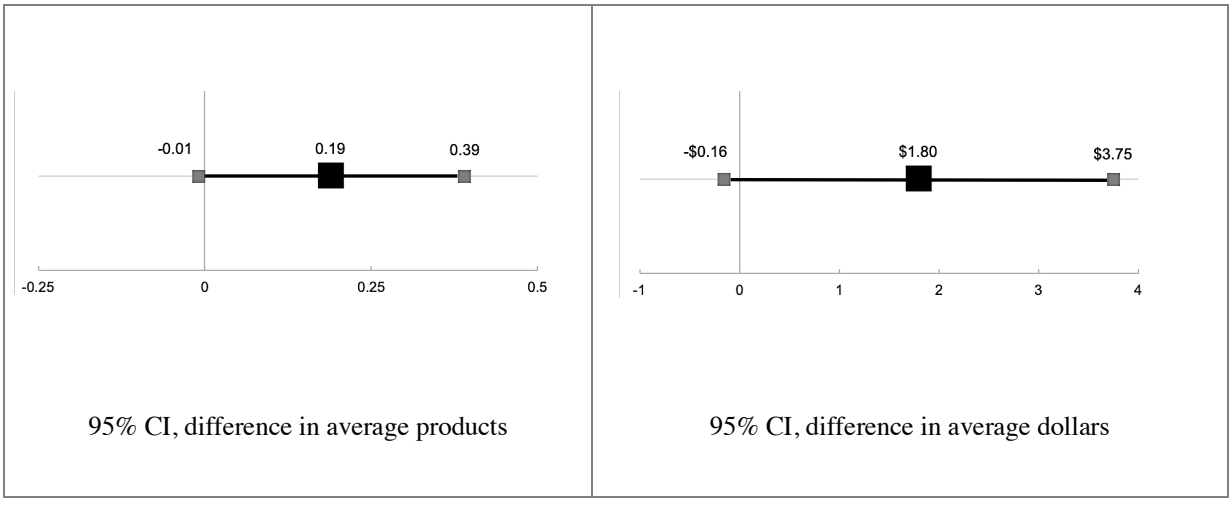


Figure 4: 95% Confidence Intervals of the difference in average number of products impulsively purchased (left) and dollars impulsively spent (right) between the delay and control conditions

4.3.3.2 *Factors that impact number of products impulsively purchased*

We conducted exploratory regression analyses to identify influential variables on the number of products purchased impulsively. We began by identifying potential predictor/control variables based on theory and prior work and included them in linear regression Model 1. The control condition acts as the reference variable to the treatment condition dummy variable. After Model 1 was run, one non-significant predictor variable was removed (Education) resulting in Model 2.

Model 2 reveals that gender, age, IBT score, and time spent shopping are significant predictors of the number of products purchased impulsively (Adjusted R^2 = .177, $F(5,125)=6.57$, $p < .001$). Results show that as IBT scores (b = .02, $t(125) = 2.23$, p = .03), age (b = .01, $t(125) = 2.37$, p = .02), and time spent shopping (b = .02, $t(125)$ = 3.07, p = .003) increase, the number of products purchased impulsively increases. On average, men purchased more products on impulse in comparison to woman (b = .38, $t(125) = 3.27$, p = .001). Finally, consistent with our main hypothesis testing results, condition is not a significant predictor (b = -.101, $t(125) = -1.06$, p = .29).

To explore whether the effect of postponement depends on an individual's impulsive buying tendencies, we ran Model 3 (Adjusted R^2 = .177, $F(6,124)=5.45$, $p < .001$), which includes the interaction term: Impulse Buying Tendency x Treatment condition. The interaction term is not a significant predictor of number of products purchased impulsively (b = .005, $t(124) = .257$, p = .80).

4.3.3.3 *Factors that impact dollars spent impulsively*

We conducted exploratory regression analyses to identify influential variables on dollars spent impulsively. We began by identifying potential predictor/control variables based on theory and prior work and included them in linear regression Model 4. We then removed one non-significant predictor at a time in a step-wise fashion, resulting in Model 5.

	Model 1 $F(6,124)=5.44, p < .001$	**Model 2** $F(5,125)=6.57, p < .001$	**Model 3** $F(6,124)=5.45, p < .001$
constant	-.740 * (.311)	-.720 * (.280)	-.647 (.401)
Education	.003 (.029)	____	____
Treatment condition	-.101 (.096)	-.101 (.096)	-.210 (.433)
Male	.379 ** (.116)	.378 ** (.116)	.378 ** (.116)
Age	.009 * (.005)	.010 * (.004)	.010 * (.004)
Impulse Buying Tendency (IBT)	.020 * (.009)	.020 * (.009)	.017 (.015)
Time spent shopping	.020 ** (.006)	.020 ** (.006)	.019 ** (.006)
IBT x Treatment Condition	____	____	.005 (.019)
Adj. R^2	.170	.177	.177

$*p < .05 \quad **p < .01 \quad ***p < .001$

Table 6: Summary of regression models predicting number of products bought impulsively (N=131)

Model 5 (Adjusted R^2 = .067, $F(3,127)=4.12$, p = .008) reveals gender to be the only significant predictor of dollars spent impulsively. On average, men spent more money impulsively in comparison to woman (b = 2.951, $t(127)$ = 2.46, p = .015). Consistent with our main hypothesis testing results, condition is not a significant predictor (b = -1.483, $t(127)$ = -1.53, p = .13). To explore whether the effect of postponement depends on an individual's impulsive buying tendencies, we ran Model 6 (Adjusted R^2 = .062, $F(4,126)=3.15$, p = .017), which includes the interaction term: Impulse Buying Tendency x Treatment condition. The interaction term is not a significant predictor of dollars spent impulsively (b = .109, $t(126)$ = .569, p = .571).

	Model 4 $F(6,124)=3.15, p = .007$	**Model 5** $F(3,127)=4.12$, p = .008	**Model 6** $F(4,126)=3.15$, p = .017
constant	-.5.15 (3.19)	-.598 (2.304)	.974 (3.603)
Education	.074 (.294)	____	____
Age	.062 (.049)	____	____
Time spent shopping	.122 (.066)	____	____
Treatment condition	-1.081 (.988)	-1.483 (.966)	-3.955 (4.454)
Male	3.04 * (1.19)	2.951 * (1.19)	2.952 * (1.203)
Impulse Buying Tendency (IBT)	.189 (.096)	.185 (.094)	.117 (.153)
IBT*Treatment Condition	____	____	.569 (.571)
Adj. R^2	.09	.067	.062

$^*p < .05$ $^{**}p < .01$ $^{***}p < .001$

Table 7: Summary of regression models predicting dollars spent impulsively (N=131)

4.3.3.4 *Post purchase regret*

All participants who completed an impulse purchase were invited to rate how much they regretted purchasing their product(s). A total of 15 control participants and 11 delay participants provided regret ratings. An independent samples t-test did not reveal a statistically significant difference in average regret between participants in the delay condition (M=1.73, SD=1.16) and the control condition (M=2.45, SD=1.75), $t(24)$=-1.26, p = .22.

4.3.3.5 *Behavior during delays*

Participants shopped, checked phone while waiting. Among the 41 delay participants who added a product to their shopping cart (and therefore experienced a postponement period), 100% (N=41) continued shopping during the delay period and 19.5% (N=8) checked their phone.

Some participants decided not to buy while waiting. Among the 66 delay participants, 41 (62%) added at least one product to their cart. Of the 41 delay participants who added a product to their cart, 36 (88%) reported that they noticed their shopping cart imposed a 10-minute delay on their purchases. Among the participants who noticed the delay, 20 (56%) reported that they changed their mind during the delay period and choose not to buy a product in their cart.

Checking time remaining. Delay participants clicked to check the time remaining in their 10-minute delay an average of 1.79 times (*SD*=2.53, range: 0-14 clicks). A bivariate linear regression analysis revealed that for every additional click to check time-remaining, the number of impulse products purchased increased by .1 (b = .1, $t(65)$ = 5.05, $p < .001$), R^2 = .29, $F(1, 64)$=25.54, $p < .001$). Linear regression also revealed that for every additional click to check time-remaining, the dollars spent on impulse purchases increased $.99 ($b$ = .99, $t(65)$ = 4.69, $p < .001$), R^2 = .26, $F(1, 64)$=21.97, $p <$ .001).

4.3.3.6 *Reasons for changing their mind during the delay period*

Delay participants who indicated that they had changed their mind about a product during the delay period (N=20) provided a range of reasons for why they decided not to purchase the product (See Table 8). Participants described how paying closer attention to the product or reviews during the delay led them to change their mind. One participant explained, “[The] product looked very appealing on first thought, the design of the mug was at first funny and interesting, but on second glance started to confuse me what it actually was” (Male, 21 years old). Participants also described realizing that

the product was a want and not a need, “I had plenty of tank tops or women’s clothing and didn't NEED anymore (I wanted it)....” (Female, 31 years old). Other participants reported that paying closer attention to product prices during the delay changed their mind, while others noted that they found alternative products during the delay period. Finally, some participants reported that they simply got tired of waiting or that postponement is the strategy that they typically use to make purchase decisions.

Example reasons for changing mind during delay	
Realized product was a "want" not a "need"	▪ “I had plenty of tank tops or women’s clothing and didn't NEED anymore (I wanted it)....”
Paid closer attention to the prices or budget	▪ “I felt like I could put the $20 toward other things that I would enjoy more and be happier with”
Paid closer attention to product / reviews	▪ “Because I realized I didn't really like the style of it.” ▪ “It might get lost in the mail”
Found alternative product	▪ “I saw another similar item that was less expensive and potentially more useful.”
Postponement is an established strategy	▪ “I often add things and think about them in the shopping cart and then delete them later.”
Tired of waiting	▪ “I was tired of waiting which clearly meant that I did not need/strongly want the items.”

Table 8: Themes and examples of why participants changed their mind during the delay period and decided not to purchase

4.3.3.7 *Attitudes about the app*

Of the 41 delay participants who added a product to their shopping cart, 36 reported that they noticed that their purchases were delayed by 10 minutes. The other five participants reported they did not notice a delay period, possibly because they added a product to their cart but never visited their cart or because ten minutes had already elapsed when they visited their cart. We collected feedback on the postponement period only from those participants who noticed it (N=36).

Helpfulness ratings. Among participants who noticed the delay, 50% (N=18) indicated that waiting 10 minutes was helpful while 39% (N=14) reported that it was not helpful (Note: 11%, N=4 were neutral). Approximately 61% (N=22) reported that waiting 10 minutes helped them make better purchase decisions while 28% (N=10) reported that it did not help them make better decisions (Note: 11%, N=4 were neutral). Approximately 56% (N=20) indicated that they would like to continue using an app that makes them wait before checkout while 33% (N=12) reported that they would not like to continue using such a tool (Note: 11%, N=4 were neutral).

What participants liked about waiting to checkout	
Made me think or rethink	▪ "The 10 minutes was long enough of a time that I was able to really think about if I wanted it, and if I would use it, but not so long that it became a true burden" ▪ "it made me think twice about buying"
Made me think about prices / cost	▪ "I started to think about the opportunity cost of the money (i.e. would I trade two cups of coffee for this case -- yes)"
Gave me time to gather more info	▪ "I had time to look at the reviews, which I had not done before adding the item to the cart."
Allowed me to look at alternatives	▪ "Waiting to checkout made me explore the other options on what i could spend my money on" ▪ "It also allowed me to add more to my cart :)"
Discourages impulse buying	▪ "It reduced the ability to make an impulse purchase."
Mirrors my own strategy	▪ "I tend to do this to myself, and I often wait a day or more before deciding to buy things."

Table 9: Themes and examples of what participants liked about waiting to checkout

What participants liked about waiting to checkout. Positive feedback generally fell into six categories (see Table 9). Participants liked that waiting to checkout made them think or rethink their initial purchase decisions. For example, one participant notes that "The 10 minutes was long enough of a time that I was able to really think about if I wanted it, and if I would use it, but not so long that it became a true burden" (Female, 36 years

old). Other participants liked that the delay period made them think specifically about the product prices or the opportunity costs of buying. Participants also liked having time to gather more product information by inspecting the products in their cart more closely and reading product reviews. Other participants noted that they liked having the time to explore other product options and add new products to their cart. Some participants reported that what they liked about waiting was that it discourages impulse buying or that it mirrors their own strategy of waiting before making final purchase decisions.

What participants did not like about waiting to checkout	
Ten minutes feels too long	▪ "I didn't like the length of time, 10 mins seemed too long." ▪ "…Ideally 5-7 minutes would be a good wait time for me."
I already deliberated / was ready to purchase	▪ "I thought about each item as I saw it and made the determination already if I wanted it or not before it was in my cart so for me the extra time to think about it wasn't needed." ▪ "I had already started thinking about these things and basically formed my rationale before putting the item in my cart."
I don't think waiting works for me	▪ "I ended up sticking with what I had in my cart so it wasn't as beneficial to wait to checkout."
I have a different strategy	▪ "My online shopping process is to usually add things to my cart, wait a day, and then go back and purchase" ▪ "I purchase items, then cancel them if I realize they were purchased on impulse or I will return them."
Could have encouraged me to buy more	▪ "When I was done looking at the reviews I had time to browse other items, which could have resulted in my adding them to my cart spontaneously."
You might miss out on deals or shipping	▪ "If it was a hot product and going fast, you might not get it in time unless the product is reserved for you."
I felt a time-pressure	▪ "It made me feel pressured to make a decision in under 10 mins or I would have had to re-add the products"
Generally, did not like waiting	▪ "Waiting. Boring. Ready to leave site." ▪ "It was annoying at first"

Table 10: Themes and examples of what participants disliked about waiting to checkout

What participants did not like about waiting to checkout. Negative feedback generally fell into eight categories (see Table 10). Some participants reported that ten minutes felt

too long and some specifically reported wanting a five- or seven-minute delay instead. Other participants felt the delay was unnecessary because they had already deliberated and were confident in their choices. For example, one participant stated, “I thought about each item as I saw it and made the determination already if I wanted it or not before it was in my cart so for me the extra time to think about it wasn't needed” (Female, 36 years old). Other participants reported that they did not believe the waiting period changed their purchasing behavior (e.g., “I ended up sticking with what I had in my cart so it wasn't as beneficial to wait to check out” (Female, 21 years old). Some participants did not like waiting because they prefer other strategies such as purchasing and then canceling or returning unwanted products. Some participants disliked that waiting encouraged them to continue browsing product options, which could have led them to buying more products. Finally, some participants disliked waiting because they worried they might miss out on fast selling products, time sensitive sales, or shipping deadlines.

4.3.4 Discussion

The goal of this study was to test the effectiveness of postponement on actual impulse purchases. To summarize our results:

- We do not find statistically significant support for postponement leading to fewer impulse purchases, fewer dollars spent impulsively, nor a smaller percentage of impulsive adds to cart being purchased.
- We find that all participants in the delay condition continued shopping during the postponement period.
- We find evidence that postponement was effective and helpful for some participants based on their self-reported feedback.

In the following we explore why this study’s hypotheses were not supported and identify opportunities for future research as well as design recommendations for self-control tools.

4.2.4.1 *Why postponement did not work here*

The self-control literature suggests that postponement can encourage self-control by enabling deliberative thinking [126], shifting preferences from short-term to long-term [225], allowing emotional reactions to cool [43,101,184], and allowing users to become distracted from "hot", impulse-inducing stimuli [108,167,170]. However, Study 4's 10-minute delay on purchases did not lead to consistent declines in impulse buying in comparison to the control group. One explanation for this result is that 100% of delay participants continued shopping (i.e., browsing through other product options) during the postponement period. Prior work has shown that more time spent browsing or "window shopping" increases the likelihood of making an impulse purchase [28,85].

By spending the delay period browsing through alternative products, it is less likely that participants engaged in slow, deliberative reasoning about the product in their cart. Any deliberation that did occur may have been more focused on "should I buy A or B?" versus of "should I buy at all?". Further, by continuing to shop during the delay, participants most likely did not experience a sufficient distraction from the temptation of impulse buying. Instead, participants remained engaged in the stimulating environment that promised popular Amazon products at a high discount, shipped quickly and for free. In this case, the delay period most likely did little to help emotions cool.

There are a few possible explanations for why participants continued shopping during the delay. First, the study's instructions were that "While you wait, you can continue shopping, add or remove items from your shopping cart, or enjoy free time to do something else." While we mention that they were allowed to enjoy free time, the wording of these instructions may have inadvertently emphasized shopping during the delay period. Second, this experiment was conducted in-lab with a researcher in the room. Participants may have felt obligated to continue engaging with the study website instead of checking email, writing a pro/con list, etc. The low rate of participants checking their phone during the delay (only 19.5%) appears to corroborate this explanation. This type of participant bias or demand characteristic is a common challenge in HCI when testing new technologies; participants often change their

behavior to be “good” subjects [61]. Further, during in-lab experiments participants are a relatively captive audience. If participants experienced the delay at home, they may have felt more free to step away during the ten minutes. Finally, a ten-minute delay may not have been long enough for distraction to naturally occur. In contrast with Study 3’s 25-hour delay, participants are less likely to have a meal, sleep, hear from a friend, or be otherwise distracted away from the purchase during ten minutes.

4.3.4.2 *The case against unguided postponement*

The postponement period implemented in this study was “unguided”. Participants were not restricted from any behavior (other than finalizing their purchase) and were not prompted to complete any exercises. Instead, all participants opted to spend at least some of their unguided delay period browsing alternative products. Unfortunately, more time spent browsing is linked to increased impulse buying [28,85]. Indeed, some participants observed that the delay provided time to “browse other items”, to “explore the other options…” and “allowed me to add more to my cart”. Any app designed to help consumers who struggle with impulse buying will likely encounter a similar behavior with an unguided delay period. Further, some participants noted that ten minutes was too long and, at times, felt boring. Ten minutes may have felt especially long and boring because the delay period was unguided and unstructured. This is a problematic unintended consequence of the intervention, given that consumers sometimes use impulse buying to combat feelings of boredom [93].

Further, a small number of participants reported feeling time pressured to make a purchase decision. For example, one participant reported, “It made me feel pressured to make a decision in under 10 mins or I would have had to re-add the products”. Participants in fact had unlimited time to shop, even past their 10-minute delays. However, some participants perceived the 10-minute delay as a deadline, similar to a limited-time offer, which is a common strategy used to encourage impulse buying (see Study 1). In this case, participants not only spent their 10-mintues browsing alternatives, they did so with the imagined urgency that they might miss out on a great deal if they did not purchase something.

However, participant feedback provides a promising indication that postponement can be effective when it in involves reflection. Participants who indicated that they changed their mind about buying a product during the delay described how they spent that time paying closer attention to product details, costs, reviews, and thinking about whether it was a “need” or a “want” for them. Participants also reported liking that the delay period made them rethink their potential impulse purchase and its costs. It seems that for these participants spending the delay period reflecting was effective and helpful.

Overall, the results of this study suggest that unguided postponement is not an ideal intervention for greater self-control with online impulse buying. An alternative design is to prompt users to complete a reflection or distraction exercise during the delay. Providing a required activity will help discourage users from continuing to browse the online store, provide a structured and ideally engaging way to spend the delay period, and can be designed to be shorter than 10 minutes. Study 5 uses these findings to design and test interventions that either guide users to engage in deliberative reasoning about the product or provides an absorbing exercise that distracts the user away from the product.

4.3.4 Limitations

This experiment was conducted in-lab, one participant at a time, with a researcher in the room. This setup may have contributed to participant bias, with participants being extra attentive to the online store during the delay period when they normally may not have been. During the shopping exercise, participants spent money that they would have received for participating in the study. While this represents participants spending their own money, some participants may have viewed the $20 compensation as a windfall and therefore this study design may not be representative of the experience consumers have of spending money that, for example, they earned as income (i.e., “hard-earned” money). Finally, the Chrome extension was designed to work with the desktop version of Amazon.com. It is not clear how these results may or may not generalize to other platforms such as mobile devices.

CHAPTER V
Reflection

Chapter 4 presented studies showing that postponement can reduce the felt urge to buy impulsively (Study 3) but ultimately may not impact purchase behavior if the delay is spent browsing alternative products (Study 4). To build on Studies 3 and 4, which tested unguided postponement (i.e., the participant is free to spend their delay however they wish), Study 5 tests guided postponement periods, where the participant engages in reflection (also referred to as deliberation). Reflection strategies can help consumers transcend an intense, emotionally charged consumption opportunity and shift them to their deliberative processing system [25]. Impulse buying is generally thought to be a product of an individual's rapid and reflexive processing system [23,167] and can result in purchases that may not have been made if they "had been *contemplated* from a removed, dispassionate perspective" [108:493–494] (emphasis added).

There is evidence that reflection can lead to better outcomes. A multi-year field study in Chicago showed that teaching youth to slow down and think through their initial impulses was associated with a drop in arrests and increased graduation rates [270]. Reflection can also lead to positive outcomes for consumers. Reminding individuals of the potential negative consequences of a behavior (e.g., with "elaboration prompts") can encourage more reflection and, in the case of credit card bills, increase the consumer's intention to pay more than the minimum balance [105]. Elaborating or reflecting on the potential outcomes of a decision can also lessen the influence that persuasive framing effects have on investment decisions [183]. Reflection has also been shown to reduce purchase regret. In choosing between two hypothetical cars to buy, participants who made an affect-based choice liked their choice less after finalizing their choice than before they made their choice (i.e., they experienced buyer's remorse) [268]. In

contrast, participants who made a deliberation-based choice did not report a drop in their preference strength. Finally, there is also evidence to suggest that unconscious processing while being distracted can also be effective in improving decision quality. Unconscious processing or “deliberation without attention” theory argues that decision quality can improve when one steps away from the decision and allows their mind to unconsciously think through the choice [70].

Methods for encouraging reflection take two general forms: instructing and nudging. Instructing involves giving individuals explicit instructions on how to think about a decision or how to evaluate options. Common instructions include having participants list reasons why “you feel the way you do about each option” or list the pros (advantages) and cons (disadvantages) of each option [113]. Another instructing method is to have participants “stop and think about” the available information regarding each option and then rate the importance of each piece of information in informing their decision [113]. Other methods provide more general instructions to “think carefully” or to “take your time” in making a decision [113]. Nudging reflection involves presenting information that should encourage one to think more about the decision, such as highlighting non-obvious costs [205]. In HCI, this can take the form of presenting feedback data on behavior and progress toward goals (e.g., tracking minutes spent on social media). However, there has been recent criticism of the assumption that reflection is a broadly available skill that will be automatically triggered when presented data [224]. Instead, Slovak and colleagues call for interventions that encourage reflection and learning through practice in safe, low-stakes settings [224].

In the following we review specific classes of reflection strategies including the elaboration on potential outcomes, reflecting on costs, reflecting on the past, present, and future, reframing how we think, psychological distancing, inducing different construal levels, and general mindfulness strategies.

5.1 Reflection Strategies

5.1.1 Elaborating on potential outcomes

5.1.1.1 *Emotional forecasting*

Emotional forecasting [17] involves thinking about the anticipated emotions that can result from a choice, including, for example, feelings of regret, guilt, remorse, and shame from engaging in impulse buying [27,93,174,261]. Engaging in emotional forecasting has been shown to predict one's ability to resist temptation [195]. Subjects in a lab experiment were told to anticipate the amount of pride they would feel for not eating a cheesecake (pride condition) or the amount of shame they would feel for eating the cake (shame condition). Results showed that participants in the pride condition ate significantly less cake, took significantly fewer bites, and reported significantly fewer thoughts about the tempting stimulus (e.g., "the cake looks creamy.") [195]. The authors contend that anticipating shame maintains a focus on "hot" or impulsive stimulus features, where anticipating pride activates the reflective system by directing attention to the self and away from the stimulus. However, anticipating emotional outcomes can also encourage a consumer to make an immediate purchase. When prompted to think about how they would feel if they made the "wrong choice" between buying now or waiting for a better price later, consumers are more likely to purchase sooner [222].

5.1.1.2 *Positive abstract and negative concrete outcomes*

Individuals tend to follow a pattern when elaborating on potential outcomes—positive outcomes tend to be abstract (e.g., I will enjoy a successful career) and negative outcomes tend to be specific (e.g., I will not get tenure and be forced to take a lower-paying position) [181]. This may help explain why when faced with a saving versus indulging scenario, the likelihood to save was higher for participants who were prompted to list "broad", positive consequences (for saving) than for those prompted to list "specific" positive consequences. Similarly, the likelihood to save was higher for participants who were asked to list concrete negative outcomes (of buying) than for those who listed abstract, negative outcomes [181]. In both cases, the elaboration prompts were rated as significantly easier for abstract (versus concrete) positive

outcomes and for concrete (versus abstract) negative outcomes. Nenkov and colleagues speculate that outcome expectancy (i.e., the believed likelihood that the outcome will actually occur) is higher for outcomes that come to mind more easily (i.e., generated with high fluency), which may explain why focusing on those potential outcomes is more effective for exerting self-control.

5.1.1.3 *Individual tendency to elaborate on outcomes*

Individuals who have a strong tendency to elaborate on potential future outcomes are less susceptible to framing and presentational cues [183]. A series of experiments showed that individuals who tend to elaborate were not affected by information framing (e.g., positive/gains versus negative/losses) when making investment choices. In contrast, individuals who do not tend to elaborate were significantly affected by those presentation and framing effects. However, those differences fell away when participants were explicitly prompted to elaborate on potential future outcomes, leaving both groups of participants equally likely to invest regardless of which framing (positive or negative) they were exposed to. Taken together, these experiments suggest that prompting outcome elaboration can be an effective strategy for making more deliberative and less heuristic-based decisions, especially for individuals who do not normally elaborate [183].

5.1.2 Reflecting on costs

Another reflection strategy is to conduct a cost assessment, or a systematic consideration of costs [108]. One example of a cost assessments is to bundle dispersed costs together (e.g., calculating the total cost of installment payments) to generate a more accurate and cumulative calculation of costs. One way to nudge cost assessments is to highlight non-obvious costs, which has been shown to be effective at curbing generally impulsive decisions, such as going to a concert instead of studying [205], as well as improving financial decisions. In a lab experiment, participants were asked to decide how much of a hypothetical credit card bill to pay [105]. Participants in the control condition only saw standard information on the credit card bill (e.g., amount

due, date due, minimum payment required) while participants in the treatment condition also saw the potential costs of only paying the minimum payment (i.e., length of time to pay-off of the bill and finance charges). The authors found that participants low in self-control, who were exposed to the additional cost information, indicated they would make higher payments than those in the control condition. However, even with a cost assessment, there is opportunity for consumers to fail at self-regulation. Consumers who engage in mental accounting (i.e., mentally tracking expense and spending buckets) tend to underestimate how much they spend on seemingly rare, special occasion purchases [229] and tend to classify costs and exploit budget loopholes in a way that justifies their spending [46].

5.1.3 Reflecting on the past, present, and future

Reflection can include thinking about present circumstances. Dholakia, Jung, and Chowdhry present an "anti-consumption strategy" of reflecting on the current possessions that one already owns [67]. Participants who reflected on a recently used possession (condition 1) reported lower willingness to pay for five new products (i.e., a sweater, watch, coffee maker, chair, and a box of chocolates). Further, participants who reflected on a recently used possession (condition 1) and participants who reflected on the future use of an unused possession (condition 2) reported lower desire for and lower likelihood of purchasing a product presented in a hypothetical, impulse buying vignette. However, the authors qualified these results by demonstrating that the effect of reflection on purchase intention was moderated by product type, where reflecting on an owned hedonic product reversed the intervention and increased likelihood to purchase.

Reflection can also involve thinking about past behavior. The effectiveness of reflecting on the past for greater self-control can depend on an individual's trait impulsivity [176]. In an in-lab experiment, individuals were asked to spend five minutes describing a recent instance when they had either resisted or succumbed to a tempting food item. Individuals who rated high on trait impulsivity displayed a switching effect, where they were more likely to resist eating the tempting snack if they had reflected on a time when they succumbed to temptation. On the other hand, individuals low in impulsiveness

displayed a consistency effect, where they were more likely to resist eating the temptation if they had reflected on a time when they successfully resisted a temptation. However, reflecting on past behavior can also backfire for impulsive individuals who tend to distort memories of past behavior (e.g., underestimating how many calories they consumed) in such a way that makes them feel they have made progress on self-control goals, allowing them to indulge now [164].

Individuals primed to take a future-mindset are more likely to prioritize larger future-gains over smaller, short-term gratification. Participants asked “to imagine what their everyday life circumstances might be like 4 years in the future” were compared to participants who were asked to “recall the events of a typical day in their present life circumstances” [52]. Future-orientated participants were more likely to wait for larger, delayed payments than to accept smaller, instant payments. Similarly, after an immersive virtual reality exercise, participants who interacted with a digitally aged avatar of themselves contributed twice as much money to a hypothetical retirement fund than participants who interacted with non-aged avatar of themselves [107].

5.1.4 Reframing thoughts about the temptation

Reflection can include thinking about temptations in strategic ways. For example, thinking about a food temptation in a non-consummatory way can reduce automatic positivity toward that temptation [110]. Thinking about “possible odd or novel settings or uses” of chocolate reduced positive associations with chocolate in comparison to individuals who thought about “how eating the chocolate would taste and feel” [110]. Similarly, using a cognitive re-appraisal strategy can reduce the desire for tempting junk food [97]. Participants in a study were asked to look at pictures of tempting food. The treatment group was then prompted to think about the food “in a way that reduces your desire to eat [it]” by for example, imagining that “you are already full” or that “something bad has happened to the food (such as someone coughing on it)”. Self-reported desire ratings for the tempting food were significantly less for individuals using cognitive re-appraisal reflection in comparison to those in the control condition.

5.1.5 Psychological distancing

Psychological distancing is a strategy that involves thinking about something from a removed or “fly on the wall” perspective. Utilizing a self-distanced approach can enhance wise reasoning, which is generally characterized as “transcending egocentric viewpoints to take the ‘big picture’ into account and reason holistically” [43]. In a series of lab experiments, participants were asked to think about issues that have “profound personal implications” for them, such as how the US recession would affect their career prospects. Participants were randomly assigned to reason out loud from either a distanced perspective (i.e., “imagine the events unfolding as if you were a distant observer”) or from an immersed perspective (i.e., “imagine the events unfolding before your own eyes as if you were right there”). Participants who took a distanced perspective displayed significantly higher levels of “wise reasoning”. Wise reasoning was operationalized to include dialectical reasoning (i.e., recognizing that the world is in flux and the future is likely to change), intellectual humility (i.e., recognizing the limits of one’s own knowledge), and openness to alternative viewpoints (measured here as willingness to join a bipartisan political discussion group). Other work has shown that participants who referred to themselves by their name and non-first person pronouns during “self-talk” performed better on stressful tasks such as public speaking and reported lower levels of negative affect and shame [143]. Taken together, these studies suggest that self-distancing can encourage more robust reasoning.

5.1.6 Construal levels

Construal is the subjective mental representations of events, actions, or choices [91]. Basing decisions on the specific details (e.g., the difference in taste between a carrot and a cookie) represents low-level, concrete construal. High-level construal abstracts the decision into broader terms (e.g., weight loss versus indulgence) [91]. Abstraction or high-level construal is thought to foster self-control by refocusing attention to big picture preferences and long-term goals. One way to induce abstract or concrete construal levels is to have participants complete a category/exemplar exercise. Participants are given a set of everyday objects (e.g., dogs) and participants in the abstract condition

generate superordinate categories (e.g., animal) while participants in the concrete condition generate subordinate exemplars (e.g., poodle). Utilizing an Implicit Association Test showed that participants induced to take a high-level construal had more negative associations toward temptations and those induced to take a low-level construal had more positive associations toward temptations [92]. Further, participants in the high-level construal condition were more likely to choose self-control (an apple) over temptation (a candy bar) [92]. However, switching mindsets can be depleting and, in line with ego-depletion theory, can adversely affect the ability to exert self-control. Lab experiments have shown that participants who were induced to switch mindsets (e.g., between abstract and concrete mindsets) reported greater likelihood in engaging in "want" or vice behaviors over "should" or virtue behaviors [260].

5.1.7 General mindfulness

Various mindfulness techniques can help individuals reflect in a way that enhances self-control. Mindfulness is rooted in simply observing behavior and thoughts in a non-judgmental manner (in contrast to deliberation, which typically involves value judgements) [211]. An example strategy is cognitive diffusion, where individuals are not asked to change their thoughts but to simply notice them and view them as "merely thoughts" and not statements of fact [121]. The mindbus metaphor is a cognitive diffusion strategy where participants view themselves as a bus and their thoughts as passengers on that bus, and can apply strategies for dealing with difficult "passengers" such as asserting "who is in charge". Among participants who were asked to carry a bag of chocolates with them over a five day trial, participants who used the mindbus metaphor consumed less chocolate than the control group [121].

5.1.8 Hypotheses

Taken together, the reviewed work provides evidence that reflection can be an effective strategy for exerting self-control in the face of temptation. As such, we hypothesize that reflection will reduce impulse buying.

H4(a): The felt urge to buy and purchase intent will be lower for participants who complete a reflection exercise in comparison to participants who do not (control condition).

However, the reflection literature also suggests that unconscious processing (i.e., "deliberation-without-attention") can also be effective in improving decision quality, particularly in a consumer context [70]. Dijksterhuis and colleagues had participants read about several product choices and then had them either (a) choose immediately, (b) choose after deliberating, or (c) choose after completing a distractor task for several minutes. A greater percentage of participants in the distraction condition selected the best product (i.e., the product with the greatest ratio of positive to negative attributes) [70]. Distraction can direct attention away from the "hot" or alluring features of a temptation [167] and can help individuals resist small immediate rewards in favor of a larger, delayed reward (i.e., delay of gratification) [170]. As such we hypothesize that distracting individuals from a potential impulse purchase will reduce the felt urge to purchase and purchase intent.

H4(b): The felt urge to buy and purchase intent will be lower for participants who complete a distraction exercise than participants who do not (control condition).

Finally, while prior work supports reflection and distraction as promising self-control strategies, there is little indication whether one of these strategies is more effective than the other. We explore this by investigating the following research question.

RQ: Is there a difference in felt urge to buy and purchase intent between participants who complete a reflection exercise versus those who complete a distraction exercise?

5.2 Reflection Experiment: Urge to Buy (Study 5)

Building on Study 3 and Study 4, Study 5 moves beyond unguided postponement and tests specific activities for participants to complete before making an online purchase. Specifically, Study 5 tests whether reflection or distraction interventions reduce the felt urge to buy impulsively and intent to purchase. To test these hypotheses, we conducted a between-subjects, online experiment in November 2019. The experiment compared three conditions: (1) a reflection intervention, (2) a distraction intervention, and (3) a control condition with no intervention. Participants in the reflection condition were asked to provide five reasons for buying and five reasons against buying a product that they selected from a website. Participants in the distraction condition completed a counting exercise designed to distract them from the product that they selected from a website.

5.2.1 Method

5.2.1.1 *Recruiting*

Participants signed up to participate in an "Online Shopping" study through the recruiting platform, Prolific.co. Part 1 of the study was a screener completed by 1,238 participants. Only participants who were at least 18 years old and currently residing in the United States were eligible to participate in the screener. The screener asked one question, "how often do you make unplanned, impulse purchases online?" (Never / A few times a year / A few times a month / A few times a week / Every day). Participants then viewed the informed consent form. If the participant reported that they "Never" make impulse purchases online or declined the consent form, they were thanked and compensated, but were not eligible to participate. All other participants (N=880) were compensated and then invited to complete the main study. All 880 invited participants participated in the main study. The screener took on average 63 seconds to complete and participants were paid at a rate of approximately $11/hour.

5.2.1.2 *Procedure*

Product selection. As with Study 3 and Study 4, this study created an impulse buying situation by providing an unplanned product choice exercise where participants were

unaware of product choices in advance [105,185,189]. At the start of the study, participants visited a fictitious shopping website that we created, called Amazon Discounted, and were asked to "Look through the products on the website and then return to this survey to answer the questions below." (See the Materials section below for a description of the website). Participants then selected the product that they felt "the strongest urge to purchase" from a drop-down list. Next, participants were asked to rate their felt urge to purchase and purchase intent for that product. Participants were then randomly assigned to one of the study's three conditions.

Reflection condition. Participants in the reflection condition were then shown a screen with the name of the product that they selected and the following instructions, "Imagine that product is available for purchase for $10. Please list 5 reasons for buying it" followed by five text entry fields and then "Now please list 5 reasons for **not buying** it" followed by five text entry fields. Participants were asked to reflect on both reasons for and against buying to mitigate the risk of demand effects and hypothesis guessing. To measure participants' level of engagement, we unobtrusively recorded the amount of time spent on the reflection task as well as the number the characters that participants generated. On the next screen participants were again shown the name of the product they selected and were asked to rate their felt urge to purchase and their purchase intent. See Appendix 4.1 for a screenshot of the reflection task.

A pilot test (N=21 participants) revealed that the distraction task was taking more time to complete (4.34 minutes on average) than the reflection task (2.23 minutes on average). To make the two interventions comparable in terms of time spent, the reflection condition was revised from its original design, which required 3-4 reasons for and against buying, to requiring 5 reasons each. As a result, time spent on the reflection and distraction interventions in the main experiment were comparable (see Results section for details).

Distraction condition. Participants in the distraction condition completed a distraction task adapted from Buhren and Kundt's counting task where participants counted the

number of “1”s displayed in a 10x15 table randomly filled with ones and zeros [42]. However, to avoid priming participants with the notion of mathematics by having them count “0”s and “1”s (and potentially activating deliberative processing), the tables displayed red squares and blue circles. Participants were shown the following instructions: “Counting Squares Exercise: Please count the number of red squares in each row of the table and enter that number into the corresponding field below the table.” When participants completed two 10x15 tables (for a total of 30 sums), participants were shown the name of the product they selected at the beginning of the study and were asked to rate their felt urge to purchase the product and their purchase intent. See Appendix 4.1 for a screenshot of the distraction task.

As described above, a pilot test (N=21 participants) revealed that the distraction task was taking more time to complete (4.34 minutes on average) than the reflection task (2.23 minutes on average). To make the two interventions comparable in terms of time spent, the distraction condition was revised from its original design, which required three counting tables, to requiring only two counting tables. As a result, time spent on the reflection and distraction interventions in the main experiment were comparable (see Results section for details).

Control condition. Participants in the control condition did not complete any exercises and were instead immediately directed to the post-survey.

Post-survey. All three conditions completed the post-survey. To begin, participants indicated whether they were already planning on buying the product that they selected before they saw it in the study. Participants then completed a modified version of the five-item Impulse Buying Tendency (IBT) scale [122] (adapted for online buying) and a five-item version of the Need For Cognition scale [158]. Participants then indicated their motivation level to reduce online impulse buying and their perceived self-efficacy for resisting online impulse buying. Prior work has shown that self-control strategies are especially effective for highly motivated individuals [166]. Similarly, self-efficacy (i.e., the confidence in one’s ability to execute a target behavior) can influence how much

effort an individual will expend related to a target behavior, such as resisting a temptation [19]. Next, all participants answered demographic questions about gender, age, household income, race, employment status, marital status, and education level.

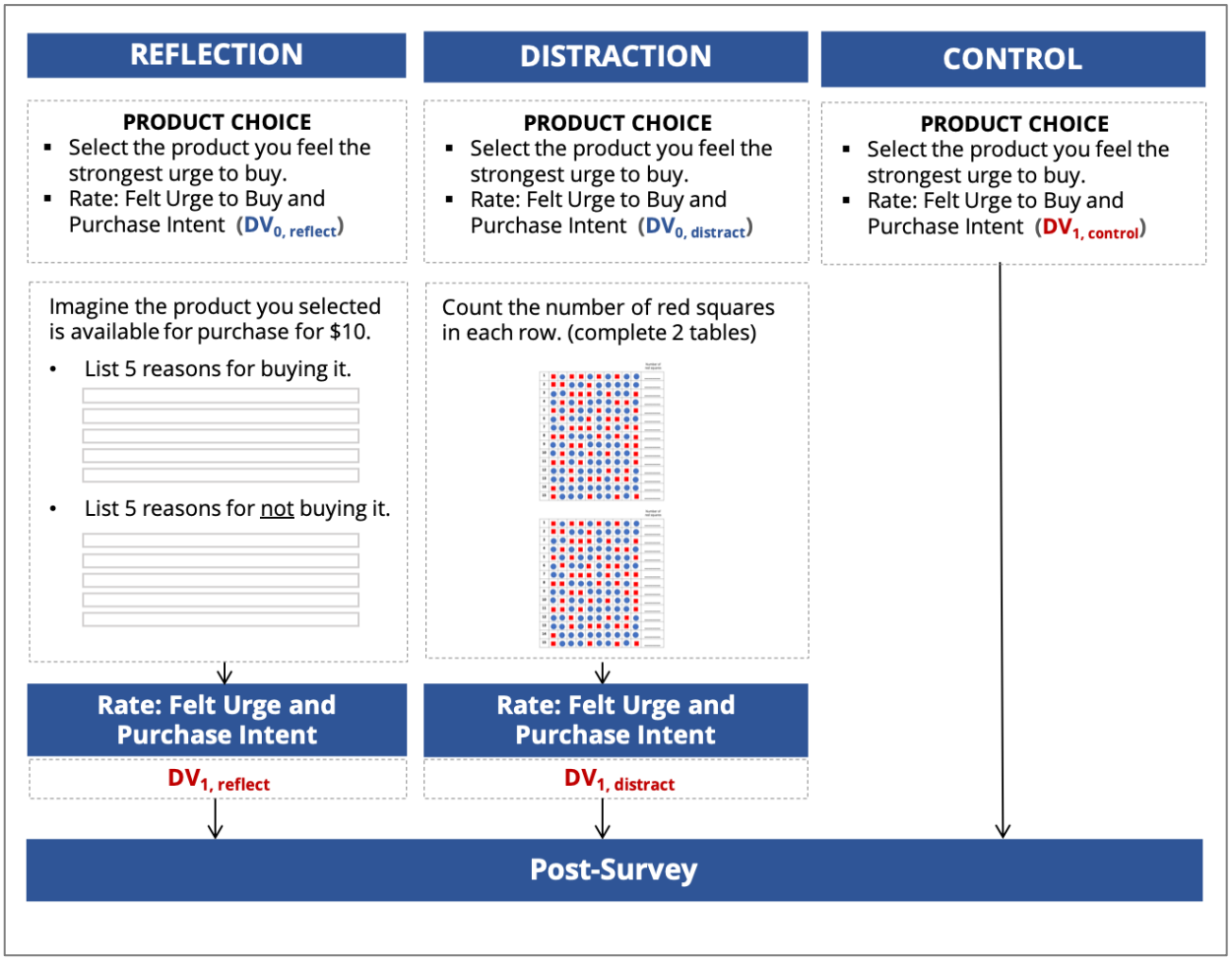


Figure 5: Procedure summary of Study 5 with dependent variables labeled

The post-survey concluded with questions specific to each condition. Because fluency (i.e., the ease in which something comes to mind) is thought to affect outcome expectancy and therefore successful self-control [181], participants in the reflection condition rated the difficulty of answering the reflection prompts. Similarly, because taxing exercises that require control over one's attention or behavior can deplete self-control resources [242], participants in the distraction condition rated the difficulty of completing the counting squares exercise and indicated whether they were still thinking

about the product while they counted squares. Participants in the reflection and distraction conditions then provided open-ended text feedback for what they liked and did not like about their tasks and how their feelings changed about the product, if it all. Participants in the control condition only provided feedback on what they liked and did not like about the products displayed at the beginning of the study. Upon completion, participants were compensated at a rate of approximately $12/hour. The research group's Institutional Review Board determined that the study was exempt.

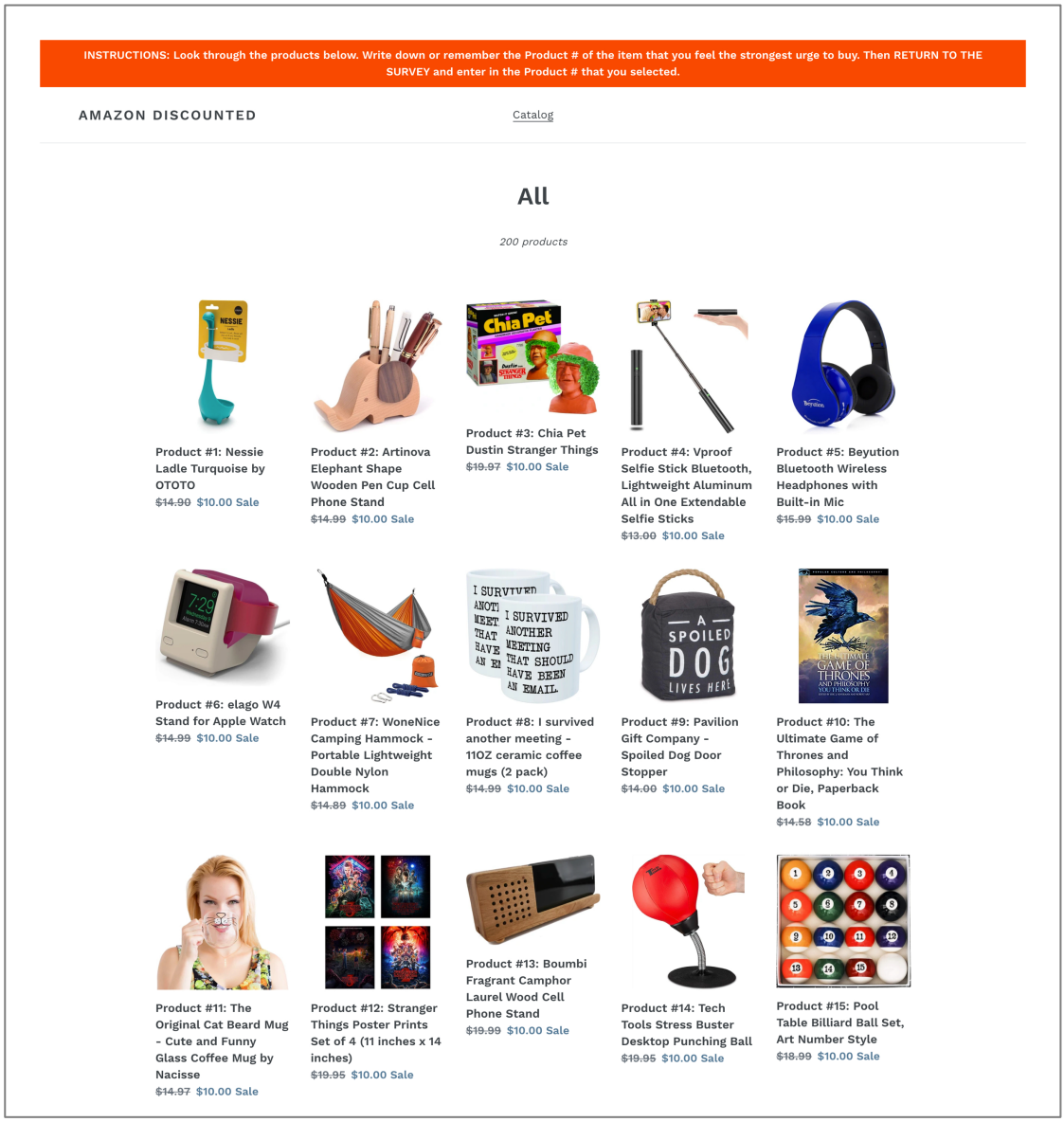


Figure 6: Study 5's simulated e-commerce website

5.2.1.3 *Materials*

For the product selection exercise, participants visited our simulated e-commerce store called Amazon Discounted (see Figure 6). A standard e-commerce website template from Shopify.com was used to design the site. The site displayed 200 Amazon products (40 products per page for a total of 5 pages). The site displayed similar products to those used in Study 3 and 4, including home goods, make-up, toys, exercise accessories, clothing and accessories, games, and novelty products. All products were displayed with a discounted price of $10. The site also displayed each product's original Amazon price (which ranged approximately from $13-$20). Each product had a description page with product details and a link to the live Amazon product page so that participants could access more product detail, photos and reviews if wanted. The simulated website was informational only; e-commerce features such as the shopping cart were disabled.

5.2.1.4 *Measures*

Felt urge to buy impulsively:
Participants rated their felt urge to buy impulsively by responding to "At this moment, the urge I feel to buy the product that I selected above can be described as:" using a seven-point Likert-like scale ranging from (1) *I feel no urge to buy this product*, to (4) *I feel a moderate urge to buy this product*, to (7) *I feel a very strong urge to buy this product* (adapted from [69]).

Purchase intent:
Participants indicated their purchase intention for the product they selected by responding to "The likelihood that I would purchase this product is:" using a seven-point Likert scale anchored by (1) *very low* and (7) *very high* (adapted from [77,100,203]).

Main dependent variable-impulse buying urge:
Felt urge to buy and purchase intent were highly correlated (see Analysis section below). An index score, referred to as "impulse buying urge" was calculated as the average of participants' felt urge to buy scores and purchase intent scores. For the

reflection and distraction conditions, impulse buying urge was collected after administering an intervention ($DV_{1, reflect}$ and $DV_{1, distract}$ in Figure 5). Because the control condition did not administer an intervention, impulse buying urge was collected after the product selection exercise ($DV_{1, control}$ in Figure 5).

Pre-impulse buying urge:

Felt urge to buy and purchase intent were also collected before the reflection intervention and distraction intervention. Because those scores were highly correlated (see Analysis section below), we averaged them to create a pre-impulse buying urge index score ($DV_{0, reflect}$ and $DV_{0, distract}$ in Figure 5).

Impulse Buying Tendency Scale:

Participants completed a modified version of the five-item Impulse Buying Tendency (IBT) scale [122], adapted for online buying. Sample items include "I am a person who makes unplanned purchases online" and "When I go shopping online, I buy things that I had not intended to purchase." Responses were made on a seven-point Likert Scale anchored by either *Strongly disagree/Strongly agree* or *Very rarely/Very often*.

Motivation level:

Motivation level was measured with "How motivated are you to reduce your amount of online impulse buying?" on a seven-point scale from (1) *completely unmotivated* to (7) *completely motivated* (adapted from [118,166]).

Self-efficacy:

Self-efficacy was measured with one item, "How confident are you in your ability to resist online impulse buying," with responses on a seven-point scale from (1) *completely unconfident* to (7) *completely confident* (adapted from [118,146]).

Difficulty in answering:

Difficulty in completing the reflection prompts was captured with two items, "On a scale from 1 (*very difficult*) to 5 (*very easy*), how hard was it for you to come up with reasons

for buying the product that you selected" and "…how hard was it for you to come up with reasons for not buying the product that you selected?" (adapted from [18]). Similarly, difficulty in completing the distraction task was measured using one item, "On a scale from 1 (*very difficult*) to 5 (*very easy*), how hard was it to complete the counting squares exercise?"

5.2.1.5 *Participants*

A total of 880 participants participated in the main study. A total of 109 participants indicated that they were already planning on purchasing the product that they selected in the study (reflection condition: 37; distraction condition: 40; control condition: 32). Among the 109 participants, nine participants dropped out before completing the post-survey. This study investigates impulse buying (versus planned purchases) and therefore all 109 participants were excluded from analysis. The final sample of participants includes N=771 participants (reflection condition: N=257; distraction condition: N=254; control condition: N=260).

Participants were between 18-74 years old (*M*=35.39, *SD*=12.22, median=32 years) with 49.0% identifying as a man (N=378), 49.8% identifying as a woman (N=384), and 1.2% identifying as non-binary or androgynous. Our sample was primarily white (70.2%, N=560) and Asian (11.2%, N=89). The majority of participants (65%, N=507) completed at least an Associate's degree and 72% (N=556) reported working full-time or part-time. Participants scored *M*=5.19, *SD*=1.33, range 1-7 for perceived self-efficacy in ability to curb online impulse buying and *M*=4.57, *SD*=1.49, range 1-7 for motivation level to curb impulse buying online. Need for Cognition scores were on average *M*=16.59, *SD*=4.59, range 5-25.

Participants were online impulse buyers with 45.65% (N=351) making online impulse purchases at least a few times per month. For reference, 37.28% of Study 3's student population and 95.42% of Study 4's student/staff population indicated that they made impulse buys online at least a few times per month. Participants scored *M*=19.91, *SD*=6.69, range: 5-35 on the Impulse Buying Tendency scale. These IBT scores are

Gender	49% 49.8% 1.2%	(N=378) (N=384) (N=9)	Man Woman Non-binary or androgynous
Income	23.6% 18.7% 23.9% 27% 6.9%	(N=182) (N=144) (N=184) (N=208) (N=53)	<$30K $30K-$49,999 $50K-$74,999 $75K-$149,999 >= $150K
Marital status	34.8% 11.7% 6.1% 1.8% 1.3% 44.4%	(N=268) (N=90) (N=47) (N=14) (N=10) (N=342)	Married Living with partner Divorced Separated Widowed Never been married
Education	1.7% 10.1% 19.8% 2.6% 7.8% 39.7% 14.4% 1.9% 1.9%	(N=13) (N=78) (N=153) (N=20) (N=60) (N=306) (N=111) (N=15) (N=15)	Some high school, no diploma High school degree or equivalent Some college credit, no degree Trade/technical/vocational training Associate degree Bachelor's degree Master's degree Professional degree Doctorate degree
Race	70.2% 8.4% 8.1% 0.5% 11.2% 0.1% 1.5% _____ 2.98%	(N=560) (N=67) (N=65) (N=4) (N=89) (N=1) (N=12) _____ (N=23)	White Hispanic Black Native American Asian Pacific Islander Other _____ Self-identified as two or more races
Employment	55.3% 15.2% 8% 1.1% 4.4% 9.0% 0.3% 3.4% 3.2% _____ 2.07%	(N=436) (N=120) (N=63) (N=9) (N=35) (N=71) (N=2) (N=27) (N=25) _____ (N=16)	Full-time Part-time Out of work and looking for work Out of work but not looking for work Stay at home parent Student Military Retired Unable to work _____ Self-reported two or more employment statuses.
Frequency of impulse buying online	0% 54.3% 34.5% 10.5% 0.6%	(N=0) (N=419) (N=266) (N=81) (N=5)	Never (*not eligible to participate) A few times per year A few times per month A few times per week Every day

Table 11: Participant demographics for Study 5 (N=771)

consistent with prior work that reported average scores ranging from 14.73 (*SD*=4.16) and 21.30 (*SD*=6.95) [253]. Additional reporting of participant demographics is shown in Table 11.

5.2.1.6 *Analysis*

Main analyses (hypothesis testing). This study's hypotheses were preregistered (see Appendix 4.2). All quantitative analyses were conducted using the statistics software package, SPSS. Because this study's two main dependent variables (felt urge to purchase impulsively and purchase intent) are highly correlated (r = .821, p < .001), we averaged the two scores to create one main dependent variable, referred to as "impulse buying urge". H4(a) and H4(b) were tested using a one-way ANOVA with Bonferroni post-hoc comparisons of means of impulse buying urge. Individual analyses for felt urge to purchase impulsively and purchase intent yield similar results and are reported in Appendix 4.4.

Secondary analyses. The reflection and distraction conditions also collected a pre-measure of the two main dependent variables (felt urge to purchase and purchase intent). The pre-measures of felt urge to purchase and purchase intent were highly correlated for both the reflection condition (r = .80, p < .001) and for the distraction condition (r = .79, p < .001). We averaged the two scores to create an index value for each condition, referred to as "pre-impulse buying urge". Paired samples t-tests were used to analyze the within-subject change in dependent variables from before to after the reflection/distraction intervention.

Exploratory analyses. Linear regression was used to explore the role of various variables (e.g., motivation level, self-efficacy, and demographics) in predicting felt urge to buy and purchase intent. Linear regression was also used to explore which variables specific to the reflection intervention (e.g., number of characters generated by the participant) and specific to the distraction intervention (e.g., perceived difficulty of counting) impacted felt urge to purchase and purchase intent.

Qualitative analysis. Open-ended text responses were analyzed using an inductive approach. The lead author read through all responses and then re-read all responses, noting themes and drafting a codebook book representing the types of responses generated by participants. Finally, the lead author pulled a random 20% sample of responses for each question, applied the code book, and made adjustments as needed. The free text responses analyzed included (a) reason for buying the product, 12 codes, (b) reasons against buying the product, 18 codes, (c) reflection positive feedback, 16 codes, (d) reflection negative feedback, 10 codes, (e) distraction positive feedback, 6 codes, and (f) distraction negative feedback, 6 codes (see Tables 18-22). The results reflect an inventory of the different types of responses provided by participants but do not make claims about the prevalence or frequency of codes.

Manipulation check. As a manipulation check, distraction participants responded to "While I was counting squares, I was also thinking about the product that I selected" on a scale from (1) *strongly disagree* to (7) *strongly agree*. Distraction participants generally disagreed that they were still thinking about the product while counting (M=2.09, SD=1.58, range 1-7), providing support that the counting task did distract participants from the product. A self-reported manipulation check was not used with reflection participants because they were required to generate five reasons for and five reasons against purchasing.

Data and scripts. Data and SPSS scripts are available at the University of Michigan's Deep Blue Data repository (https://doi.org/10.7302/xj8r-sy16).

5.2.2 Results

5.2.2.1 *Time to complete and products selected*

Across all conditions, participants took on average 11 minutes to complete the study. Reflection participants took on average 13 minutes, distraction participants took on average 11 minutes, and control participants took on average 9 minutes. In the post-survey, participants in the reflection group took more time to complete the free text

responses (*M*=116.8 seconds, *SD*=101.08) than participants in the distraction group (*M*=74.1 seconds, *SD*=53.16), $t(509)=5.97$, $p < .001$. Time to complete the two interventions were comparable. The reflection prompts were completed in approximately 3 minutes 43 seconds (*M*=223.61 seconds, *SD*=494.54) and the distraction task was completed in approximately 3 minutes 32 seconds (*M*=212.48 seconds, *SD*=136.57), $t(509)=.35$, $p = .73$.

Participants selected a variety of different products from the simulated e-commerce website. Examples include headphones, hammocks, backpacks, and coffee mugs. See Appendix 4.3 for complete list of products selected along with frequency counts. Most participants selected products from the first two pages of the website (71.73%, N=553), while 28.27% (N=218) selected products from pages 3-5.

5.2.2.2 *Difficulty in completing interventions*

Reflection participants reported that it was easier to generate reasons for buying the product (*M*=3.91, *SD*=1.13) than to generate reasons against buying (*M*=3.18, *SD*=1.23), paired $t(256)=7.25$, $p < .001$. To compare interventions, reflection difficulty scores (i.e. for generating reasons for buying and for generating reasons against buying) were averaged and compared to the distraction group. Distraction participants reported that it was easier to complete the counting squares exercise (*M*=4.18, *SD*=.89) than reflection participants reported for generating reasons for and against buying (*M*=3.54, *SD*=.86), $t(509)=8.27$, $p < .001$.

5.2.2.3 *Hypothesis testing*

For all hypothesis testing, felt urge to purchase scores and purchase intent scores were averaged to create one dependent variable, impulse buying urge (see Analysis section). See Table 12 for a summary of results reported below. Note: individual analyses for felt urge to purchase impulsively and purchase intent yield similar results and are reported in Appendix 4.4.

H4(a) supported. Hypothesis 4(a) predicted that the felt urge to buy and purchase intent would be less for the reflection group than for the control group. There was a statistically significant difference between all three conditions as determined by a one-way ANOVA ($F(2,768) = 9.35$, $p < .001$). A Bonferroni post hoc test revealed that impulse buying urge was significantly lower for reflection participants (M=4.04, SD=1.52) than for participants in the control condition (M=4.50, SD=1.34), $p = .001$.

H4(b) supported. Hypothesis 4(b) predicted that the felt urge to buy and purchase intent would be less for the distraction group than for the control group. A Bonferroni post hoc test revealed that impulse buying urge was significantly lower for distraction participants (M=3.97, SD=1.65) than for participants in the control condition (M=4.50, SD=1.34), $p < .001$, ($F(2,768) = 9.35$, $p < .001$).

RQ: No significant difference between reflection and distraction. RQ asked which treatment condition (reflection or distraction) would yield lower felt urge to purchase and purchase intent. A Bonferroni post hoc test revealed no statistically significant difference in impulse buying urge between participants who completed the reflection exercise (M=4.04, SD=1.52) versus those who completed the distraction exercise (M=3.97, SD=1.65), $p = 1.00$. Additional exploratory regression analysis confirms these results and revealed that neither (a) the perceived difficulty of the interventions nor (b) the time spent on the interventions predict a difference in impulse buying urge between the reflection and distraction conditions. See Appendix 4.8 for more details.

	Group comparison	**Difference in means (a-b)**	**Sig.**
H4(a)	Reflection (a) - Control (b)	-.463	p = .001 **
H4(b)	Distraction (a) - Control (b)	-.524	p < .001 ***
RQ	Reflection (a) - Distraction (b)	.06	p = 1.00

$*p < .05$ $**p < .01$ $***p < .001$

Table 12: Impulse buying urge, difference in means between reflection, distraction, and control

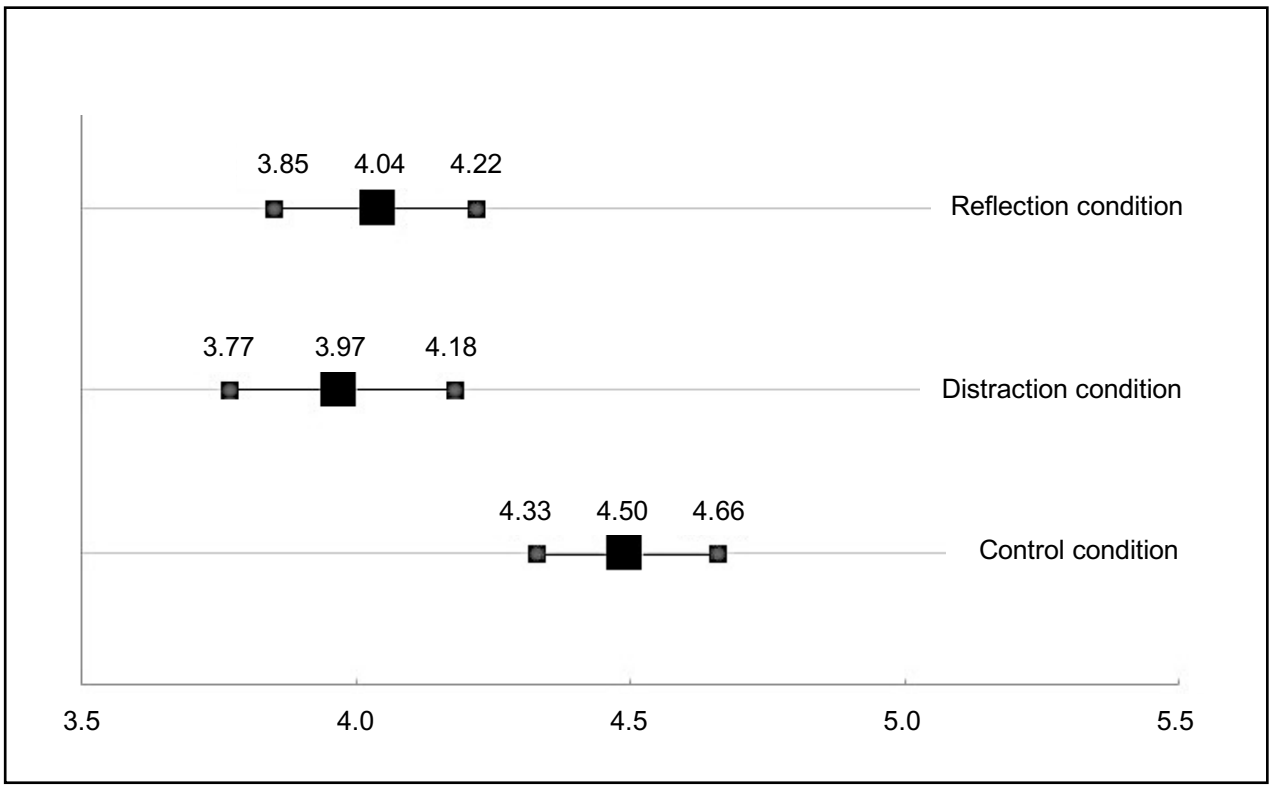


Figure 7: Average impulse buying urge per condition shown with 95% Confidence Intervals.

5.2.2.4 *Within-subjects analyses*

Below we report paired samples t-tests that compare participants' pre-impulse buying urge with their post-impulse buying urge. Note: Analyses treating felt urge and purchase intent as separate variables yield similar results and are reported in Appendix 4.5.

Reflection participants (All). Among subjects in the reflection condition, a paired t-test revealed a statistically significant decrease in impulse buying urge from before the reflection exercise (M=4.55, SD=1.47) to after the reflection exercise (M=4.04, SD=1.52), $t(256)=10.25$, $p < .001$.

Reflection participants with high initial urge. The above results also hold when looking just at participants who reported a high initial urge to buy (N=126), defined as a score greater than 4 on a 1 (*low*) – 7 (*high*) scale. A paired t-test revealed a statistically

significant decline in impulse buying urge from before the reflection exercise (*M*=5.73, *SD*=.82) to after the reflection exercise (*M*=5.08, *SD*=1.12), *t*(125)=8.34, *p* < .001.

Reflection participants with low initial urge. Analyses were repeated looking only at participants with a low initial urge to buy (N=49), defined as a score less than 4 on a 1 (*low*) – 7 (*high*) scale. A paired t-test revealed a statistically significant decrease in impulse buying urge from before the reflection exercise (*M*=2.46, *SD*=.73) to after the reflection exercise (*M*=2.19, *SD*=.81), *t*(48)=3.26, *p* = .002.

Participants	**Difference in means** (Pre-impulse buying urge) – (Post-impulse buying urge)	**Sig.**
Reflection: All (N=257)	.514	p < .001 ***
Reflection: High Initial Urge (N=126)	.659	p < .001 ***
Reflection: Low Initial Urge (N=49)	.265	p = .002 **

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 13: Change in impulse buying urge for reflection group

Distraction participants (All). Among subjects in the distraction condition, a paired t-test revealed a statistically significant decrease in impulse buying urge from before the distraction exercise (*M*=4.55, *SD*=1.48) to after the distraction exercise (*M*=3.97, *SD*=1.65), *t*(253)=9.81, *p* < .001.

Distraction participants with high initial urge. The above results also hold when looking just at participants who reported a high initial urge to buy (N=124), defined as a score greater than 4 on a 1 (*low*) – 7 (*high*) scale. A paired t-test revealed a statistically significant decline in impulse buying urge from before the distraction exercise (*M*=5.70, *SD*=.83) to after the distraction exercise (*M*=4.97, *SD*=1.44), *t*(123)=7.39, *p* < .001.

Distraction participants with low initial urge. The analyses were repeated looking only at participants with a low initial urge to buy (N=46), defined as a score less than 4 on a 1

(*low*) – 7 (*high*) scale. A paired t-test revealed a statistically significant decrease in impulse buying urge from before the distraction exercise (*M*=2.45, *SD*=.89) to after the distraction exercise (*M*=2.13, *SD*=.91), *t*(45)=3.81, *p* < .001.

Participants	**Difference in means** (Pre-impulse buying urge) – (Post-impulse buying urge)	**Sig.**
Distraction: All (N=254)	.571	p < .001 ***
Distraction: High Initial Urge (N=124)	.729	p < .001 ***
Distraction: Low Initial Urge (N=46)	.310	p = .002 **

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 14: Change in impulse buying urge for distraction group

5.2.2.5 *Factors that impact impulse buying urge*

Condition and Impulse Buying Tendency.

We report above that impulse buying urge is significantly lower for reflection and distraction conditions in comparison to control. To supplement that finding, we conducted exploratory regression analyses to identify other influential variables on impulse buying urge. We began by identifying those potential predictor/control variables based on theory and prior work and then we ran correlations between those variables and impulse buying urge (see Appendix 4.6 for the full correlation table). Those variables that were significantly correlated with impulse buying urge were included in linear regression Model 1, along with the following dummy/binary variables: reflection condition, distraction condition, and male (gender). The control condition acts as the reference variable to the reflection condition variable and distraction condition variable. After Model 1 was run, one non-significant predictor variable was removed at a time in a stepwise fashion, to generate Models 2-5.

While Models 1-5 are statistically significant, the only predictor variables that are consistent significant predictors of impulse buying urge across the five models are

	Model 1 $F(7,763)=28.37$, $p < .001$	**Model 2** $F(6,764)=33.06$, $p < .001$	**Model 3** $F(5,765)=39.54$, $p < .001$	**Model 4** $F(4,766)=49.32$, $p < .001$	**Model 5** $F(3,767)=64.55$, $p < .001$
constant	2.431 *** (.454)	2.54 *** (.417)	2.838 *** (.234)	2.793 *** (.226)	2.535 *** (.172)
Frequency Impulse Buying	.050 (.083)	____	____	____	____
Self-efficacy	.045 (.047)	.040 (.046)	____	____	____
Male	-.070 (.099)	-.071 (.099)	-.072 (.099)	____	____
Education	-.047 (.027)	-.045 (.026)	-.046 (.026)	-.047 (.026)	____
Impulse Buying Tendency (IBT)	.097 *** (.010)	.099 *** (.009)	.094 *** (.007)	.095 *** (.007)	.096 *** (.007)
Reflection Condition	-.418 ** (.120)	-.417 *** (.120)	-.409 ** (.120)	-.409 ** (.120)	-.409 ** (.120)
Distraction Condition	-.442 *** (.121)	-.438 *** (.121)	-.430 *** (.120)	-.431 *** (.120)	-.423 *** (.120)
Adj. R^2	.199	.200	.200	.201	.198

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 15: Summary of regression models predicting impulse buying urge (N=771)

Impulse Buying Tendency (IBT) scores, reflection condition, and distraction condition. In combination, these factors explain approximately 20% of the variance in impulse buying urge scores (Model 5, Adjusted $R^2 = .198$, $F(3,767)=64.55$, $p < .001$). Consistent with the results reported above, impulse buying urge scores are on average lower for participants in the reflection condition ($b = -.409$, $t(767) = -3.41$, $p < .01$) in comparison

to the control group and impulse buying urge scores are on average lower for participants in the distraction condition (b = -.423, t(767) = -3.51, p < .001) than for the control condition. Results also show that as IBT scores increase, impulse buying urge scores increase (b = .096, t(767) = 13.07, p < .001).

No significant interaction for IBT or NFC. To test for potential moderators, we ran regression models that added interaction terms of interest to Model 5 (see Appendix 4.7 for a table of results). To test whether the effect of interventions depends on an individual's impulsive buying tendencies, we ran Model 6, which includes the interaction term IBT x Reflection condition and Model 7, which includes the interaction term IBT x Distraction condition. The interaction terms for both Model 6 and 7 were not statistically significant predictors of impulse buying urge. To test whether the effect of interventions depended on an individual's Need For Cognition (NFC), we ran Model 8, which includes the interaction term NFC x Reflection condition and Model 9, which includes the interaction term NFC x Distraction condition. The interaction terms for both Model 8 and 9 were not statistically significant predictors of impulse buying urge.

5.2.2.6 *Factors that predict successful reflection interventions*

Characteristics of reflection responses. Participants generated on average 280.96 characters (*SD*=280.96, range 55-1100) when generating reasons for and against buying. A paired samples t-test revealed that on average participants generated more characters against buying (*M*=154.56, *SD*=83.58, range 15-584) than for buying the product (*M*=126.40, *SD*=74.44, range 28-572), t(256)=-7.09, p < .001.

Reflection factors that reduce impulse buying urge. Regression analysis reveals that time spent on the reflection intervention, total characters generated for buying, and total characters generated against buying are significant predictors of the change in impulse buying urge. For these analyses, the dependent variable is defined as pre-impulse buying urge minus post-impulse buying urge. Positive coefficients on predictor variables represent a reduction in impulse buying urge, while negative coefficients on predictor variables represent an increase in impulse buying urge.

For every additional second spent on the reflection task, impulse buying urge declined, though marginally (b = .0002, $t(251)$ = 2.25, p = .025). For every additional character generated in favor of buying, impulse buying urge increased (b = -.003, $t(251)$ = -2.51, p = .013). For every additional character generated against buying, impulse buying urge declined (b = .003, $t(251)$ = 2.93, p = .004). The perceived difficulty of completing the reflection prompts (both for and against buying) were not significant predictors of impulse buying urge. See Table 16 for summary of results.

	Model 12 $F(5, 251)=2.62, p = .025$
constant	.203 (.227)
Time spent on reflection task (seconds)	.0002 * (.0001)
Characters generated for buying	-.003 * (.001)
Characters generated against buying	.003 ** (.001)
Perceived difficulty of generating reasons for buying (reverse scored)	.004 (.044)
Perceived difficulty of generating reasons against buying (reverse scored)	.050 (.041)
Adj. R^2	.031

$^*p < .05$ $^{**}p < .01$ $^{***}p < .001$

Table 16: Regression model predicting the change in impulse buying urge for the reflection intervention. DV = Pre-impulse buying urge – Post-impulse buying urge

5.2.2.7 *Factors that predict successful distraction interventions*

Characteristics of distraction exercise. On average, distraction participants provided the correct sum of red squares in M=29.73 (SD=.6) out of a total 30 rows, representing approximately 99% accuracy rate.

Distraction factors that reduce impulse buying urge. Regression analysis reveals that self-reports of being distracted from the product while counting and correctly summing all 30 rows of squares are significant predictors of the change in impulse buying urge. Note that the dependent variable is defined as pre-impulse buying urge minus post-impulse buying urge. As a reminder, positive coefficients on predictor variables represent a reduction in impulse buying urge and negative coefficients on predictor variables represent an increase in impulse buying urge.

	Model 13 $F(4, 249)=4.44, p = .002$
constant	.597 (.322)
Not distracted from product while counting (self-report)	-.130 *** (.036)
Summed all rows of squares correctly (binary)	.308 * (.141)
Time spent on reflection task (seconds)	.0002 (.0004)
Perceived difficulty of counting squares (reverse scored)	-.008 (.064)
Adj. R^2	.056

$^*p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 17: Regression model predicting the change in impulse buying urge for the distraction intervention. DV = Pre-impulse buying urge – Post-impulse buying urge

The more the participant was still thinking about the product while counting (i.e., they were not distracted), impulse buying urge increased (b = -.130, $t(249)$ = -3.59, $p < .001$). Among distraction participants, 79.5% (N=202) summed all 30 rows of the counting task correctly. Impulse buying urge declined more for them than for the people who made mistakes on one or two rows (b = .308, $t(249)$ = 2.19, p = .03).

Unlike with the reflection intervention, time spent on the distraction task was not a significant predictor of the change in impulse buying urge. Consistent with the reflection results, perceived difficulty in completing the counting exercise was not a significant predictor of the change in impulse buying urge. See Table 17 for summary of results.

5.2.3 Qualitative Results

5.2.3.1 *Reasons for buying the product*

Participants provided a variety of reasons for why they should purchase the product. Reasons generally fell into one of three major categories: product-focused, self-focused, or future-focused (see Table 18). Product-focused reasoning was centered around the specific product or company. Examples included (a) positive product features, (b) affordable price, (c) brand, (d) recommended product, or (e) having prior experience with the product. Other reasoning was future-focused, generally optimistic, and included (a) possible product uses and enjoyment, (b) specific positive outcomes to owning the product, and (c) anticipating actually using the product (as opposed to buying it and never using it). Finally, some reasons for buying the product focused more on the self than on the product, such as (a) describing how the product fits with or supports the participant's identity or hobby, (b) wanting to splurge and treat oneself to some indulgence, and (c) simply satisfying one's desire (e.g., "I just want it").

5.2.3.2 *Reasons against buying the product*

Participants provided a range of reasons against buying the product that they selected. Those reasons generally fell into seven categories. *Product-focused reasoning* cited negative product features (e.g., color, size), negative product reviews, negatives to the online purchase process, a desire for more product information, or being unfamiliar with the brand, website, or company. *Elaborating on potential negative outcomes* of buying generally took the form of: If I buy this, this negative outcome may happen. Examples included: (a) the product might not work as expected, (b) I might not actually use the product, (c) requires me to manage/maintain more products, (d) I might feel guilt/regret, (e) I will have to make additional purchases, (f) owning the product may have negative

consequences, and (g) the product might get broken, lost, or stolen. For example, while one participant described the "I survived another meeting" coffee mug that they selected as "funny" and "a good conversation starter", he also identified potential negatives to owning the mug, such as, "Could be seen as inappropriate by uptight coworkers/boss" and "Would not want to seem like I am not a dedicated employee" (Male, 40 years old).

Reasoning that *reframed the purchase* as unnecessary typically took the form of "the product is a want, not a need". This sometimes involved downplaying the once exciting aspects of the product and reframing them as unnecessary. For example, one

Product-focused reasoning		
Product features	▪ "I like the color"	▪ "Can be adjusted"
Affordable price	▪ "Affordable"	▪ "$10 seems reasonable
Brand	▪ "I trust the brand"	▪ "Carhartt is a quality brand"
Recommended product	▪ "friends recommended"	▪ "reviews"
Having prior experience	▪ "I've used them before"	
Purchase process	▪ "Convenience--online shopping with one click"	▪ "Delivery"
Future-focused reasoning		
Possible product uses/enjoyment	▪ "I'm going camping soon and need a new hammock"	▪ "Could give to daughter as gift"
Benefits to owning	▪ "Help me keep my mind sharp"	▪ "Good to have a backup"
Anticipates using product	▪ "Something I'd use often"	▪ "I could get good use out of it"
Self-focused reasoning		
Ties to identity/hobby	▪ "I'm a coffee lover"	▪ "I'm a mamma bear"
Treating self / splurge	▪ "A little bit of a splurge"	▪ "I feel like treating myself"
I just want it	▪ "I just want it"	▪ "I enjoy having a new bag"

Table 18: Themes of participants' reasoning for buying the product

participant who was originally excited by a cat-shaped egg mold ("My kids will get a kick out of it" and "we'll eat more eggs") reframed how she thought about the product when reasoning against buying: "I can make normal eggs" and "It's totally unnecessary") (Female, 46 years old). Other participants reframed by simply calling it "more of a nice to have than a need to have" or "not really necessary; more of a luxury item".

Conducting a cost assessment typically referred to either the product's price, the lack of funds to purchase, or the costs to the environment or society. For example, participants wrote "could be cheaper", "$10 is a lot of money", and "I don't have extra money to spend right now." Examples of societal/environmental costs included "Amazon has horrible labor practices" and "I don't want to create a demand for more plastic items." Other types of reasoning included *reflecting on currently owned possessions* (e.g., "I already have a hammock" and "I don't usually use the taco holder I have now"), *reflecting on the positive outcomes of not buying* such as using the money elsewhere (e.g., "I could [make] a deposit to my kids' college education funds"). Finally, some participants reasoned that they could use a *delay strategy* such as "I could consider buying it later if I still want it".

Several common self-control strategies (see Section 5.1 for a review) were not observed in participants' reasoning against buying. Participants did not reflect on their past behavior, such as recalling a time when they succumbed to an impulse buy or a time they resisted buying. Participants did not appear to engage in psychological distancing by referring to themselves by their name or non-first person pronouns (e.g., Carol, you should not purchase this product because you have bills to pay). Finally, participants did not appear to engage in general mindfulness practices, such as observing and noting their behavior in a non-judgmental way (e.g., I'm noticing that I have a strong desire to buy this product).

Product-focused reasoning	
Negative product features	▪ "I don't like how it looks" ▪ "Hand wash only"
Negative reviews	▪ "reviews say pain increased after use"
Purchase process	▪ "I'll have to put in order info" ▪ "It might get lost in the mail"
Wants more info	▪ "Haven't researched the competition"
Unfamiliar brand	▪ "I've never heard of this brand"
Elaborating on potential negative outcomes (of buying)	
May not work as expected	▪ "It might not work" ▪ "It might look stupid on me"
I might not use product	▪ "I might just use it once" ▪ "I would eventually get tired of it"
Managing more products	▪ "It would be annoying to dust" ▪ "Another [thing] to keep track of"
I might feel guilt/regret	▪ "I'll feel bad about spending money on something frivolous"
Requires additional purchases	▪ "I would have to purchase more than 1 set…" ▪ "Have to buy batteries"
Negatives to owning	▪ "It could distract me from work"
Might get broken/stolen	▪ "I'd be worried about having an accident and breaking them"
Reframing (cognitive reappraisal)	
Reframing as unnecessary	▪ "A face mask is a luxury in my beauty routine, not a necessity"
Conducting a cost assessment	
Price / budget	▪ "Could be cheaper" ▪ "$10 is a lot of money"
Costs to society/environment	▪ "I don't want to create a demand for more plastic items."
Reflecting on current possessions	
I already own one	▪ "Already have a hammock" ▪ "Have something similar"
Elaborating on potential positives (of <u>not</u> buying)	
Money for something else	▪ "I can save that money" ▪ "I could spend on better products"
Delay strategy	
I can wait to buy	"I may decide against buying…after sleeping on it"

Table 19: Themes of participants' reasoning against buying the product

5.2.3.3 *User feedback on reflection*

Positive feedback. Participants provided free text response feedback on (a) what they liked and (b) what they did not like about completing the reflection exercise. Positive feedback fell generally in five categories: participants liked that the exercise (a) made them think, (b) was easy and made deciding easier, (c) was enjoyable, and (d) discouraged impulse buying or (e) allowed them to justify buying. Participants described liking that the exercise *made them think* about: the pros and cons of the purchase, whether the product was a want or a need, about why they wanted the product, whether they would actually use the product, and about their shopping behavior in general. For example, while some participants noted that they liked that the exercise "Helped me think critically about whether I would use the product", other participants liked that they were encouraged to reflect on their behavior beyond this one purchase, "Helped me consider why I buy things online in general". Participants also liked that the exercise was *easy* and that it made deciding easier ("e.g., "It helped me decide" and "Makes it easy to decide").

Some participants liked that the exercise provided a *structured process* for thinking about the purchase ("I liked the structure of thinking things through") or that the process was similar to their usual process for thinking about purchase decisions. Participants also described the exercise as *enjoyable*—enjoyable to think of reasons for buying ("Thinking about buying it and the reasons added to the excitement…"), enjoyable to think of reasons against buying ("I enjoyed the reasons to stop myself from buying…"), and enjoyable in general ("It was fun and interesting."). Other participants liked that the exercise *discouraged impulse spending* ("…it actually reduced my desire to purchase it"), helped *temper the hot emotions* around impulse buying ("I think it was a good way to stay cool"), and helped them *slow down* ("It made me pump the breaks."). On the other hand, some participants enjoyed that the exercise allowed them to *justify buying*, "It helped me justify in my mind why I should buy what I already decided upon". See Table 20 for a summary of themes and examples of positive reflection feedback.

Made me think	
About the pros and cons of the purchase	▪ "Helped to weigh out the pros and cons"
About if product was a want or a need	▪ "It was a good exercise to see if I really needed it instead of just wanting it."
About why I wanted the product	▪ "Made me think about my motivation for buying it"
About whether I would use the product	▪ "Made me think critically about whether I would use the product"
About my shopping behavior in general	▪ "Helped me consider why I buy things online in general"
Easy	
Easy to complete	▪ "It was relatively easy"
Made making decision easier	▪ "It helped me decide" ▪ "Makes it easy to decide"
Structured process	
Structured process	▪ "I liked the structure of thinking things through"
Similar to my usual process	▪ "It's the same thought process I go through when buying anyway"
Enjoyable	
Enjoyable in general	▪ "It was fun and interesting"
Enjoyable to think of reasons for buying	▪ "Thinking about buying it and the reasons added to the excitement…"
Enjoyable to think of reasons for not buying	▪ "fun to think of saving money instead"
Discourages impulse spending	
Discourages buying	▪ "...it actually reduced my desire to purchase it"
Tempered emotions	▪ "I think it was a good way to stay cool"
Slowed me down	▪ "It made me pump the breaks…"
Let's me justify buying	
Allowed me to justify buying	▪ "I like validating my desire to purchase..." ▪ "It helped me justify in my mind why I should buy what I already decided upon"

Table 20: Themes and examples of positive feedback on the reflection exercise

Negative feedback. Participants also provided feedback on the aspects of the reflection exercise that they did not like. While some participants reported that they liked that the exercise made them think, other participants disliked that they were *forced to think* ("I didn't like having to think of reasons"). Similarly, while some participants reported that they perceived the reflection exercise to be easy, other participants found the exercise to be *difficult* and in particular found that providing five reasons for buying and not buying was *too many* or *too time consuming*. For other participants, reflecting on reasons for and against buying was an *unfamiliar process* ("I don't usually make pro con lists so it felt foreign to do").

Other participants generally *did not enjoy* the exercise ("I did not enjoy coming up with reasons"), for some because the exercise felt unnecessary ("I did not like it as I don't have a problem with impulse shopping"). While some participants reported that they liked that the exercise discouraged impulse buying, other participants disliked that it *discouraged impulsivity* or spontaneity and that doing so took some of the fun out of buying ("Didn't like being practical instead of spontaneous"). On the other hand, other participants noted that reflecting on reasons to buy made them *justify an unwanted/not needed product* ("It made me want something that I don't know if I need"). Finally, some participants reported that while reflecting they experienced *negative emotions* ("I felt guilty for trying to justify a frivolous [purchase]" and "It's tough to say out loud that I'm poor"). See Table 21 for a summary of themes and examples of negative reflection feedback.

Made me think	
Made me think (generally)	▪ "I didn't like having to think of reasons" ▪ "It made me really think"
Difficult	
Difficult to complete (generally)	▪ "Having to write out separate and disparate reasons was somewhat challenging"
Required too many reasons	▪ "I struggled to reach five"
Time consuming	▪ "Took a bit too much time"
Unfamiliar process	
Unfamiliar or atypical way of approaching purchase decisions	▪ "I don't usually make pro con lists so it felt foreign to do"
Not Enjoyable	
Not enjoyable in general	▪ "I did not enjoy coming up with reasons"
Not enjoyable because unnecessary	▪ "I did not like it as I don't have a problem with impulse shopping."
Discourages impulsivity	
Discourages impulsivity	▪ "Didn't like being practical instead of spontaneous"
Made me justify an unneeded product	
Made me justify/want an unneeded product	▪ "it made me justify what I felt was an unnecessary product" ▪ "It made me want something that I don't know if I need."
Negative emotions	
Reflecting created negative emotions	▪ "It's tough to say out loud that I'm poor" ▪ "I felt guilty for trying to justify a frivolous [purchase]"

Table 21: Themes and examples of negative feedback on the reflection exercise

5.2.3.4 *User feedback on distraction*

Positive feedback. Participants provided free text response feedback on (a) what they liked and (b) what they did not like about the counting squares distraction task. Some participants noted the *design* aspects of the counting tables that they appreciated, such as the contrasting colors, the spaced-out rows, and easy method for entering row sums. Participants also described the counting task as *easy, quick, and fun* or relaxing ("A fun little exercise" and "It was surprisingly relaxing"). Finally, some participants liked that the exercise was distracting and just *challenging enough to require concentration* and keep their attention.

Negative feedback. While some participants appreciated the design of the counting tables, other participants noted aspects of the *design* that they did not like, such as the small size of the square icons, the spacing in between rows, and the color of the squares and circles. In contrast to participants who found the counting exercise to be easy, quick, and fun, other participants found it to be boring, *tedious, and time consuming* ("Rather tedious and dull to do" and "I did not enjoy how long the activity took to make sure that I was right"). Some participants also expressed disliking how the activity seemed *pointless* or that they did not understand what the purpose was meant to be. Finally, some participants reported that they experienced *negative emotions* while completing the exercise, emotions such as uncertainty and anxiety over correctly counting squares, as well as feeling manipulated ("I knew that the survey was causing me to think logically instead of emotionally and I felt manipulated"). See Table 22 for a summary of themes and examples of both positive and negative feedback about distraction.

Emotions generated by task can be influential. Participants provided feedback on how their feelings changed after completing the task, if at all. While most participants did not detail how or why their feelings changed, some participants noted how the emotions they experienced during each exercise influenced them. In particular, some participants in both the reflection and distraction conditions noted how *sad emotions may have*

increased their likelihood to impulse buy. One participant reported that the counting squares exercise reminded her of games she once played with her grandfather.

> *"I wanted the product even more so. I imagine the combination of tired eyes and missing my grandfather made me want to buy the product even more than I already did. It would make me feel happy, I suppose, to buy it."* [Female, 41 years old, Stress Punching Ball, distraction]

Another participant reported feeling "uncomfortable" after thinking about the emotional reasons why she buys things that she doesn't need.

> "*I felt kind of sad after thinking about it and I think that made me want to buy it slightly more for some reason.*" [Female, 32 years old, Bluetooth Speaker, reflection].

In these cases, participants may have been more motivated to purchase in order to regulate their sad/uncomfortable emotions upward. In contrast, some participants in the distraction condition noted how feeling *annoyed or irritated decreased their desire to buy.* For example, *"I was annoyed so I didn't want to buy anything"* (Female, 33 years old, Insulated Tumbler) and *"It seemed less enticing when I was irritated by the counting exercise"* (Male, 33 years old, Stainless Steel Water Bottle). In these cases, participants did not see purchasing as a way to regulate emotions upward and instead saw a decline in their desire for the product or purchasing.

POSITIVE FEEDBACK		NEGATIVE FEEDBACK	
Design of task		**Design of task**	
Colors, formatting, or other design aspects of the counting tables	▪ "Squares were red and very visible" ▪ "The rows were clearly separated which made them easy to count"	Colors, formatting, or other design aspects of the counting tables	▪ "The size of the squares made it challenging." ▪ "How close the rows were crammed together."
Easy, Quick, Fun		**Tedious, Long, Pointless**	
Easy	▪ "I liked it was simple" ▪ "It was an easy and a mindless exercise."	Tedious/not enjoyable	▪ "It was tedious" ▪ "It was extremely boring"
Quick	▪ "I like that it didn't take that long" ▪ "It was fairly easy to quickly chunk and count them."	Time consuming	▪ "It was time consuming" ▪ "I did not enjoy how long the activity took to make sure that I was right"
Fun / relaxing	▪ "A fun little exercise" ▪ "It was surprisingly relaxing"	Pointless	▪ "I did not understand the purpose." ▪ "Seemed pointless"
Kept my attention			
Challenging enough to keep my attention	▪ "I liked the challenge and the attention required."		
A good distraction	▪ "It was very distracting and took more of my attention than I expected		
		Created negative emotions	
		Anxiety/uncertainty	▪ "I disliked the feeling of uncertainty I had when counting the squares." ▪ "Mostly nervous about counting wrong" ▪ "Felt somewhat anxious"
		Feeling manipulated	▪ "I knew that the survey was causing me to think logically instead of emotionally and I felt manipulated."

Table 22: Positive and negative feedback on the distraction exercise

5.2.4 Discussion

The goal of this study was to test the effectiveness of reflection and distraction on curbing online impulse buying. To summarize we find that:

- Reflecting on reasons for and against buying reduces the felt urge to purchase impulsively and purchase intent
- Distraction from a tempting product reduces the felt urge to purchase impulsively and purchase intent
- We do not find support for a difference in efficacy between reflection and distraction interventions

In the following we explore why these particular reflection and distraction exercises were successful and offer recommendations for designing future iterations of these types of interventions for real world application.

5.2.4.1 *Reflection and distraction lower urge and intent to impulse buy*

Reflection. As hypothesized, reflecting on reasons for and against buying reduced participants felt urge and intention to make an impulse purchase online. These results are consistent with choice theory, which posits that the impressions formed quickly by an individual's intuitive system tend to control preferences, unless overridden by an individual's slower, more deliberative cognitive processes [126]. In this case, participants' initial attraction to an impulse product was revised downward after they engaged their deliberative cognitive systems. Further, we find that reflection was effective not just for those who experienced an intense urge to buy but also for those who experienced a more modest urge to purchase. Indeed, some participants explicitly stated that what they liked about the exercise was that it discouraged them from buying and reduced their desire for the product.

A closer examination of participant's reasoning against purchasing the product revealed that participants not only focused on specific product details (e.g., I don't like how it looks) but also engaged in, perhaps unknowingly, strategies for exerting self-control. Participants elaborated on the potential outcomes of purchasing. They identified both

potential negative outcomes and emotions (i.e., emotional forecasting) of buying, as well as the potential positive outcomes of not buying. They reframed the way they thought about the product temptation into some less desirable (e.g., “a want, not a need”), a strategy known as cognitive reappraisal, which has been shown to reduce desire for tempting food [97,110]. Participants also reflected on their currently owned possessions (e.g., “Already have a hammock”), a strategy that has recently been shown to reduce willingness to pay for new products and the likelihood to impulse buy [67]. Finally, participants assessed the costs of purchasing to both themselves and to society and recognized that they could use a delay strategy to wait and see if they still want to buy later.

Several common self-control strategies, however, were not observed in participants’ reasoning against buying. Those include reflecting on past experiences with impulse buying, engaging in psychological distancing, and the mindfulness practice of observing one’s behavior in a non-judgmental way. Participants might have engaged in these strategies with more explicit instruction to exert self-control (as currently designed, the reflection prompt simply asks for pros and cons). Another possibility is that participants did engage in these strategies internally and their text responses did not reflect that. For example, a participant may have engaged in psychological distancing by telling themselves internally “Carol, you should not purchase this product because you have bills to pay” but then only typed “bills to pay” as a response. Finally, participants may not have used these strategies because they are more uncomfortable (e.g., reflecting on past regretted impulse purchases).

Distraction. In addition, we found that distracting participants from their chosen product reduced their felt urge to impulsively buy and their purchase intent. These results are consistent with the self-control literature that cites distraction as an effective means for resisting temptations by reducing desire and arousal [108]. Metcalfe and Mischel’s hot/cool self-control framework posits that distraction can enhance willpower over a temptation by (a) removing the “hot” stimuli that encourages impulsive behavior, (b) by intentionally redirecting one’s attention away from the stimuli (i.e., look away), or by (c)

attending to other intriguing but non-related hot stimuli (i.e., look at something else) [167]. In the case of Study 5, the distraction task presumably executed all three distraction techniques by (a) removing mention of or photography of the product during the distraction task, (b) redirecting attention away from the product by sending them to the counting tables, and (c) and encouraging engagement with something unrelated to the product (i.e., the counting exercise).

We have several indications that the counting task successfully distracted participants away from their product choice. On average participants self-reported that they were not thinking about their selected product while counting. Qualitative feedback included reports that some participants liked that the counting exercise was challenging enough to keep their attention. Participants' accuracy rate in correctly summing the number of squares per row was very high (99% accuracy rate), suggesting that participants were engaged in the task. Finally, we found that distraction tempered the urge to buy not just for individuals who experienced a low initial urge to buy (and therefore may have been easily distracted from the product) but also for individuals who experienced a higher, more intense initial urge to buy.

5.2.4.2 *Designing effective reflection interventions*

The results of this study surface key factors for designing successful reflection interventions that encourage self-control with e-commerce. Below we discuss those design recommendations and identify opportunities for future work.

1. Encourage pro / con reasoning but prioritize cons.

Results suggest that the more text characters generated against buying, the less likely the consumer is to complete the impulse purchase. Therefore, reflection interventions should prioritize having the user think about and generate reasons *against* buying the product in question. Results also showed that the more characters a consumer generates in favor of buying, the more likely they are to buy. Based on those results, it might be tempting to remove all prompts that ask participants to argue the pros of buying. However, nudging consumers to reflect on both the pros and cons may have

other important advantages. Behavior change interventions run the risk of psychological reactance. Reactance happens when an individual senses that their freedom or autonomy is being threatened and, in response, they act to reestablish that threatened freedom [37]. For example, making a particular behavior more difficult to exercise can be perceived as threat to the freedom of performing that behavior. As a result, individuals may become more motivated to perform that behavior to restore their autonomy [207]. In the case of reflection interventions, only prompting users to provide reasons against buying may be perceived as a threat to users' freedom to purchase or freedom to want to purchase. The intervention then may backfire by actually encouraging more impulse buying. Asking users to reflect both on reasons for and against buying may be less vulnerable to reactance because the user is afforded the freedom to reason both the pros and the cons.

However, given the effectiveness of reasoning against a purchase, future reflection interventions may benefit from emphasizing the generation of cons. One strategy for nudging more reflection of cons is to make it easier for users to generate arguments against buying. For example, reflection prompts that highlight potential costs, especially non-obvious costs, can be effective at discouraging impulsive choices [205] and encouraging more financially responsible choices [105]. Further, fluency theory suggests that when elaborating on potential outcomes, outcome expectancy (i.e., the believed likelihood that an event will actually happen) is higher for outcomes that come to mind more easily [181]. This suggests that making it easier to generate negative outcomes of purchasing will increase the user's belief that those negative outcomes will happen and, as result, should discourage the purchase. However, in order to avoid psychological reactance by users, attempts to highlight costs and potential negative outcomes should not be heavy-handed. One subtle approach is to include example costs and outcomes in the wording of the reflection prompt (See Table 23). Future work should test different prompts to optimize for the quantity and quality of cons generated, to assess possible reactance effects, and to understand their impact on the likelihood of impulse buying.

Another design strategy is to encourage more abstract reflection of the cons of buying. Qualitative analysis showed that when generating reasons against buying, many participants engaged in low-level, concrete construal (i.e., focusing on specific product characteristics, such as how it looks and what material it is made of). This finding is consistent with prior work showing that individuals tend to generate concrete versus abstract negative outcomes [182]. However, construal theory research has shown that abstraction (i.e., high-level construal) fosters greater self-control when faced with a temptation [91]. High-level construal abstracts the decision into broader terms and can refocus attention to long-term goals and preferences [91]. Therefore, to discourage users from fixating on the concrete details of the product, reflection prompts may be more effective if they nudge abstract thinking that considers long-term costs, goals, and preferences. Instructions could be revised to (a) ask participants to reflect on *making the purchase* instead of reflecting on the *product* and/or (b) reference long-term costs or goals (e.g., "Please list 5 reasons for not making the purchase (such as how it would benefit your other long-term goals") (See Table 23). Care should be taken to test this approach for perceived difficulty, the quantity and quality of cons generated, any reactance effects, and to understand the influence on impulse buying behavior.

Study 5's current reflection prompt	Please list 5 reasons for **not** buying it.
Revision: focus on purchase not product	Please list 5 reasons for **not** making the purchase.
Revision: highlight opportunity costs	Please list 5 reasons for **not** making the purchase (such as how the money could be used elsewhere).
Revision: nudge long-term thinking	Please list 5 reasons for **not** making the purchase (such as how it would benefit your other long-term goals).

Table 23: Proposed revisions to Study 5's reflection prompt to encourage more abstract reflection

2. Let users opt out of arguing for purchasing.

Participant feedback included complaints that the exercise made some participants justify a purchase they did not want initially and inadvertently increased their desire for it. For these participants, it seems that reflecting on reasons for purchasing felt forced and changed attitudes in unwanted, negative ways. Considering our findings that the more text generated in favor of purchasing increases the likelihood of impulse buying, future work should test an opt-out option for participants who do not want to argue in favor of purchasing. An opt-out option could let users completely avoid generating reasons for buying or could let users generate a smaller number of pros. This option could be helpful for consumers who only feel a modest urge to buy and are hoping to talk themselves out of buying, or for consumers who recognize they are disproportionately swayed by pros and want to avoid convincing themselves to purchase. A design that prompts users to generate reasons in favor of buying but allows them to opt out may help mitigate reactance effects (i.e., in comparison to only asking for reasons against buying) while not inadvertently encouraging consumers to talk themselves into an unwanted purchase.

3. Consider time spent reflecting and find the difficulty sweet-spot.

Results suggest that the more time a participant spent reflecting, the less likely they were to impulse buy (though the effect was modest). In contrast, results did not indicate that the perceived difficulty/ease of reflecting was influential on participants' likelihood to impulse buy. On average, participants perceived the task to be neutral in terms of difficulty (an average score of approximately 3 on a scale from (1) *very difficult* to (5) *very easy*). Qualitative feedback included complaints that generating five reasons was challenging for some participants, while other feedback described the task as easy and enjoyable. And while participants found it to be more difficult to generate reasons against buying than in favor of buying, participants on average generated more text against buying. This suggests that perhaps the reflection intervention was just challenging enough to encourage meaningful deliberation without overtaxing participants and depleting self-control resources. Future work can systematically vary

time spent on the reflection and manipulate difficulty levels to more directly test the effect that these variables have on a participant's impulse buying self-control.

4. Monitor negative emotions generated by tasks.

Some participants reported that they experienced negative emotions while completing the reflection exercise. For instance, some participants experienced negatives emotions when grappling with their financial hardships or with their shopping behavior. Some participants reported that those negative emotions increased their desire for the product. Indeed, shopping can be used as a means for regulating emotions upward and has been shown to be effective in reducing sadness by restoring feelings of control in one's environment [210]. However, feelings of discomfort are to be expected when attempting to change unwanted behaviors. Cognitive dissonance theory posits that when an individual's behavior does not align with their beliefs, they can experience psychological discomfort and become motivated to reduce those negative emotions [83]. Behavior change technology can take advantage of that motivation to reduce cognitive dissonance by supporting the adoption of the new, desired behavior [58].

While Study 5 did not measure participants' emotional states before or after completing the reflection prompt, future work can more systematically investigate the effect that reflection has on emotions and how those emotions impact impulse buying likelihood. Further, a responsible design approach would be to monitor for any such unintended negative effects including on the user's emotional and financial well-being. Future implementation of reflection interventions may be able to detect negative emotions in reflection responses and offer support in real time.

5.2.4.3 *Designing effective distraction interventions*

Results highlight several considerations for designing successful distraction interventions for encouraging self-control. Below we discuss those design considerations and identify opportunities for future work.

1. Being distracted matters more than time spent distracted.

Unsurprisingly, the most important consideration for an effective distraction intervention is to successfully distract users. In fact, results suggest that achieving a state of distraction is more important than the amount of time spent in a distracted state. Results showed that the more that participants perceived themselves to be distracted, the more their urge and intent to impulse buy dropped. Similarly, participants who were more accurate on the distraction task (an indication of engagement) were less likely to impulse buy. In contrast, time spent on the distraction task was not significantly influential on impulse buying. These results surface another design recommendation to incorporate multiple measures (both self-reported and unobtrusive) to track and triangulate distraction levels to ensure the intervention is effective and that it remains effective after completing repeated distraction tasks. Because learning effects are probable with repeated distraction tasks, it may be best to rotate [142] distraction tasks with other self-control interventions (such as reflection tasks).

2. The task should be achievable.

Results show that out of 30 rows, on average participants correctly summed 29.73 rows for an accuracy rate of approximately 99%. In total 79.5% of participants summed all 30 rows perfectly. No participant made mistakes on more than 3 rows. This shows that the distraction task was achievable for nearly all participants. On average, participants perceived the task to be easy (an average score of approximately 4 on a scale from (1) *very difficult* to (5) *very easy*). Qualitative feedback described the task as easy and while some feedback described the task as long and tedious, it was not described as difficult to complete. While results show that the perceived difficulty of completing the distraction task was not significantly influential on urge and intent to buy, prior work has shown that tasks that are taxing can hinder self-control [242]. Flow theory states that one key to reaching a state of fully immersed engagement is to make tasks just challenging enough but not so challenging that they are perceived an unachievable [180].

3. Consider the emotions generated by the task.

Some participants reported feelings of uncertainty and anxiety in providing correct sums in the counting exercise. It is not clear from these data how those emotions might affect self-control but it is plausible that the effort spent coping with negative emotions could be taxing on self-regulatory resources and diminish self-control. For example, prior work has shown that having individuals smile and convey happiness and enthusiasm while reading a passage out loud is taxing enough to encourage impulsive spending [242]. Unlike with reflection interventions where some level of cognitive dissonance or discomfort might be unavoidable, distraction tasks can be designed to avoid performance anxiety. For example, distractor tasks that do not resemble math problems or involve computation may be better a choice. At the same time, tasks should avoid overly positive feedback that leaves users with the excitement or euphoria of "winning" something. Positive affect (e.g., feeling excited, enthusiastic, proud, inspired) can lead to more felt urges to buy impulsively [28]. While this study did not measure participants' emotional states before or after completing the distraction task, future work should investigate how different distraction tasks affect emotions and how those emotions impact drop-out rates and impulse buying likelihood.

5.2.4.4 *Reflection versus distraction*

We do not find support for a difference in efficacy between the reflection and distraction interventions. However, there are other considerations that suggest reflection may be a superior intervention, particularly when anticipating how interventions will perform in real world application. First, reflection may be less vulnerable to psychological reactance. By prompting users to reflect both on reasons for buying and against buying, users are less likely to feel as though their freedom to buy is being threatened [207]. Indeed, some participants noted that what they liked about the reflection exercise was that it allowed them to justify and validate a purchase that they decided they truly wanted. In contrast, the distraction exercise does not offer that opportunity and instead aims to completely distract the user from purchasing the product. At least one distraction participant noted that they suspected the counting task was meant to manipulate them and disliked that. In general, the reflection task, which encourages balanced deliberation, offers a less

paternalistic style of behavior nudge [1,233] that better preserves and respects the user's autonomy.

Second, incorporating reflection into consumer-facing apps or tools has the potential to teach reflection skills and create deliberation habits. Forming new, desired habits involves repeating a preferred response to a set of identified cues or triggers so that over time the preferred response occurs without conscious attention [201]. An app or tool that has consumers repeatedly reflect on the pros and cons of purchasing may, over time, help consumers automatically adopt that behavior when faced with an impulse buy. In contrast, consumers who utilize a distraction tool (as designed in this study) are not shown how to distract themselves but instead remain dependent on the app for distraction. Over time consumers are not likely to develop the habit of, for example, counting red squares without an app or tool providing tables to count. A better solution may be a distraction intervention that teaches users how to step away from a tempting purchase and distract themselves. Over time, repeatedly distracting oneself from a tempting product may help consumers develop that skill and habit, even without the presence of the app or tool.

Finally, a major disadvantage of distraction is that distraction tasks may be less effective as a repeated intervention. Distraction participants in this study were unaware that the counting exercise was designed to distract them. If distraction interventions are incorporated into a self-control app or tool, users would most likely be aware that the purpose of those exercises is to distract them from a temptation. This essentially forces users into a thought suppression exercise. If users understand that they are not meant to think about the product, users may actually fixate on the product more (i.e., the product becomes Wegner's "white bear") [249]. While rotating distraction interventions among other self-control interventions may marginally obscure its intended purpose, a better solution may be (as described above) to design an intervention that teaches users the skill of self-distraction. However, in its current form, distraction is not as strong a candidate for real world application as reflection.

5.2.5 Limitations

This experiment relies on self-reports of the felt urge to purchase and purchase intent, as well as user interactions with a simulated e-commerce store. Future work can endeavor to extend this work to real online impulse purchases. Participants were recruited from a survey panel company and may not represent the same mindset or goals of consumers who are actively seeking to curb their online impulse buying. Analysis of reflection prompts relied on the number of text characters generated by users. While this provides a good approximation for engagement in the task, character counts do not capture argument quality. For example, although the word “debt” has a low character count, the weight of that reasoning may be more influential to a consumer than a lengthier description of a less important point. In addition, because of how this experiment was setup online, we only captured the total time spent reflecting. We do not have a sense of how much time was spent reflecting on pros and cons separately.

Individuals like to be consistent with their prior behaviors [83] and repeated measures can be vulnerable to learning effects [32], demand effects, and hypothesis guessing. We were careful to have participants provide reasons for and against buying to mitigate the risk of demand effects and results strongly suggest that distraction participants were in fact distracted. However, we cannot rule out the possibility that some participants in the reflection and distraction conditions remembered how they initially rated their felt urge and purchase intent when they were asked to provide those ratings a second time. Finally, this study was motivated in part by the results from Study 4 that suggest that encouraging self-control requires a particular type of postponement (e.g., an unguided time delay where consumers continue shopping may be insufficient). While Study 5 demonstrates the effectiveness of reflection and distraction, it does not directly compare those interventions against a control condition where participants continue browsing alternative products. This presents an opportunity for future work.

CHAPTER VI
Summary and Conclusion

The goal of this research is to support consumers who wish to gain greater control over online impulse buying. We set out to accomplish this by examining how shopping websites are encouraging impulse buying (Study 1), asking consumers what type of support they would like and what has worked and not worked for them in the past (Study 2), and by designing and testing interventions to reduce impulsive spending online (Studies 3-5).

We find that e-commerce sites do indeed use features that can encourage impulse buying. The use of these features is common (100% of websites sampled included at least four features that can encourage impulsivity) and does not vary significantly by a site's product type. On average, consumers can expect to face approximately 19 impulse buying features when visiting a top e-commerce site. We highlight which shopping websites may be especially encouraging of impulse buying (some of which contain over 30 impulse features) and catalog the different types of features that these sites use. The most common types of features, which appear in at least 90% of the sites we sampled, include those that reduce the perceived risk of buying (e.g., discount promo codes), use social influence (e.g., highlighting what other shoppers have purchased), and enhance the perceived physical proximity (e.g., 360-spin product displays) or temporal proximity (e.g., same-day shipping) of the product.

Conversely, consumers desire tools that counteract these types of features. Frequent online impulse buyers want tools that, for example, make costs more salient, encourage reflection, enforce spending limits, increase checkout effort, and postpone purchases. Notably, consumers are not interested in social accountability tools, such as tools that

connect them to an accountability partner or tools that share successes and setbacks on social media. We also find that consumers have had success in the past resisting online impulse buying by reflecting on their purchases, creating spending limits, and postponing purchases. Results were mixed for avoidance strategies, with consumers citing them as both successful and unsuccessful strategies. However, it is clear that consumers have not found success relying on simple “will power” to control impulse spending.

Relying on these insights, we designed interventions that represent the types of tools that consumers desire and that correspond with the strategies that consumers have found to be effective in the past. Specifically, we tested both unguided postponement interventions (i.e., the consumer is free to spend their delay as they like) and guided postponement (i.e., the consumer is prompted to complete a reflection or distraction task before purchasing). We provide evidence that long unguided postponement can be effective in reducing consumer’s felt urge to buy impulsively and purchase intent (Study 3). We speculate that an unguided, 25-hour delay is long enough to allow for some potential reflection, but more likely, a significant amount of distraction by the normal activities of the day (e.g., eating, sleeping, interacting with others). We also find that short postponement periods coupled with reflection or distraction exercises are effective at reducing felt urge to buy and purchase intent (Study 5). When consumers spend about 3 ½ minutes listing reasons for and against buying a product or engaged in a distracting task, impulse buying becomes less likely.

However, we were unable to find support for the effectiveness of short, unguided postponement. We did not observe a statistically lower rate of impulse buying when consumers’ purchases were simply delayed by 10 minutes (Study 4). We speculate that this short unguided postponement was ineffective because participants continued to shop and browse during their delays, a behavior that has been shown to increase the likelihood of impulse buying [28,85]. These findings help us explain when postponement may or may not work. Our studies suggest that postponement is effective if (a) the delay is long enough to allow for the natural distractions of life to cool the hot impulse to buy

or (b) is short but focused on either reflecting on the product or focused on something that distracts from shopping.

Study	Design	Intervention	Time Delay (average)	Behavior During Delay	Results
3	Online experiment	Unguided postponement	24.82 hrs	▪ Unobserved (but distraction is likely). ▪ Low rate (0.6%) of continuing to shop.	▪ Felt urge to buy: declines. ▪ Purchase intent: declines.
4	In-lab experiment with Chrome extension	Unguided postponement	10 min	▪ 100% of delay participants continued to shop.	Directionally, number of impulse products and dollars spent decline, but not a statistically significant decline.
5	Online experiment	Reflection-based postponement	3 min 43 sec	▪ Listing 5 reasons for and 5 reasons against buying.	▪ Felt urge to buy: declines. ▪ Purchase intent: declines.
		Distraction-based postponement	3 min 32 sec	▪ Completing a distraction, counting task.	▪ Felt urge to buy: declines. ▪ Purchase intent: declines.

Table 24: Summary of experimental results

These findings make both practical and theoretical contributions. The practical contributions of this work can benefit designers, consumers, and corporations. For researchers and designers interested in designing tools to support consumer welfare, this research provides insight into the types of potentially problematic design features that consumers are exposed to and the type of support consumers wish to receive. Researchers and designers can also lean on and build upon our design recommendations on how to best implement postponement tools for self-control. Consumers themselves can benefit from a greater awareness of the types of design

elements outlined in this work that can encourage impulsive spending. Finally, we highlight transparency opportunities for e-commerce companies to provide more ethically designed web experiences that consider the welfare of their consumers.

The theoretical contributions of this work are equally important. This work provides experimental data that support Hoch and Loewenstein's long-standing, but surprisingly untested, theory that the urge to purchase declines over time [108]. This dissertation also builds on prior work by directly testing the effectiveness of postponement for exerting self-control in the face of a temptation. The behavioral economics literature has shown that delays can shift preferences from smaller immediate rewards to larger rewards in the future. Therefore, in theory, delaying purchases should shift consumers' preferences away from the immediate product reward to longer-term goals, such as financial wellness. This dissertation takes a first step at directly testing that hypothesis. Other work has examined postponement implementation plans (e.g., "If I'm faced with a temptation, I'll tell myself I can indulge in it some other time") but stopped short of testing actual time-delays. This dissertation demonstrates how a range of time delays (e.g., 3 minutes-25 hours) and a variety of types of delays (unguided, reflection-based, distraction-based) can effectively help consumers resist the urge to buy.

Future work can test the effectiveness of the interventions presented here but in real-world application, with consumers' own money and implemented over time with repeated use. Interventions designed to create healthy consumer habits that persist independent of the app or tool may be especially valuable and can benefit consumers with both their online and offline consumer choices. Teaching reflection, distraction, postponement, and other self-control skills can help equip consumers who will likely face ever more sophisticated technologies and strategies that endlessly push them to buy more.

APPENDICES

APPENDIX 1

Online Survey Administered to Frequent Online Impulse Buyers (Study 2)

Start of Block: Screening Questions Online Shopping Survey

Thank you for your interest in participating. One in every ten participants will win a $15 e-gift card to Amazon. Only one submission per person is permitted. First, please answer the following questions to see if you qualify to participate in this study.

In which US zip code do you live? (You must live in the United States to participate).

_____

How old are you?

_____

How often do you make purchases online?
o Never
o A few times a year
o A few times a month
o A few times a week
o Every day

How often do you make unplanned, impulse purchases online?
o Never
o A few times a year
o A few times a month
o A few times a week
o Every day

Would you like to reduce the amount of impulse buying you do online?
o Yes
o No

Consent to Participate in a Research Study

ONLINE SHOPPING SURVEY

Conducted by Carol Moser, University of Michigan; Dr. Sarita Yardi Schoenebeck, Ph.D, University of Michigan.

We invite you to participate in a research study about online shopping and impulse buying. We are interested in learning about how online shoppers try to resist making impulse buys online and what type of technology shoppers would like to have in order to help them resist impulse buying online. You are in invited to participate because you indicated that you are an adult (18 years or older), living in the United States, who has shopped online before, and who would like to do less impulse buying online. This survey is being conducted as part of a doctoral dissertation research project.

Description of subject involvement
If you agree to take part in the research study, we will ask you to complete an online survey. This will take about 10 minutes.

Benefits
Although you may not directly benefit from being in this study, others may benefit because this survey will give us a better understanding of how we can design apps and web tools to help consumers avoid impulse buying online.

Risks and discomforts
There is little risk associated with this study. Participating in this study is no more risky than other everyday activities.

Compensation
You will be entered into a lottery to win a $15 Gift Card for being in the study. You have a 1 in 10 chance of winning.

Confidentiality
We plan to publish the results of this study, but will not include any information that would identify you. There are some reasons why people other than the researchers may need to see information you provided as part of the study. This includes organizations responsible for making sure the research is done safely and properly, include the University of Michigan.

To keep your information safe, your survey response will be made anonymously. The only time you will be asked for personally identifiable information is if you are a lottery winner, in which case we will need an email address to send your gift card to. Email addresses will not be saved or linked to any survey responses you provide. The researcher will retain anonymous survey responses for up to five years.

Voluntary nature of the study
Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time.

If you decide to withdraw early, the information or data you provided cannot be destroyed because it is not linked to you either directly or by code.

Contact information
If you have questions about this research, including your compensation for participating, you may contact Carol Moser at moserc@umich.edu or Dr. Sarita Schoenebeck at yardi@umich.edu or at (734) 764-8677.

The University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board has determined that this research is exempt from IRB oversight.

Consent

By clicking "Yes" below, you are agreeing to be in the study. Be sure that questions you have about the study have been answered and that you understand what you are being asked to do. You may contact the researcher if you think of a question later.

- o Yes, I agree to participate in the study
- o No, I do NOT agree to participate in the study

Start of Block: Online Shopping Survey

What type of things have you impulsively purchased online in the past?

_____

_____

_____

_____

_____

What strategies, if any, have you used successfully to resist making impulse purchases online?

_____

_____

_____

_____

What strategies, if any, have you used that were NOT successful in helping you resist making impulse purchases online?

_____

_____

_____

_____

_____

If you could talk to the designers of an app or an online tool that is meant to help you control the amount of impulse buying you do online, what would you tell them to design / build / create for you?

_____

_____

_____

_____

When I'm trying to control my impulse buying online, I would like to use an app or online tool that:

- o Makes me wait 1-2 minutes before I can checkout
- o Makes me wait 1-2 hours before I can checkout
- o Makes me wait 1-2 days before I can checkout
- o Makes me wait 1-2 weeks before I can checkout
- o Makes me wait 1-2 months before I can checkout
- o I don't want an app / tool that makes me wait to checkout

When I'm trying to control my impulse buying online, I would like to use an app or online tool that (check all that apply):

- Warns me when I have been shopping online for too long
- Sends me a reminder warning whenever I click on an online advertisement
- Makes me calculate the number of hours I need to work to pay for the product
- Shows me the product in a less glamorized way
- Shows me pictures of things I care more about than shopping (e.g., family, friends, trips)
- Posts to social media or emails a friend every time I impulsively buy something online
- Posts to social media or emails a friend every time I resist buying something online
- Gives me a physical warning, such as a mobile phone vibration, when I'm about to checkout
- Shows me pictures of the negative outcomes of over-shopping (e.g., landfills, sweatshop labor, poverty)
- Highlights the most negative product reviews
- Make me review all the online purchases I have already made that month
- Makes me list reasons why I need the product I am trying to buy
- Makes me rate (from 1 -10) how much I want to buy each product in my shopping cart
- Won't let me buy without the approval of someone I designate (like a trusted friend or partner)
- Reminds me of my goals, such as to save money
- Hides text like "limited time offer" or "only a few left in stock"
- Reminds me of my past regretted impulse buys online
- Lets me shop and create wish lists but stops me from actually buying
- Reminds me of my spending budget
- Other _____

When I go shopping online, I buy things that I had not intended to purchase.

- o (1) Very Rarely
- o (2)
- o (3)
- o (4) Sometimes
- o (5)
- o (6)
- o (7) Very Often

I am a person who makes unplanned purchases online.

- o (1) Very Rarely
- o (2)
- o (3)
- o (4) Sometimes
- o (5)
- o (6)
- o (7) Very Often

When I see something online that really interests me, I buy it without considering the consequences.

- o (1) Strongly Disagree
- o (2)
- o (3)
- o (4) Neither
- o (5)
- o (6)
- o (7) Strongly Agree

It is fun to buy spontaneously online.

- o (1) Strongly Disagree
- o (2)
- o (3)
- o (4) Neither
- o (5)
- o (6)
- o (7) Strongly Agree

I avoid buying things online that are not on my shopping list.

- o (1) Strongly Disagree
- o (2)
- o (3)
- o (4) Neither
- o (5)
- o (6)
- o (7) Strongly Agree

How do you identify your gender?

- o Man
- o Woman
- o____

What is your annual household income?

- o Less than $30,000 per year
- o $30,000-$49,999
- o $50,000-$74,999
- o $75,000-$149,999
- o $150,000 or more

What is your race?

- ▢ White
- ▢ Hispanic or Latino

- ▢ Black or African American
- ▢ Native American or American Indian
- ▢ Asian
- ▢ Pacific Islander
- ▢ Other _____

What is your current employment status?

- ▢ Employed full-time
- ▢ Employed part-time
- ▢ Out of work and looking for work
- ▢ Out of work but not currently looking for work
- ▢ Stay-at-home parent
- ▢ Student
- ▢ Military
- ▢ Retired
- ▢ Unable to work

Are you currently married, living with a partner, divorced, separated, widowed, or have you never been married?

- o Married
- o Living with a partner
- o Divorced
- o Separated
- o Widowed
- o Never been married

What is your highest completed level of education?

- o Some high school, no diploma
- o High school graduate, diploma or the equivalent (for example: GED)
- o Some college credit, no degree
- o Trade/technical/vocational training
- o Associate degree
- o Bachelor's degree
- o Master's degree
- o Professional degree
- o Doctorate degree

End of Block: Online Shopping Survey

APPENDIX 2

Online Survey Instruments (Study 3)

Online Shopping Study Screener Questionnaire

Thank you for your interest. To find out if you qualify to participate in this study, please answer the following questions.

In which US zip code do you live? (You must live in the United States to participate).

How old are you?

Consent to Participate in a Research Study

SHOPPING STUDY

Conducted by Carol Moser, University of Michigan; Dr. Sarita Yardi Schoenebeck, Ph.D, University of Michigan; and Dr. Paul Resnick, Ph.D., University of Michigan.

We invite you to participate in a research study about shopping. We are interested in learning about how consumers make purchase decisions. You are invited to participate because you indicated that you are an adult (18 years or older), living in the United States. This study is being conducted as part of a doctoral dissertation research project.

Description of subject involvement
If you agree to take part in the research study, we will ask you to complete two phases of the study. Part 1 will show you some products and ask you some questions about a product and yourself. Part 1 will take about 5 minutes. We will ask for your email address to complete Part 2, where we will email you some additional questions to answer. Part 2 should take about 5 minutes.

Benefits
Although you may not directly benefit from being in this study, others may benefit because this survey will give us a better understanding of how we can design apps and web tools to help consumers shop online.

Risks and discomforts
There is little risk associated with this study. Participating in this study is no more risky than other everyday activities.

Compensation
For completing both parts of this study (Part1 and Part 2), you will be given a $5 Amazon e-Gift Card. You will only be compensated after completing Part 2 of this study.

Confidentiality
We plan to publish the results of this study, but will not include any information that would identify you. There are some reasons why people other than the researchers may need to see information you provided as part of the study. This includes organizations responsible for making sure the research is done safely and properly, including the University of Michigan.

To keep your information safe, your survey response will be anonymized. Email addresses will not be saved or linked to any survey responses you provide. The researchers will retain anonymous survey responses for up to five years.

Voluntary nature of the study
Participating in this study is completely voluntary. Even if you decide to participate now, you may change your mind and stop at any time. If you decide to withdraw early, the information or data you provided cannot be destroyed because it is not linked to you either directly or by code.

Contact information
If you have questions about this research you may contact Carol Moser at moserc@umich.edu or Dr. Sarita Schoenebeck at yardi@umich.edu . If you have questions about your rights as a research participant or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board, 2800 Plymouth Rd. Building 520, Room 1169, Ann Arbor, MI 48109-2800, (734) 936-0933, or toll free, (866) 936-0933, irbhsbs@umich.edu.

Consent
By indicating “Yes” below, you are agreeing to be in the study. Be sure that questions you have about the study have been answered and that you understand what you are being asked to do. You may contact the researcher if you think of a question later.

- o Yes, I agree to participate in the study
- o No, I do NOT agree to participate in the study

Take some time to look at the products listed. Below, we'll ask you to select **the product that you feel the strongest urge to buy.** All prices include taxes and shipping.

(A) Michigan Game Day Sunglasses

$3.81
~~List: $7.62~~ (50% off)

(B) Color-changing Coffee Mug

$4.77
~~List: $9.54~~ (50% off)

(C) Game of Thrones Mug

$5.49
~~List: $10.99~~ (50% off)

(D) Cat Coin Purse

$2.49
~~List: $4.99~~ (50% off)

(E) Bluetooth Unisex Beanie

$5.09
~~List: $10.19~~ (50% off)

(F) Stranger Things Movie Poster

$3.48
~~List: $6.96~~ (50% off)

Which product do you feel the strongest urge to buy?

(A) Michigan Game Day Sunglasses
(B) Color-changing Coffee Mug
(C) Game of Thrones Mug
(D) Cat Coin Purse
(E) Bluetooth Unisex Beanie
(F) Stranger Things Movie Poster

At this moment, the urge I feel to buy the product that I selected above can be described as:

(1) I feel no urge to buy this product
(2)
(3)
(4) I feel a moderate urge to buy this product
(5)
(6)
(7) I feel a very strong urge to buy this product

The likelihood that I would purchase this product is:

(1) very low

(2)

(3)

(4)

(5

(6)

(7) very high

How do you identify your gender?

- Man
- Woman
- _____

Thank you for completing Party 1 of this study. We will email you within 48 hours to complete Part 2 of this study. After you complete Part 2, we will send a $5 Amazon gift card to the email address you provided.

Welcome back! Below is Part 2 of the Shopping Study (which includes 2 short pages of questions).

In Part 1 of this study you selected the following product:

Michigan Game Day Sunglasses

$3.81

~~List: $7.62~~ (50% off)

At this moment, the urge I feel to buy the product that I selected above can be described as:

(1) I feel no urge to buy this product

(2)

(3)

(4) I feel a moderate urge to buy this product

(5)

(6)

(7) I feel a very strong urge to buy this product

The likelihood that I would purchase this product is

(1) very low

(2)

(3)

(4)

(5

(6)

(7) very high

Did you look for this product in stores or online after first seeing it in Part 1 of this study?

- Yes
- No

Did you end up purchasing this product or something very similar?

- Yes
- No

How often do you make unplanned, impulse purchases online?

- Never
- A few times a year
- A few times a month
- A few times a week
- Every day

Are you currently married, living with a partner, divorced, separated, widowed, or have you never been married?

- Married
- Living with a partner
- Divorced
- Separated
- Widowed
- Never been married

What is your race?

- White
- Hispanic or Latino
- Black or African American
- Native American or American Indian
- Asian
- Pacific Islander
- Other _____

What is your current employment status?

- Employed full-time
- Employed part-time
- Out of work and looking for work
- Out of work but not currently looking for work
- Stay-at-home parent
- Student
- Military
- Retired
- Unable to work
- Other

What is your highest completed level of education?

- Some high school, no diploma
- High school graduate, diploma or the equivalent (for example: GED)
- Some college credit, no degree
- Trade/technical/vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

What is your annual household income?

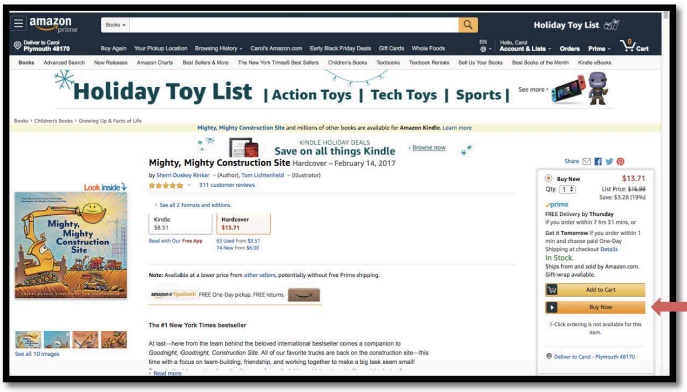
- Less than $30,000 per yea
- $30,000-$49,999
- $50,000-$74,999
- $75,000-$149,99
- $150,000 or more
- I don't know

APPENDIX 3.1

Visuals of the Chrome Extension (Study 4)

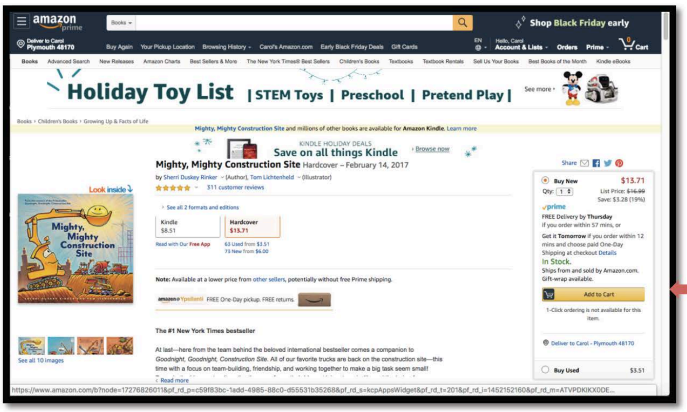
Location: Amazon Product Pages

Control condition:
(typical Amazon experience)



'Buy Now' button

Treatment condition:

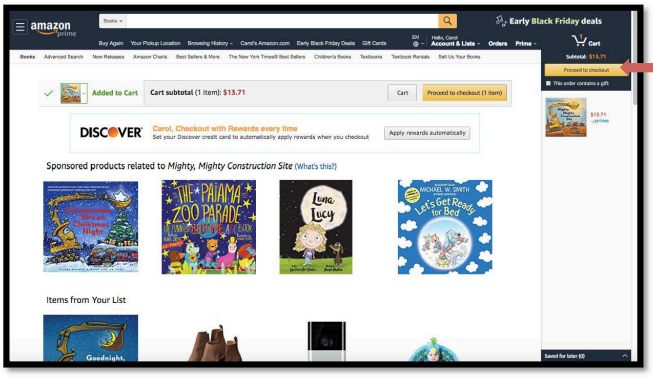


No 'Buy Now' button

Figure 8: Chrome extension as seen on Amazon product pages

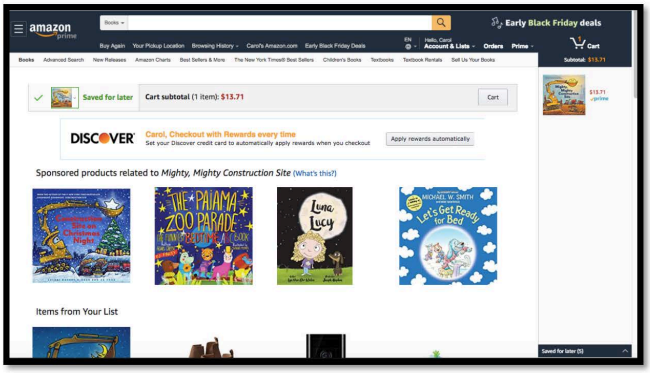
Location: Added to Cart Confirmation Pages

Control condition:
(typical Amazon experience)



'Proceed to Checkout' button

Treatment condition:

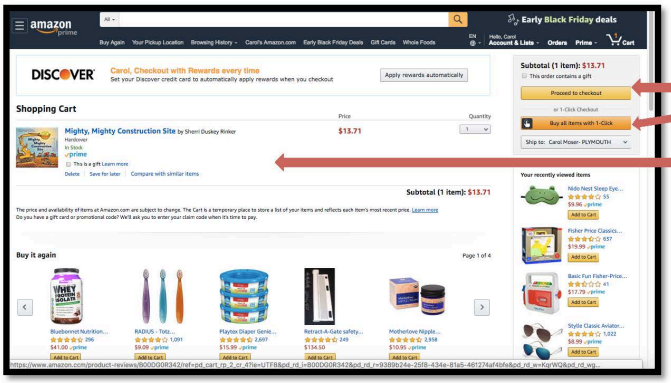


No 'Proceed to Checkout' button

Figure 9: Chrome extension as seen on confirmation pages

Location: Amazon Shopping Cart

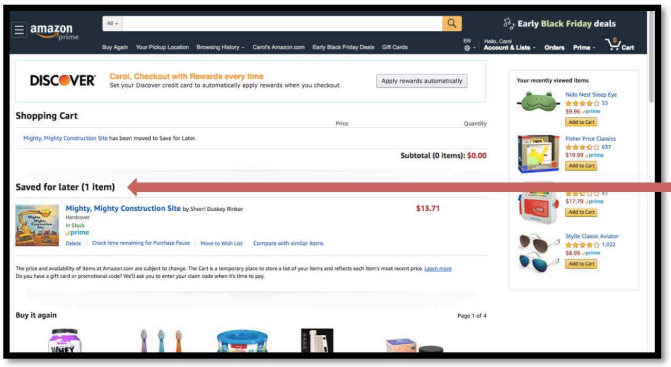
Control condition:
(typical Amazon experience)



'Buy Now' and 'Proceed to Checkout' buttons

Products are displayed in the Shopping Cart.

Treatment condition:



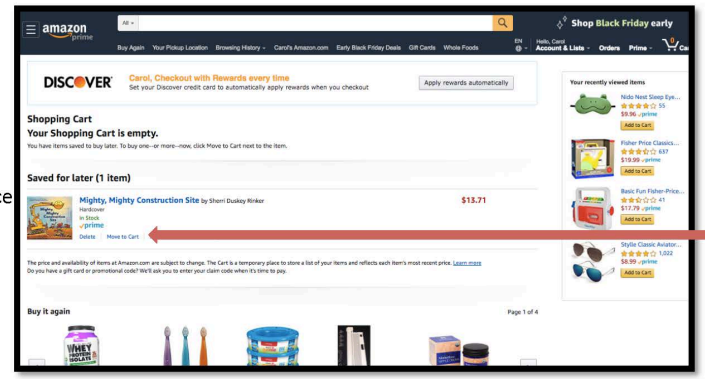
No 'Buy Now' or 'Proceed to Checkout' buttons

Products in cart automatically moved to "Save for later" list

Figure 10: Chrome extension as seen in shopping cart

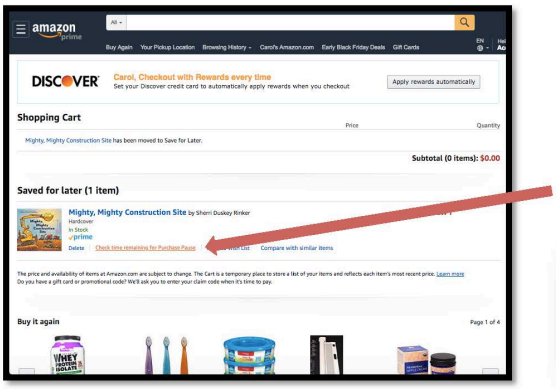
Location: Save for later list

Control condition:
(typical Amazon experience



'Move to Cart' hyperlink

Treatment condition:



"Move to Cart" link replaced with "Check time remaining for Purchase Pause," which displays seconds remaining when clicked (example shown below)

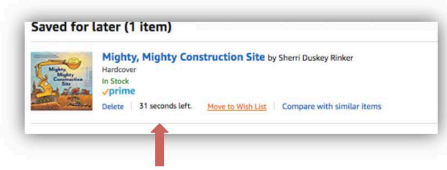


Figure 11: Chrome extension as seen in save for later list

APPENDIX 3.2

Study Instructions and Instruments (Study 4)

Consent to be Part of a Research Study

Title of the Project: Amazon Shopping Study (HUM00161211)
Principal Investigator: Carol Moser, School of Information, University of Michigan
Faculty Advisors: Dr. Sarita Schoenebeck, School of Information, University of Michigan
Dr. Paul Resnick, School of Information, University of Michigan

Invitation to be Part of a Research Study

You are invited to participate in a research study about online shopping. In order to participate, you must be at least 18 years old and someone who makes unplanned purchases at least a few times per month. This study takes place at the University of Michigan, Ann Arbor, MI. Taking part in this research project is voluntary.

Important Information about the Research Study

Things you should know:

- The purpose of the study is to understand consumer behavior online. If you choose to participate, you will be asked to complete (a) a short writing exercise, (b) a shopping exercise, and (c) a survey.
- After the study, some participants will receive an email invitation to complete a short follow-up online survey.
- We do not anticipate any substantial risks for participating in this study. However, it is not possible to eliminate the possibility of a data breach, where your email address is linked to your study data.
- Taking part in this research project is voluntary. You don't have to participate and you can stop at any time.

Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

What is the study about and why are we doing it?

The purpose of the study is to understand consumer behavior online and how to design tools that help shoppers with the consumer choices they make.

What will happen if you take part in this study?

If you agree to take part in this study, you will be asked to complete (a) a short writing exercise, (b) a shopping exercise, and (c) a survey. During the shopping exercise, we will have you shop

on Amazon.com. We will give you a 25% discount on an approved list of Amazon products and $20 to spend or to take home with you. Your computer screen will be visible to the researcher and we will take notes on how you shop. We will also have software installed on the computer that will track how you shop (for example, how many products you look at and which ones you add to your cart). We expect the study to take approximately 30-60 minutes.
After the study, some participants will receive an email invitation to complete a short follow-up online survey for a 1 in 10 chance to win a $25 Amazon e-gift card.

How could you benefit from this study?

While there are no anticipated direct benefits to you for participating in the study, your participation will help us better understand consumer behavior.

What risks might result from being in this study?

We believe there is only minimal risk from participating in this research. As with most research studies, there is a risk of loss of confidentiality. It is not possible to eliminate the possibility of a data breach, where your email address is linked to your study data.

How will we protect your information?

We plan to publish the results of this study. To protect your privacy, we will not include any information that could directly identify you.

To make this study work, the researchers need to collect and store some information about you including: your email address, your survey responses, and your shopping activity during the shopping exercise. We link your data with an anonymized participant id. However, your email address is linked to some of this data. When collecting and storing this information we take security precautions such as storing data on secure, password-protected servers. When we finish collecting data, we will remove your email address from your data.

It is possible that other people may need to see the information we collect about you. These people work for the University of Michigan and government offices that are responsible for making sure the research is done safely and properly.

What will happen to the information we collect about you after the study is over?

We plan to keep your research data to use for future research. Any information that can directly identify you will be deleted from the research data collected as part of the project. We may share your research data with other investigators without asking for your consent again, but it will not contain information that could directly identify you.

How will we compensate you for being part of the study?

You will receive $20 for participating in the study. You can choose to spend some, none, or all of the $20 during the shopping exercise. The products you see during the shopping exercise are real products that will be shipped to you if you choose to buy.

After the study, some participants will receive an email invitation to complete a short follow-up online survey for a 1 in 10 chance to win a $25 Amazon e-gift card.

What are the costs to you to be part of the study?

This study takes place at the University of Michigan, Ann Arbor, MI. To participate in this study, you will need to pay for your own transportation and/or parking costs.

Your Participation in this Study is Voluntary

It is totally up to you to decide to be in this research study. Participating in this study is voluntary. Even if you decide to be part of the study now, you may change your mind and stop at any time. You do not have to answer any questions you do not want to answer. If you decide to withdraw before this study is completed, we will delete your email address and all of the links between your data and your personal information, so it cannot be linked to you.

Contact Information for the Study Team and Questions about the Research

If you have questions about this research, you may contact **Carol Moser (moserc@umich.edu), Dr. Sarita Schoenebeck (yardi@umich.edu),** or **Dr. Paul Resnick (presnick@umich.edu).**

The University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board has determined that this research is exempt from IRB oversight

Your Consent

By signing this document, you are agreeing to be in this study. Make sure you understand what the study is about before you sign. I/We will give you a copy of this document for your records. I/We will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the study team using the information provided above.

I understand what the study is about and my questions so far have been answered. I agree to take part in this study.

_____
Printed Subject Name

_____
Signature Date

Participant Id: ____

Part 1: Writing exercise

For the next few minutes, please write down all the thoughts that enter your mind, with one exception, please do not think about a white bear.

If you do think of a white bear or if a white bear image pops into your head, place a checkmark on the side of this paper and continue writing your thoughts.

The researcher will let you know when your time is up.

	Write a checkmark ✓ when you think of a white bear

Note: Delay condition version

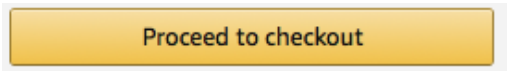
Part 2: Shopping Exercise

For this part of the study, we are going to have you shop on Amazon. These are real products that will be shipped to you if you make a purchase.

- You have $20 to spend or to take home with you at the end of the study.
- We will pay for any shipping or taxes and it won't count against your $20 budget.
- You can spend all, some, or none of the $20. Any unspent portion will go home with you.
- You can buy as many products as you want, as long as you stay within your $20 budget.
- For today's study, you have 25% off your entire order (which will be applied at checkout).

Instructions:

1. Look through the products on the approved list. You can only buy from this list.
2. If you navigate away from the approved list, click the "Approved Products" button to get back to it.
3. Take as much time as you like.
4. If you see something you want, add it to your cart.
5. **Important**: Each product that you add to your Shopping Cart will be automatically moved to a "Save For Later" list for 10 minutes.
   - This means that you'll have to wait 10 minutes before you can move that product back to your Shopping Cart and, if you want, checkout.
   - While you wait, you can continue shopping, add or remove items from your Shopping Cart, or enjoy free time to do something else.
   - If you want to know how much time is remaining for each product, go to your Shopping Cart and click on the "TIME REMAINING" link under each product.
6. If you change your mind about a product, you can delete it from your Shopping Cart.
7. When you're ready to complete your purchase:
   - Go to your Shopping Cart 

   - Click "Proceed to checkout"
     (your order cannot be changed after this) 

   - Raise your hand
   - We will walk you through the checkout process and pay for your items.
8. If you are finished and you don't see anything you want to purchase, raise your hand.
   If you have questions at any point, raise your hand.

Note: Control condition version

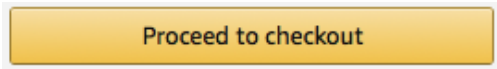
Part 2: Shopping Exercise

For this part of the study, we are going to have you shop on Amazon. These are real products that will be shipped to you if you make a purchase.

- You have $20 to spend or to take home with you at the end of the study.
- We will pay for any shipping or taxes and it won't count against your $20 budget.
- You can spend all, some, or none of the $20. Any unspent portion will go home with you.
- You can buy as many products as you want, as long as you stay within your $20 budget.
- For today's study, you have 25% off your entire order (which will be applied at checkout).

Instructions:

1. Look through the products on the approved list. You can only buy from this list.
2. If you navigate away from the approved list, click the "Approved Products" button to get back to it.
3. Take as much time as you like.
4. If you see something you want, add it to your cart.
5. If you change your mind about a product, you can delete it from your Shopping Cart.
6. When you're ready to complete your purchase:
   - Go to your Shopping Cart 

   - Click "Proceed to checkout"
     (your order cannot be changed after this) 

   - Raise your hand
   - We will walk you through the checkout process and pay for your items.
7. If you are finished and you don't see anything you want to purchase, raise your hand.

If you have questions at any point, raise your hand.

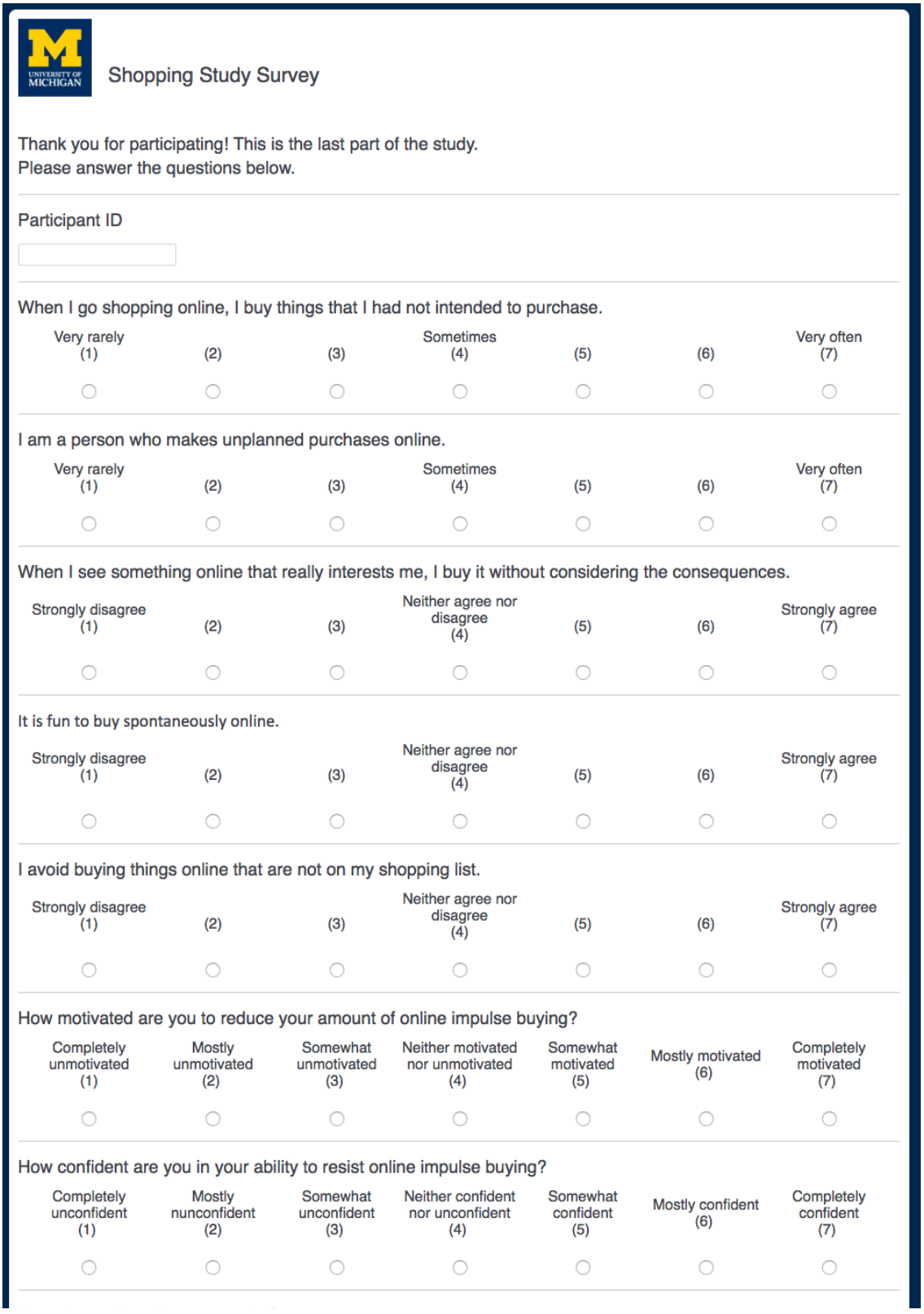
25% Off

25% off your entire order.

This discount will be applied at checkout.

Total Amount Spent on Amazon (Go to your Shopping Cart to see your total)	**After 25% Discount**
$1.00	$0.75
$2.00	$1.50
$3.00	$2.25
$4.00	$3.00
$5.00	$3.75
$6.00	$4.50
$7.00	$5.25
$8.00	$6.00
$9.00	$6.75
$10.00	$7.50
$11.00	$8.25
$12.00	$9.00
$13.00	$9.75
$14.00	$10.50
$15.00	$11.25
$16.00	$12.00
$17.00	$12.75
$18.00	$13.50
$19.00	$14.25
$20.00	$15.00
$21.00	$15.75
$22.00	$16.50
$23.00	$17.25
$24.00	$18.00
$25.00	$18.75
$26.00	$19.50

Study 4, Part 3: In-Lab Survey



Shopping Study Survey

Thank you for participating! This is the last part of the study.
Please answer the questions below.

Participant ID

When I go shopping online, I buy things that I had not intended to purchase.

Very rarely (1)	(2)	(3)	Sometimes (4)	(5)	(6)	Very often (7)
○	○	○	○	○	○	○

I am a person who makes unplanned purchases online.

Very rarely (1)	(2)	(3)	Sometimes (4)	(5)	(6)	Very often (7)
○	○	○	○	○	○	○

When I see something online that really interests me, I buy it without considering the consequences.

Strongly disagree (1)	(2)	(3)	Neither agree nor disagree (4)	(5)	(6)	Strongly agree (7)
○	○	○	○	○	○	○

It is fun to buy spontaneously online.

Strongly disagree (1)	(2)	(3)	Neither agree nor disagree (4)	(5)	(6)	Strongly agree (7)
○	○	○	○	○	○	○

I avoid buying things online that are not on my shopping list.

Strongly disagree (1)	(2)	(3)	Neither agree nor disagree (4)	(5)	(6)	Strongly agree (7)
○	○	○	○	○	○	○

How motivated are you to reduce your amount of online impulse buying?

Completely unmotivated (1)	Mostly unmotivated (2)	Somewhat unmotivated (3)	Neither motivated nor unmotivated (4)	Somewhat motivated (5)	Mostly motivated (6)	Completely motivated (7)
○	○	○	○	○	○	○

How confident are you in your ability to resist online impulse buying?

Completely unconfident (1)	Mostly nunconfident (2)	Somewhat unconfident (3)	Neither confident nor unconfident (4)	Somewhat confident (5)	Mostly confident (6)	Completely confident (7)
○	○	○	○	○	○	○

What is your annual household income?

- ○ Less than $30,000 per year
- ○ $30,000-$49,999
- ○ $50,000-$74,999
- ○ $75,000-$149,999
- ○ $150,000 or more

What is your race?

- ☐ White
- ☐ Hispanic or Latino
- ☐ Black or African American
- ☐ Native American or American Indian
- ☐ Asian
- ☐ Pacific Islander
- ☐ Other

What is your current employment status?

- ☐ Employed full-time
- ☐ Employed part-time
- ☐ Out of work and looking for work
- ☐ Out of work but not currently looking for work
- ☐ Stay-at-home parent
- ☐ Student
- ☐ Military
- ☐ Retired
- ☐ Unable to work

Are you currently married, living with a partner, divorced, separated, widowed, or have you never been married?

- ◯ Married
- ◯ Living with a partner
- ◯ Divorced
- ◯ Separated
- ◯ Widowed
- ◯ Never been married

What is your highest completed level of education?

- ◯ Some high school, no diploma
- ◯ High school graduate, diploma or the equivalent (for example: GED)
- ◯ Some college credit, no degree
- ◯ Trade/technical/vocational training
- ◯ Associate degree
- ◯ Bachelor's degree
- ◯ Master's degree
- ◯ Professional degree
- ◯ Doctorate degree

continue

I purchased at least one product during today's study.

- ◯ Yes
- ◯ No
- ◯ I don't know

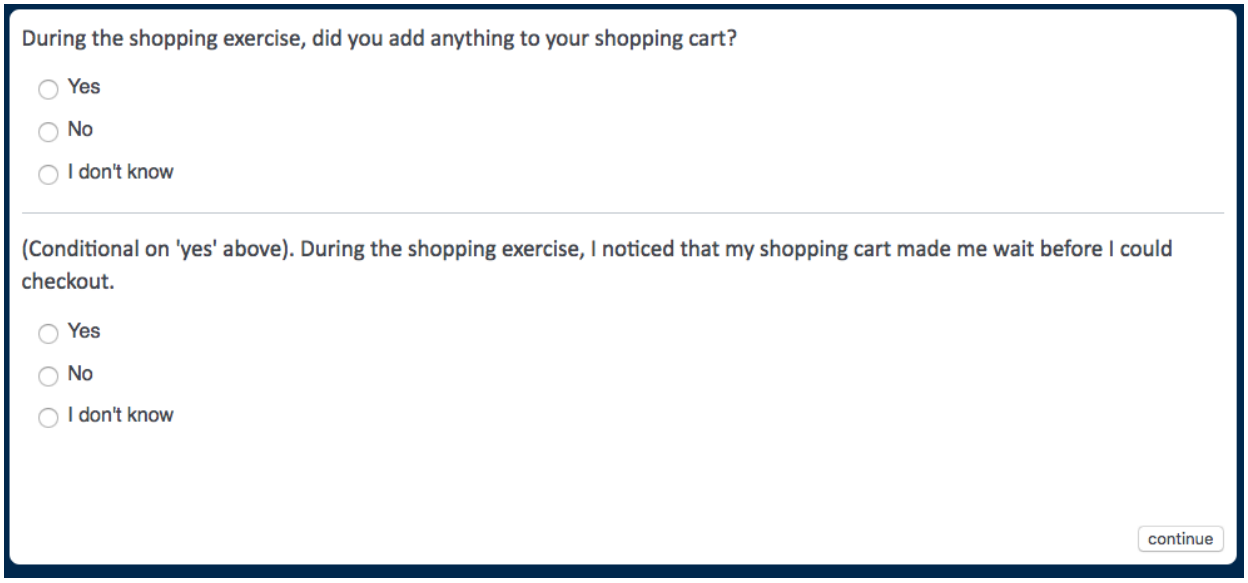
(Conditional on 'yes' above) At least one product that I bought during today's study was something I was already planning on buying before I saw it here today.

- ◯ Yes
- ◯ No
- ◯ I don't know

(Conditional on 'yes' above) Which product(s) were you already planning to purchase?

continue

Note: the following screens only appeared for the delay condition



These questions ask about your experience with this study's shopping cart, which had you wait at least 10 minutes before being able to buy a product.

During your shopping cart's waiting period, did you change your mind and decide not to buy one or more products?

- ○ Yes
- ○ No
- ○ I don't know

(Conditional on 'yes' above) Why did you decide not to buy that/those product(s)?

Waiting 10 minutes to checkout helped me make better purchase decisions.

Strongly disagree (1)	Disgree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
○	○	○	○	○	○	○

Waiting 10 minutes to checkout was not helpful for me.

Strongly disagree (1)	Disgree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
○	○	○	○	○	○	○

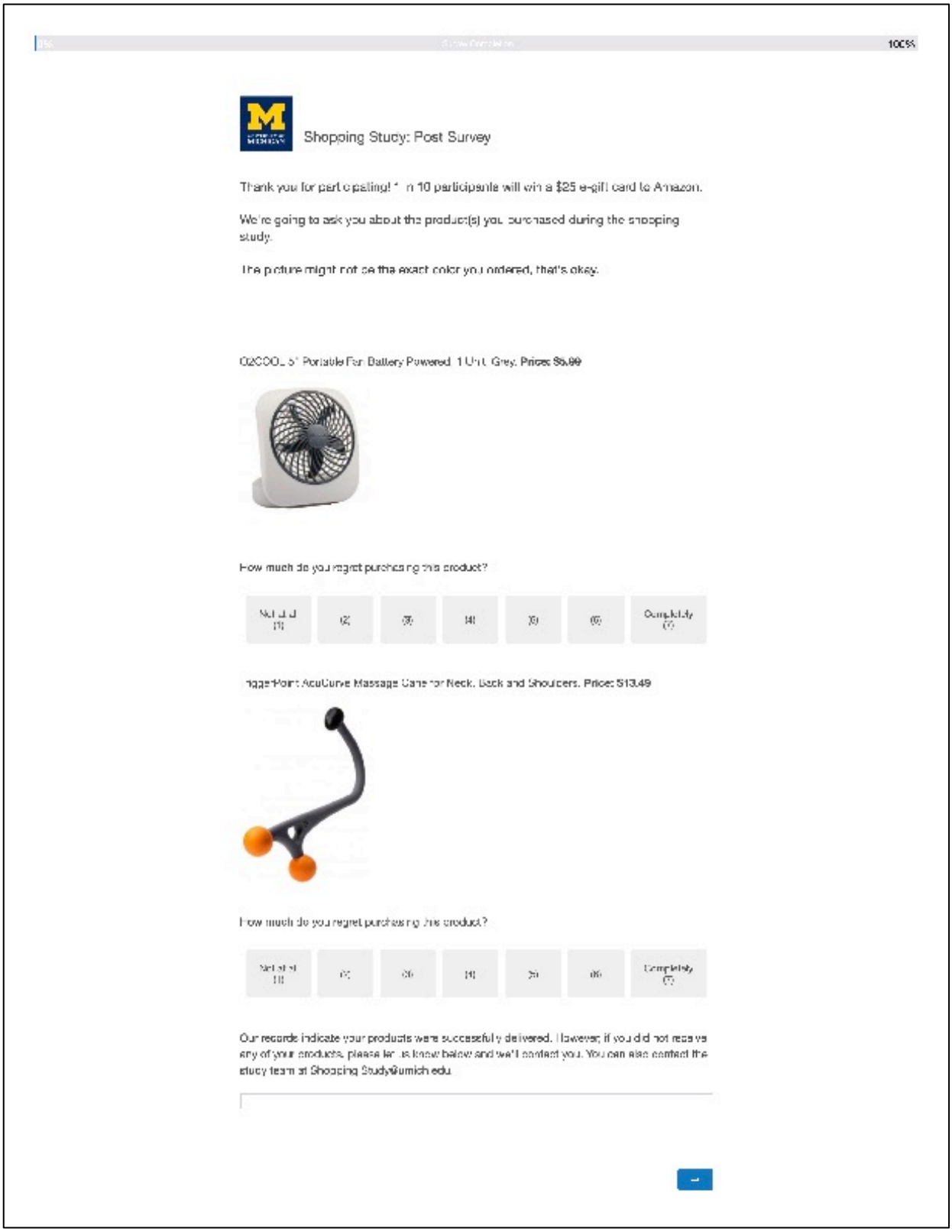
If it were possible, I would like to continue using an online shopping tool that makes me wait before I can checkout.

Strongly disagree (1)	Disgree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
○	○	○	○	○	○	○

Please describe what you liked, if anything, about having to wait to checkout.

Please describe what you did not like, if anything, about having to wait to checkout.

Study 4, Part 4: Post-Survey (Example of personalized survey)



APPENDIX 3.3

Products Made Available for Purchase (Study 4)

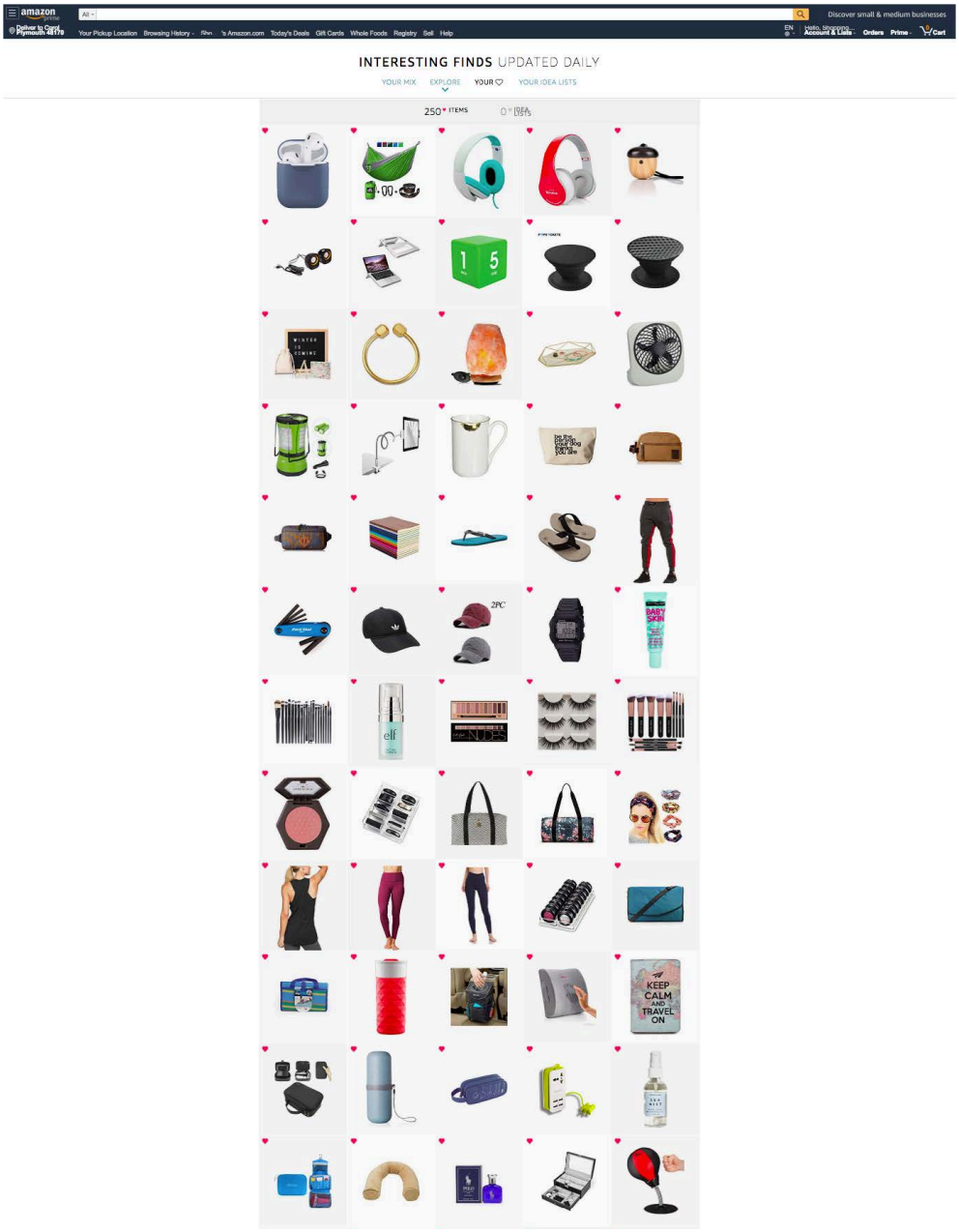


Figure 12: Products made available for purchase in Study 4 (page 1)

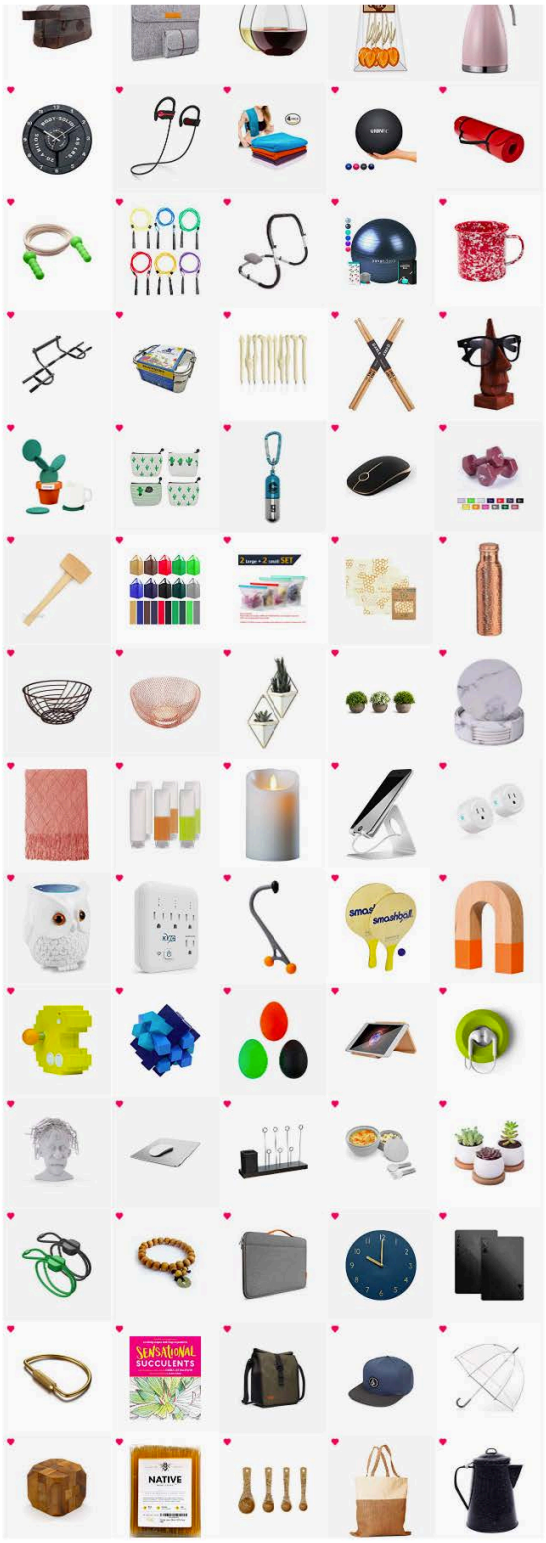


Figure 13: Products made available for purchase in Study 4 (page 2)

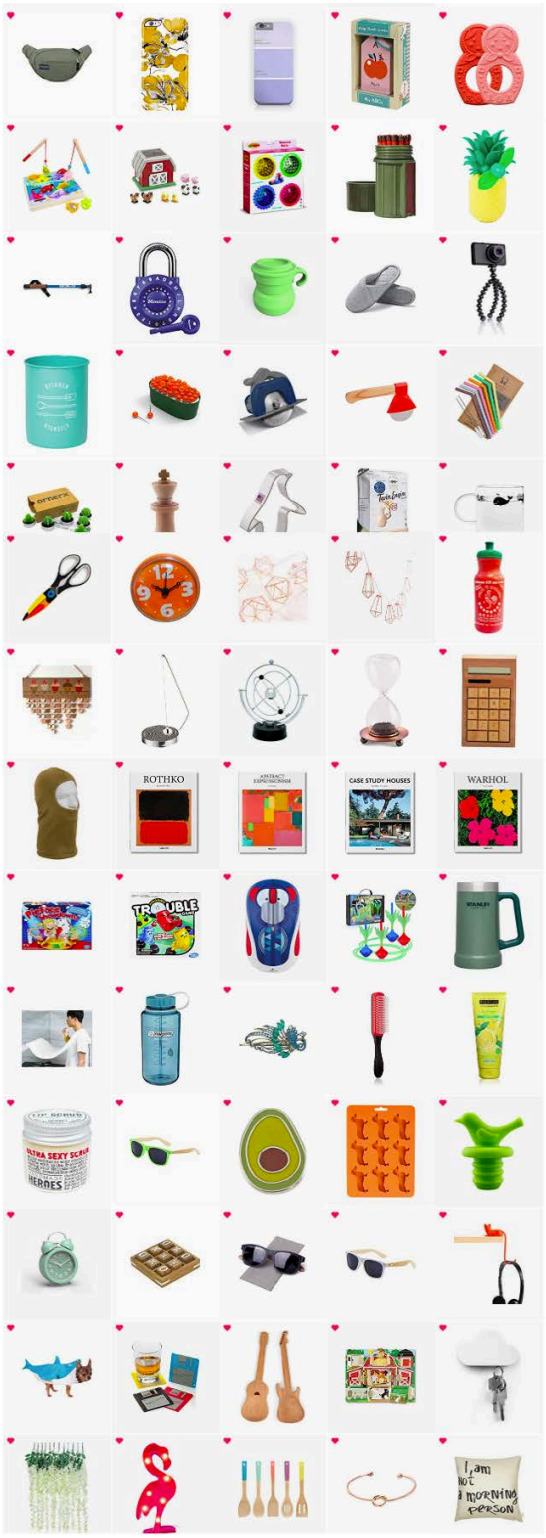


Figure 14: Products made available for purchase in Study 4 (page 3)

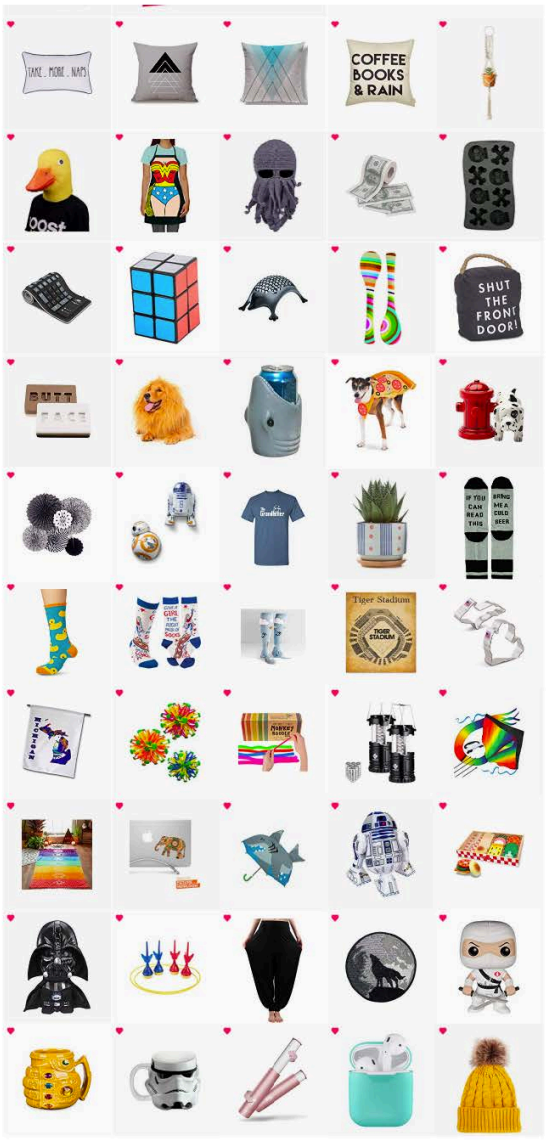


Figure 15: Products made available for purchase in Study 4 (page 4)

APPENDIX 3.4

Pre-registration of Hypotheses (Study 4)

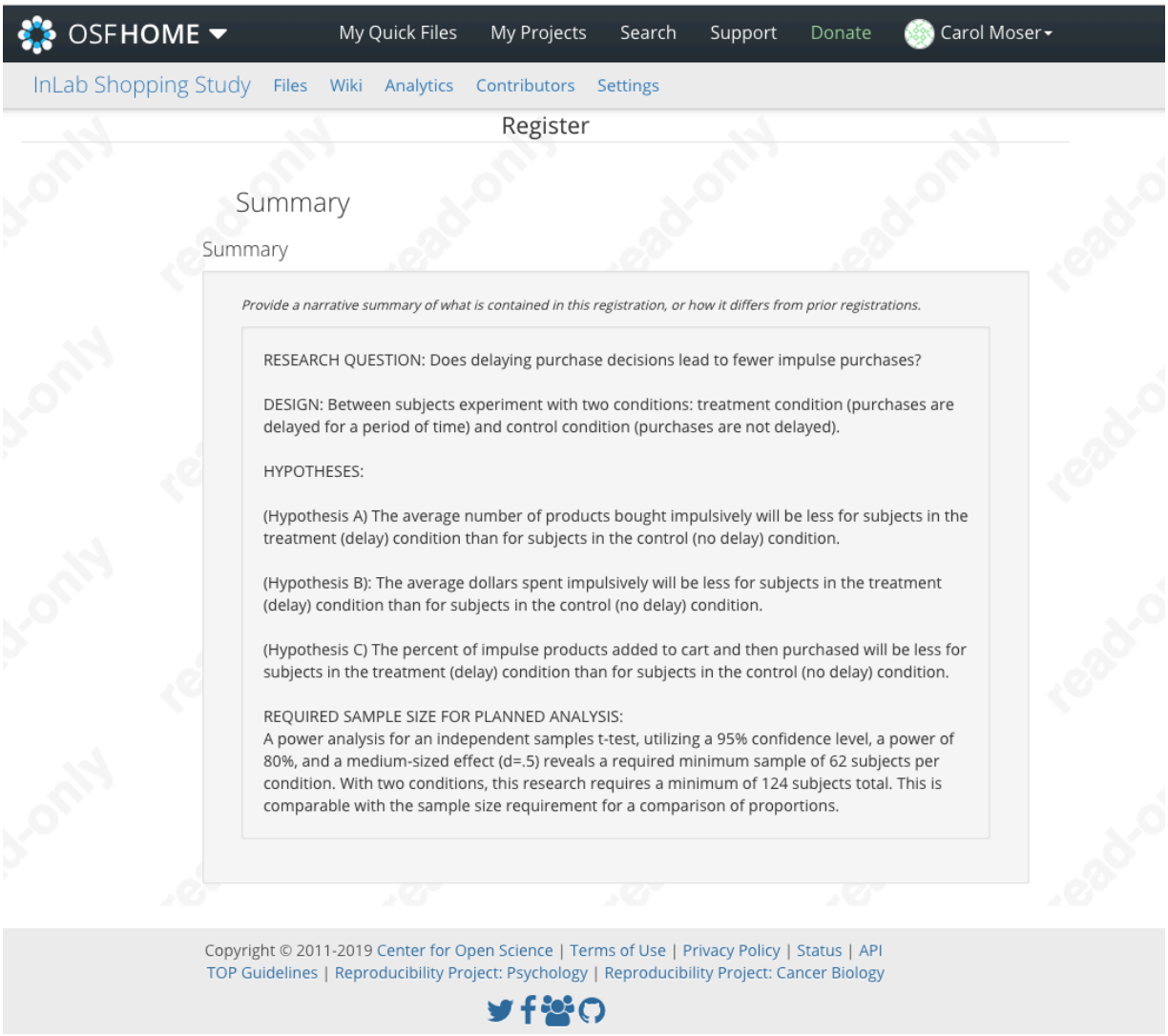


Figure 16: Pre-registration of Study 4 hypotheses

APPENDIX 4.1

Reflection Task and Distraction Task (Study 5)

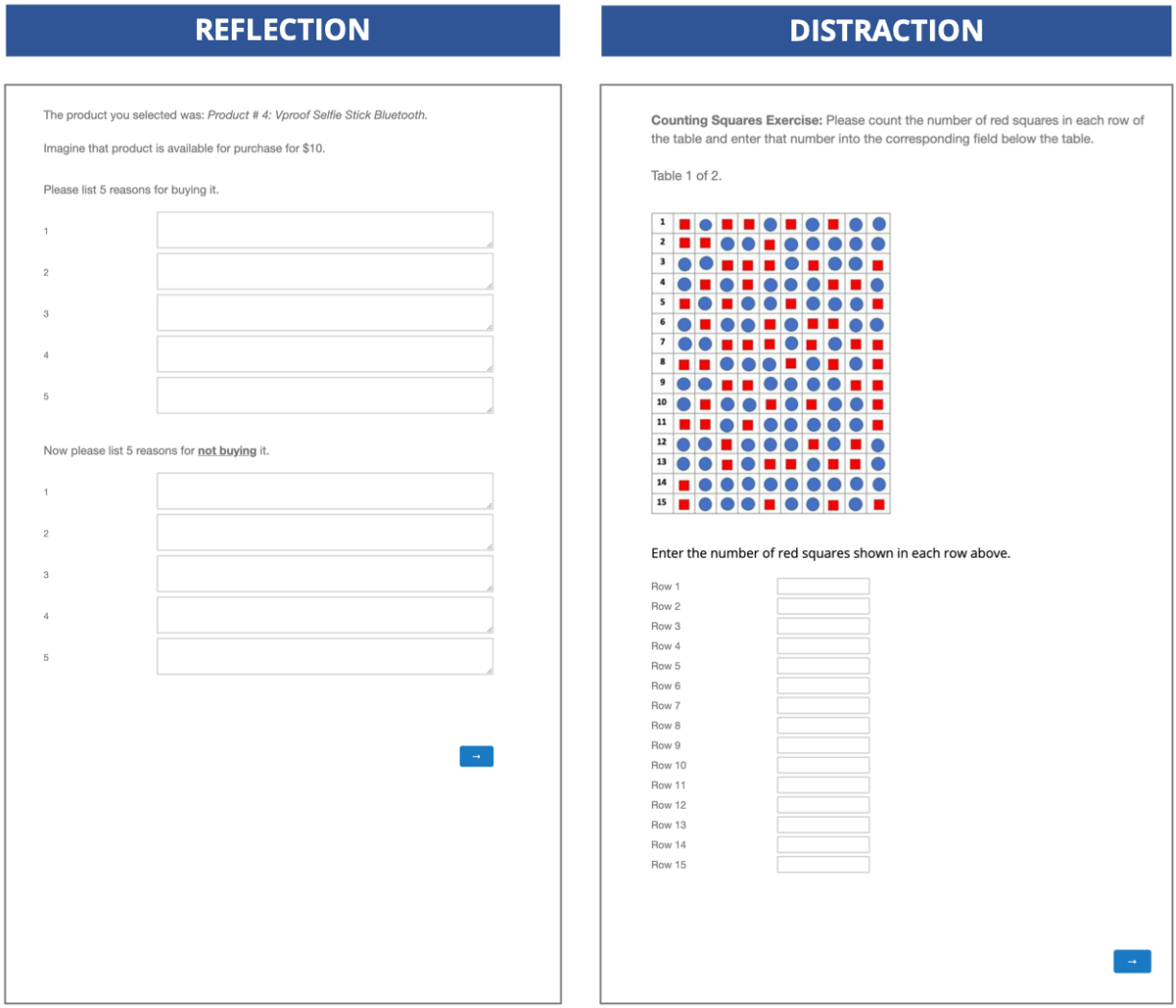


Figure 17: Reflection and distraction tasks from Study 5

APPENDIX 4.2

Pre-registration of Hypotheses (Study 5)

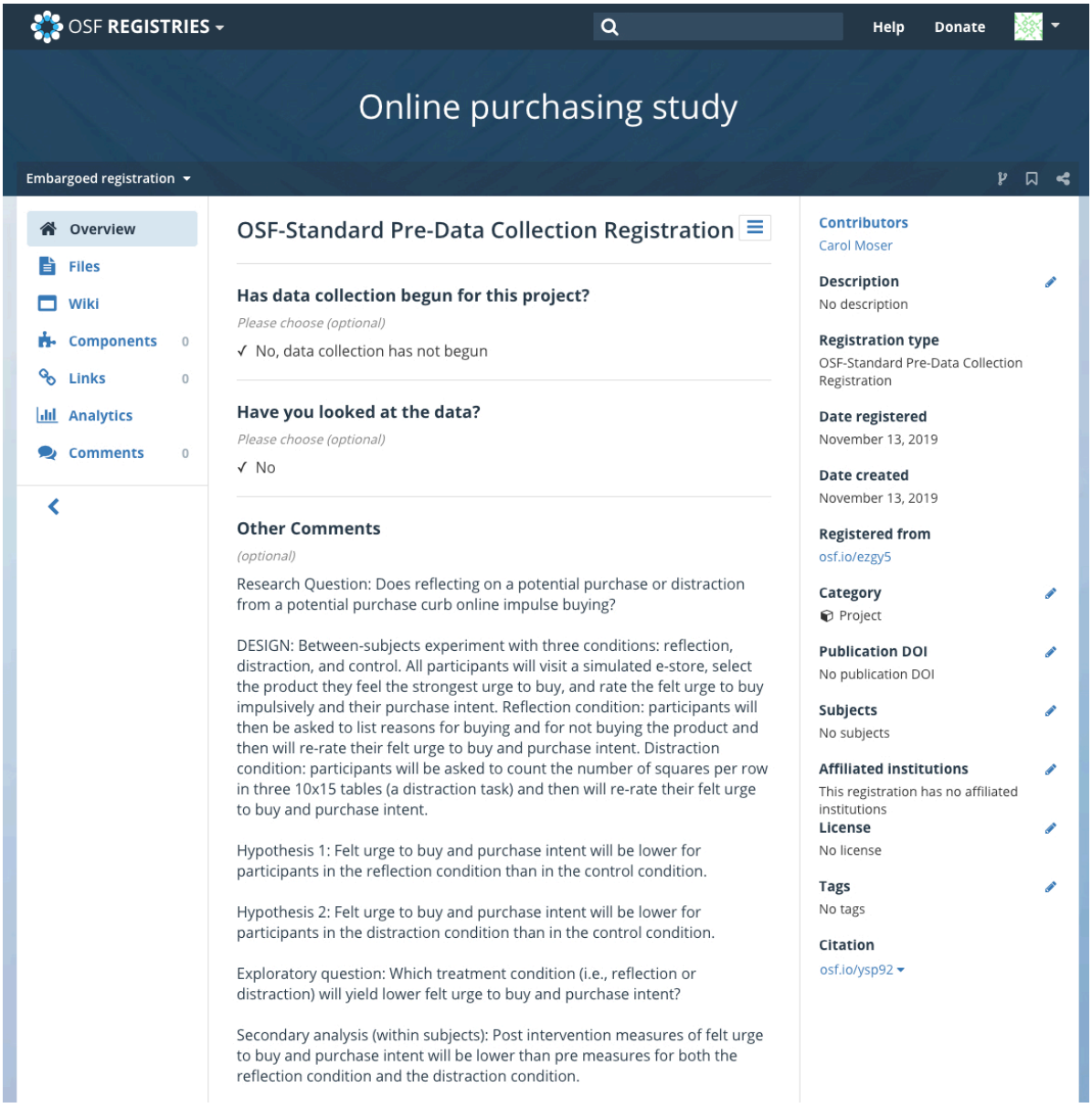


Figure 18: Pre-registration of Study 5 hypotheses

APPENDIX 4.3

Products Selected by Participants with Frequency Counts (Study 5)

		Frequency	Percent %
1	Product # 5: Beyution Bluetooth Wireless Headphones with Built-in	58	7.5
2	Product # 7: WoneNice Camping Hammock - Portable Lightweight Double Nylon Hammock	34	4.4
3	Product # 200: Lenovo Laptop Backpack B210, 15.6-Inch Laptop and Tablet, Durable, Water-Repellent, Lightweight	18	2.3
4	Product # 19: Pink Octopus Ceramic 3D Coffee Mug with Tentacle Handle	18	2.3
5	Product # 45: Bob Ross Heat Changing Mug - Add Coffee or Tea and a Happy Little Scene Appears	18	2.3
6	Product # 26: Burrito Blanket, Giant Flour Tortilla Throw Blanket, Flannel Taco Blanket for Kids.	14	1.8
7	Product # 2: Artinova Elephant Shape Wooden Pen Cup Cell Phone Stand	14	1.8
8	Product # 20: hOmeLabs Sunrise Alarm Clock - Digital LED Clock with 6 Color Switch	14	1.8
9	Product # 10: The Ultimate Game of Thrones and Philosophy: You Think or Die, Paperback Book	13	1.7
10	Product # 17: Gogobuddy Pet Christmas Headdress, 7 Pack Snowman Santa Elk Crown	13	1.7
11	Product # 13: Boumbi Fragrant Camphor Laurel Wood Cell Phone Stand	13	1.7
12	Product # 14: Tech Tools Stress Buster Desktop Punching Ball	13	1.7
13	Product # 8: I survived another meeting - 11OZ ceramic coffee mugs (2 pack)	13	1.7
14	Product # 120: YETI Rambler Stainless Steel Vacuum Insulated Tumbler with Lid	12	1.6
15	Product # 31: Dreamingbox Star Night Light Lamps 360-Degree Rotating Best Gifts for Kids	12	1.6
16	Product # 42: StarPack Premium 3 Piece Mini White Ceramic Succulent Planter Pot Set	12	1.6
17	Product # 27: Tacosaurus Rex Taco Holder- Holds 2 Tacos, Top Rated Novelty Taco Holder	11	1.4
18	Product # 1: Nessie Ladle Turquoise by OTOTO	11	1.4
19	Product # 199: Meidong QQChocolate Bluetooth Speakers Portable Waterproof	11	1.4
20	Product # 32: ONXE USB LED Clock Fan with Real Time Display Function	11	1.4
21	Product # 53: Glass Tea Cup with a Lid & Strainer Portable Cute Cat Tail Heat	11	1.4
22	Product # 24: Silver Star Wars Ep 5 & Empire 2-Piece Colored Glass Pint Set, 16-Ounces	10	1.3
23	Product # 33: Cervical Spine Alignment Chiropractic Traction Device, Neck and Head Pain Relief	10	1.3
24	Product # 35: Snuggie- The Original Wearable Blanket, As Seen On TV- Plaid	10	1.3
25	Product # 92: Plant Theatre Bonsai Trio Kit, 3 Distinctive Bonsai Trees to Grow	10	1.3
26	Product # 25: Abs Muscle Trainer for Men Women - Portable Trainer Abs Belt	10	1.3
27	Product # 38: TriggerPoint AcuCurve Massage Cane for Neck, Back and Shoulders	9	1.2
28	Product # 3: Chia Pet Dustin Stranger Things	9	1.2
29	Product # 108: Aria Starr Dead Sea Mud Mask For Face, Acne, Oily Skin & Blackheads	8	1
30	Product # 29: Learning Resources Hide-N-Go Moo, Sensory Awareness Farm Animal Toy, 9 Pieces, Ages 2+	8	1
31	Product # 39: Gooseneck Tablet Holder, Lamicall Tablet Stand: Flexible Arm Clip Tablet Mount	8	1
32	Product # 59: TheraFlow Dual Foot Massager Roller (Large). Relieve Plantar Fasciitis, Stress, Heel, Arch Pain	8	1
33	Product # 71: Handsfree Call Car Charger,Wireless Bluetooth FM Transmitter Radio Receiver,Mp3 Music Stereo Adapter	8	1
34	Product # 86: Back to the Roots Organic Mushroom Farm Grow Kit, Harvest Gourmet Oyster Mushrooms In 10 days	8	1
35	Product # 4: Vproof Selfie Stick Bluetooth	8	1
36	Product # 46: Ling's moment 5Ft Rose Gold Geometric Boho LED Bedroom Fairy Lights Battery Powered	8	1
37	Product # 6: elago W4 Stand for Apple Watch	8	1
38	Product # 9: Pavilion Gift Company - Spoiled Dog Door Stopper	8	1
39	Product # 118: TechWare Pro Ankle Brace Compression Sleeve - Relieves Achilles Tendonitis, Joint Pain. Plantar Fasciitis	7	0.9
40	Product # 41: Outdoor Waterproof Bluetooth Speaker, Kunodi Wireless Portable Mini Shower Travel Speaker	7	0.9
41	Product # 12: Stranger Things Poster Prints Set of 4 (11 inches x 14 inches)	7	0.9
42	Product # 16: Kyerivs Dog Christmas Costume Dog Santa Claus Costume	7	0.9
43	Product # 44: Ohbingo LED Photo Clips String Lights - 40 Photo Clips Battery Powered Fairy Twinkle Lights	7	0.9
44	Product # 117: Night Light Bluetooth Speaker, Portable Wireless Bluetooth Speakers, Touch Control	6	0.8
45	Product # 37: Shooting Star Puzzle: Handmade & Organic 3D Brain Teaser Wooden Puzzle for Adults	6	0.8
46	Product # 152: Succulent Planters with Tray 2.75 Inch - Set of 6, Small Cute Ceramic Cactus Pots with Bamboo Tray Decor	5	0.6
47	Product # 47: CREATURE CUPS Cthulhu Ceramic Cup (11 Ounce, Black) | Hidden Creepy Animal Inside	5	0.6
48	Product # 49: Harry Potter 48013 Cauldron Soup Mug with Spoon, Standard, Black	5	0.6
49	Product # 80: DELICORE Cactus Neon Signs, LED Remote Control Neon Light with Holder Base for Party Supplies	5	0.6
50	Product # 178: MIRA Stainless Steel Vacuum Insulated Water Bottle | Leak-Proof Double Walled Cola Shape Bottle	5	0.6

51	Product # 180: OMEM Multi Color Aquarium Set Moss Ball Terrarium Gravel Doll Boat Workbench Decoration Turtles	5	0.6
52	Product # 70: Nostalgia Retro Pop-Up 2 Hot Dog & Bun Toaster	5	0.6
53	Product # 95: Cute Cat Thermos Stainless Steel Mini Cartoon Water Bottle Travel Coffee Mug	5	0.6
54	Product # 101: Horsebiz Eco-Friendly Bamboo 2.4 GHZ Wireless Optical Mice DPI 1200/1600	4	0.5
55	Product # 18: Morris The Donkey - Desktop Note Pad, Note Dispenser and Pen Holder	4	0.5
56	Product # 183: Elegant Reusable Bamboo Eco Travel Mug - Easy to Hold Cup for Coffee or Tea.	4	0.5
57	Product # 34: LAGHCAT Mermaid Tail Blanket Blanket for Adult, Oversized Sleeping Blanket	4	0.5
58	Product # 65: Oh, For Fox Sake 15 oz Stemless Funny Glass | Unique Fox Themed Birthday Gifts For Men or Women	4	0.5
59	Product # 68: Pavilion Gift Company, Bee Chicken Pig and Cow Measuring Cups	4	0.5
60	Product # 73: Key Finder, FindKey Wireless Key RF Locator	4	0.5
61	Product # 11: The Original Cat Beard Mug - Cute and Funny Glass Coffee Mug by Nacisse	4	0.5
62	Product # 193: Spaghetti Monster Colander Strainer by OTOTO	4	0.5
63	Product # 72: Wireless Bluetooth Beanie Hat with Headphones V5.0	4	0.5
64	Product # 76: YAHTZEE National Parks Travel Edition | Classic Yahtzee Dice Game with a National Parks Theme	4	0.5
65	Product # 114: Cute Girly Coffee Mug for Mom, Women - Mama Bear - Coral - Unique Fun Gifts for Her, Wife, Mom	3	0.4
66	Product # 125: PAWZ Road Cat Sleeping Bag Self-Warming Kitty Sack 20" 22"	3	0.4
67	Product # 15: Pool Table Billiard Ball Set, Art Number Style	3	0.4
68	Product # 177: BAGAIL 4 Set Packing Cubes,Travel Luggage Packing Organizers with Laundry Bag	3	0.4
69	Product # 23: Fred FUNNY SIDE UP Silicone Egg Mold, Cat	3	0.4
70	Product # 43: JanSport Fifth Ave Fanny Pack, Smiles and Rainbows, For Men and Women	3	0.4
71	Product # 56: G-WACK Stress Relief Desk Toys, SPOLEY Desk Sculpture Decor Fidget Toy	3	0.4
72	Product # 64: Good Day, Bad Day - Funny 11 oz Rocks Glass, Permanently Etched	3	0.4
73	Product # 77: Pocket Blanket -Compact Picnic Blanket (60"x 56") - Sand Proof Beach Blanket / 100% Waterproof Ground Cover	3	0.4
74	Product # 106: Original Travel Journal Scratch Off World Map Diary	3	0.4
75	Product # 179: Dragon Stapler Novelty by Pacific Giftware	3	0.4
76	Product # 184: WeciBor Women's Funny Casual Combed Cotton Socks Packs	3	0.4
77	Product # 191: LOCHAS Deluxe Super Soft Fluffy Shaggy Home Decor Faux Sheepskin Silky Rug for Bedroom Floor Sofa Chair	3	0.4
78	Product # 192: Start Where You Are: A Journal for Self-Exploration	3	0.4
79	Product # 60: Himalayan Glow Round Basket Natural Salt Lamp with Pink Salt Chunks	3	0.4
80	Product # 82: Fred PIZZA BOSS 3000 Circular Saw Pizza Wheel	3	0.4
81	Product # 93: bouti1583 Neck Pillow Realistic Simulation Large Shrimp	3	0.4
82	Product # 104: Chia Pet Bob Ross with Seed Pack, Decorative Pottery Planter, Easy to Do and Fun to Grow, Novelty Gift	2	0.3
83	Product # 107: Beard Grooming for Men Care - Beard Brush, Beard Comb, Unscented Beard Oil Leave-in Conditioner	2	0.3
84	Product # 134: Thermos Funtainer 12 Ounce Bottle, R2D2	2	0.3
85	Product # 148: Decorative Throw Pillow Cover, the Mountains are Calling and I Must Go	2	0.3
86	Product # 153: Rodale's Basic Organic Gardening: A Beginner's Guide to Starting a Healthy Garden, Paperback	2	0.3
87	Product # 154: Fieren Indoor Planter pots,Succulent pots,Small Flower Pot,Indoor Plant Stand for 4.3"	2	0.3
88	Product # 161: Trademark Innovations 32" Portable Curved Shape Lap Desk	2	0.3
89	Product # 167: Paddywax Hygge Collection Scented Candle, 5-Ounce, Rosewood + Patchouli	2	0.3
90	Product # 88: BigMouth Inc Oversized Beach Blanket, Ulta-Soft Microfiber Towel, 5 Feet Wide, Washing Machine Friendly	2	0.3
91	Product # 115: GnD Our Adventure Book Pixar Up Handmade DIY Family Scrapbook Photo Album	2	0.3
92	Product # 129: Tech Tools Hand Pen Holder with Magnetic Back - Desktop Madness Series (HS-8040)	2	0.3
93	Product # 131: FreezerBoy (TM) Dry-Erase Whiteboard Refrigerator Magnets	2	0.3
94	Product # 141: Hand Cup Pen/Pencil Holder by LilGift (Orange)	2	0.3
95	Product # 142: DIY PBN-paint by numbers Abstract tree	2	0.3
96	Product # 163: Love Knot Abstract Circle Spiral 3D Bulbing Night Light Magic Shape Illusions	2	0.3
97	Product # 187: DAVIDJONES Women Hobos Leather Top-handle Bag	2	0.3
98	Product # 188: Funny Mens Colorful Dress Socks - HSELL Fun Novelty Patterned Crazy Design Socks	2	0.3
99	Product # 197: Carhartt Men's Odessa Cap	2	0.3
100	Product # 36: My Nutella Spoon by Weenca-Engraved Spoon-Gifts for Him/Gifts for Her-Perfect Gift	2	0.3
101	Product # 61: CHICVITA Viking Stainless Steel Skull Coffee Mug Viking Skull	2	0.3
102	Product # 62: Fred POT PINCHERS Silicone Pot Holders	2	0.3
103	Product # 63: Decorative Black Bear Glass Salt and Pepper Shaker Set	2	0.3
104	Product # 67: RED Crab Spoon Holder & Steam Releaser by OTOTO	2	0.3
105	Product # 69: Ab Roller for Abs Workout - Ab Roller Wheel Exercise Equipment - Ab Wheel Exercise Equipment	2	0.3
106	Product # 97: Carlie Cute Cat Glass Cup Tea Mug With Fish Tea Infuser Strainer Filter	2	0.3
107	Product # 103: One Size, Labyrinth Cube (INSIDE3) Level : 8 out of 12, One Colour	1	0.1
108	Product # 109: Scented Candles Set, Natural Soy Wax Candle Gift Set for Women Travel Tin Candles for Aromatherapy	1	0.1
109	Product # 112: Silver Buffalo WW0132G DC Comics Wonder Woman Uniform Glitter Ceramic Mug, 14-Ounces	1	0.1
110	Product # 122: Empower Weighted Vest for Women, Weight Vest for Running, Workout, Cardio	1	0.1
111	Product # 124: Acacia Grove Mini Cinder Blocks, 12 Pack, 1/12 Scale	1	0.1
112	Product # 136: Bicycle Playing Cards, Red	1	0.1
113	Product # 138: Open Road Brands Die Cut Embossed Tin Sign, Eat Here Arrow	1	0.1
114	Product # 140: Urban Watercolor Sketching: A Guide to Drawing, Painting, and Storytelling in Color, Paperback	1	0.1
115	Product # 144: Canvas Wall Art for Bedroom, PIY Life is Beautiful Picture Gallery Canvas Prints Home Decor	1	0.1
116	Product # 146: Grasslands Road Wall Starfish GR, Beach is My Happy Place Plaque	1	0.1
117	Product # 158: DII Farmhouse Cotton Stripe Blanket Throw with Fringe For Chair, Couch, Picnic, Camping, Beach	1	0.1
118	Product # 171: Norwegian Wood: Chopping, Stacking, and Drying Wood the Scandinavian Way Hardcover	1	0.1
119	Product # 174: The Most Scenic Drives in America, 120 Spectacular Road Trips Hardcover	1	0.1
120	Product # 176: Book Lover Mug, Yes I Really Do Need All These Books	1	0.1

121	Product # 189: Pen Pencil Holder with Phone Stand, Coolbros Resin Elephant Shaped Pen Container Cell Phone Stand	1	0.1
122	Product # 195: Coogam Toddler Fine Motor Skill Toy, Clamp Bee to Hive Matching Game, Montessori Puzzle	1	0.1
123	Product # 50: Umbra Prisma Tray, Geometric Plated Jewelry Storage	1	0.1
124	Product # 51: Sweet Spot Ice Cream Sandwich Maker, Black	1	0.1
125	Product # 84: True Zoo 3537 Corkatoo Ombre Waiter's Corkscrew, Turn Key, Bar Cart Accessory, 5", Orange	1	0.1
126	Product # 85: Umbra Poise Large Jewelry Tray, Double Jewelry Tray, Attractive Jewelry Storage You Can Leave Out	1	0.1
127	Product # 110: ZowBinBin Cat Ear Stud Earrings Freshwater Cultured Shell Pearl Stud Earrings Sterling Silver Cat Ear Studs	1	0.1
128	Product # 111: Gray Felt Letter Board 10x10 Inches. Changeable Letter Boards Include 300 White Plastic Letters and Oak Frame	1	0.1
129	Product # 119: AceList Color Changing Solar Power Wind Chime	1	0.1
130	Product # 121: Winning Moves Games Classic Twister	1	0.1
131	Product # 137: Retro Pocket Games with LCD Screen	1	0.1
132	Product # 145: Umbra Buddy Wall Hooks Decorative Wall Mounted Coat Hooks	1	0.1
133	Product # 147: Bellaa 22890 Rainbow Capiz Wind Chime Big 26 inch	1	0.1
134	Product # 149: Phantoscope Set of 4 New Living Series Coffee Color Decorative Throw Pillow Case Cushion Cover	1	0.1
135	Product # 151: Umbra Hangit Photo Display - DIY Picture Frames Collage Set Includes Picture Hanging Wire Twine Cords	1	0.1
136	Product # 157: Acrylic tray tea tray and coffee table tray breakfast tray	1	0.1
137	Product # 159: SiamMandalay Setting Sun: STEM Sliding Block Puzzle AKA Huarong Dao or Klotski from with SM Gift Box	1	0.1
138	Product # 162: MyGift Wall Mounted Decorative Rustic Style Wood Framed Chalkboard Memo Message Board	1	0.1
139	Product # 168: MosBug Creative Cloth Hook Clothes Hanger Decorative Hooks Resin Hook	1	0.1
140	Product # 170: Eyeskey Multifunctional Military Metal Sighting Navigation Compass with Inclinometer	1	0.1
141	Product # 173: Camco Classic Red & White Checkered Picnic Blanket with Waterproof Backing	1	0.1
142	Product # 186: 3D Large Size Pin Art Board - Children & Adults - Classic Pin Art Toy Sculpture	1	0.1
143	Product # 22: Dill with It Pickle Funny Cool Wall Decor Art Print Poster 12x18	1	0.1
144	Product # 30: WALIKI Bouncy Horse Hopper -- Bull Riding Hoppy Horse for Kids	1	0.1
145	Product # 40: DARUNAXY 6 Pack Sand Timer Colorful Hourglass Timer (Black Lid 6 Pack)	1	0.1
146	Product # 48: QUALY Nest Sparrow Paper Clip Holder - Green	1	0.1
147	Product # 52: Giraffe Art Print Colorful Geometric Giraffe Wall Art Minimal Animal Safari Theme	1	0.1
148	Product # 74: Mini Bluetooth Speaker - AVWOO Wireless Bluetooth Speaker with Enhanced Bass and Built-in Mic	1	0.1
149	Product # 78: MalloMe Premium Marshmallow Roasting Sticks Set of 5 Smores Skewers & Hot Dog Fork 34 Inch	1	0.1
150	Product # 81: 8oz Bacon & Bourbon Man Candle Hand poured 100% Soy Wax	1	0.1
151	Product # 87: TIMEYARD Macrame Woven Wall Hanging - Boho Chic Bohemian Home Geometric Art	1	0.1
152	Product # 90: Kikkerland Platanus Log Micro Bead Head Cushion	1	0.1
153	Product # 94: llama stuffed animal - The Original No Prob Llama lama alpaca plush animals toy.	1	0.1
	Total	**771**	**100**

APPENDIX 4.4

Hypothesis Testing for Felt Urge to Buy and Purchase Intent as Separate Dependent Variables (Study 5)

Felt urge to purchase

There was a statistically significant difference between conditions as determined by a one-way ANOVA ($F(2,768) = 14.51$, $p < .001$). A Bonferroni post hoc test revealed that the felt urge to purchase was significantly lower for participants who completed the reflection exercise (M=4.10, SD=1.5) than for participants in the control condition (M=4.63, SD=1.32), $p < .001$. The felt urge to purchase was also significantly lower for participants who completed the distraction exercise (M=3.97, SD=1.58) than for control participants (M=4.63, SD=1.32), $p < .001$. There was no statistically significant difference in felt urge to purchase between participants who completed the reflection exercise versus those who completed the distraction exercise ($p = .923$).

Group comparison	Difference in means (a-b)	Sig.
Reflection (a) - Control (b)	-.526	p < .001 ***
Distraction (a) - Control (b)	-.658	p < .001 ***
Reflection (a) - Distraction (b)	.133	p = .923

*$p < .05$ **$p < .01$ ***$p < .001$

Table 25: Felt urge to purchase, group comparisons

Purchase Intent

There was a statistically significant difference between conditions as determined by a one-way ANOVA ($F(2,768) = 4.72$, $p < .01$). A Bonferroni post hoc test revealed that

purchase intent was significantly lower for participants who completed the reflection exercise (*M*=3.97, *SD*=1.67) than for participants in the control condition (*M*=4.37, *SD*=1.57), p = .02. Purchase intent was also significantly lower for participants who completed the distraction exercise (*M*=3.98, *SD*=1.82) than for participants in the control condition (*M*=4.37, *SD*=1.57), *p* < .03. There was no statistically significant difference in purchase intent between participants who completed the reflection exercise versus those who completed the distraction exercise (*p* = 1.0).

Group comparison	Difference in means (a-b)	Sig.
Reflection (a) - Control (b)	-.400	p = .02 *
Distraction (a) - Control (b)	-.390	p = .03 *
Reflection (a) - Distraction (b)	-.011	p = 1.0

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 26: Purchase intent, group comparisons

APPENDIX 4.5

Within-subjects Analyses Treating Felt Urge to Buy and Purchase Intent as Separate Dependent Variables (Study 5)

Summary

Felt urge to buy and purchase intent both drop after completing a reflection exercise or distraction exercise. This holds for all participants, participants with a high initial urge to buy, and participants with a low initial urge to buy.

Reflection Group

All reflection participants: Within subjects in the reflection condition, a paired t-test revealed a statistically significant decrease in felt urge to buy from before the reflection exercise (M=4.50, SD=1.43) to after (M=4.11, SD=1.50), $t(256)=8.82$, $p < .001$. A paired t-test also revealed a statistically significant drop in purchase intent from before the reflection exercise (M=4.51, SD=1.65) to after (M=3.96, SD=1.67), $t(256)=9.27$, $p < .001$.

All reflection participants (N=257)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.486	p < .001 ***
Initial Intent (a) - Post Intent (b)	.541	p < .001 ***

*$p < .05$ **$p < .01$ ***$p < .001$

Table 27: Group comparisons for all reflection participants

Reflection participants with high initial urge: The above results hold when just looking at participants who reported a high initial urge to buy, defined as a score greater than 4 on

a 1 (*low*) – 7 (*high*) scale. A paired t-test revealed a statistically significant decrease in felt urge to buy from before the reflection exercise (*M*=5.79, *SD*=.76) to after (*M*=5.14, *SD*=1.09), *t*(125)=8.22, *p* < .001. A paired t-test also revealed a statistically significant decrease in purchase intent from before the reflection exercise (*M*=5.47, *SD*=1.08) to after (*M*=5.01, *SD*=1.31), *t*(125)=6.92, *p* < .001.

Reflection participants with high initial urge to purchase (N=126)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.651	p < .001 ***
Initial Intent (a) - Post Intent (b)	.667	p < .001 ***

*$p < .05$ **$p < .01$ ***$p < .001$

Table 28: Group comparisons for reflection participants with high initial urge to buy

Reflection participants with low initial urge: The analyses were repeated looking only at participants with a low initial urge to buy, defined as a score less than 4 on a 1 (*low*) – 7 (*high*) scale. The results show that felt urge to buy and purchase intent also decline for these individuals. A paired t-test revealed a statistically significant decrease in felt urge to buy from before the reflection exercise (*M*=2.49, *SD*=.74) to after (*M*=2.2, *SD*=.82), *t*(48)=2.62, *p* =. 012. A paired t-test also revealed a statistically significant drop in purchase intent from before the reflection exercise (*M*=2.43, *SD*=1.10) to after (*M*=2.18, *SD*=1.07), *t*(48)2.72, *p* = .009.

Reflection participants with low initial urge to purchase (N=49)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.286	p = .012 *
Initial Intent (a) - Post Intent (b)	.245	p = .009 **

*$p < .05$ **$p < .01$ ***$p < .001$

Table 29: Group comparisons for reflection participants with low initial urge to buy

Distraction Group

All distraction participants: Among subjects in the distraction condition, a paired t-test revealed a statistically significant drop in felt urge to buy from before the distraction exercise (*M*=4.57, *SD*=1.41) to after (*M*=3.97, SD=1.58), *t*(253)=9.46, *p* < .001. A paired t-test also revealed a statistically significant drop in purchase intent from before distraction (*M*=4.52, *SD*=1.73) to after (*M*=3.98, *SD*=1.82), *t*(253)=8.62, *p* < .001.

All distraction participants (N=254)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.598	p < .001 ***
Initial Intent (a) - Post Intent (b)	.543	p < .001 ***

*$p < .05$ **$p < .01$ ***$p < .001$

Table 30: Group comparisons for all distraction participants

Distraction participants with high initial urge: The above results hold when just looking at participants who reported a high initial urge to buy, defined as a score greater than 4 on a 1 (*low*) – 7 (*high*) scale. A paired t-test revealed a statistically significant decline in felt urge to buy from before the distraction exercise (*M*=5.75, *SD*=.76) to after (*M*=4.96, *SD*=1.29), *t*(123)=7.61, *p* < .001. A paired t-test also revealed a statistically significant drop in purchase intent from before the distraction exercise (*M*=5.65, SD=1.06) to after (*M*=4.98, *SD*=1.59), *t*(123)=6.51, *p* < .001.

Distraction participants with high initial urge to purchase (N=124)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.790	p < .001 ***
Initial Intent (a) - Post Intent (b)	.669	p < .001 ***

*$p < .05$ **$p < .01$ ***$p < .001$

Table 31: Group comparisons for distraction participants with high initial urge to buy

Participants with low initial urge: The analyses were repeated looking only at participants with a low initial urge to buy, defined as a score less than 4 on a 1 (*low*) – 7 (*high*) scale. The results show that felt urge to buy and purchase intent also decline for these individuals. A paired t-test revealed a statistically significant decline in felt urge to buy from before the distraction exercise (*M*=2.43, *SD*=.66) to after (*M*=2.13, *SD*=.86), *t*(45)=3.49, *p* =. 001. A paired t-test also revealed a statistically significant drop in purchase intent from before the distraction exercise (*M*=2.46, *SD*=1.32) to after (*M*=2.13, *SD*=1.09), *t*(45)=3.02, *p* = .004.

Distraction participants with low initial urge to purchase (N=46)		
Group comparison	**Difference in means (a-b)**	**Sig.**
Initial Urge (a) - Post Urge (b)	.304	p = .001 **
Initial Intent (a) - Post Intent (b)	.326	p = .004 **

$^{*}p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 32: Group comparisons for distraction participants with low initial urge to buy

APPENDIX 4.6

Correlations Between Variables Thought to Influence Impulse Buying Urge (Study 5)

	Impulse Buying Tendency	Need for Cognition	Motivation	Self-Efficacy	Age	Income	Frequency of Impulse Buying	Education	Impulse buying urge
Impulse Buying Tendency	1								
Need for Cognition	-.043	1							
Motivation	-.174**	.013	1						
Self-Efficacy	-.588**	.122**	.152**	1					
Age	.004	.122**	-.02	.005	1				
Income	.071	.092*	-.036	-.067	.007	1			
Frequency of Impulse Buying	.512**	-.002	-.068	-.435**	-.058	.143**	1		
Education	-.078**	.099**	-.010	.826	.132**	.382**	.026	1	
Impulse buying urge	**.43****	**.054**	**-.058**	**-.237****	**-.025**	**-.020**	**.225****	**-.087****	**1**

$*p < .05$ $**p < .01$ $***p < .001$

Table 33: Correlations between variables thought to influence impulse buying urge

APPENDIX 4.7

Regression Models Testing Interaction Terms (Study 5)

Regression models testing interaction terms that predict impulse buying urge. Model 5 is the baseline model that does not include interaction terms. Model 6 and 7 test IBT x Condition. Models 8 and 9 test NFC x Condition.

	Model 5 $F(3,767)=64.55$, $p < .001$	**Model 6** $F(4,766)=48.35$, $p < .001$	**Model 7** $F(4,766)=48.45$, $p < .001$	**Model 8** $F(5,765)=39.86$, $p < .001$	**Model 9** $F(5,765)=39.98$, $p < .001$
constant	2.535 *** (.172)	2.546 *** (.204)	2.59 *** (.202)	2.11 *** (.286)	2.21 *** (.281)
Impulse Buying Tendency (IBT)	.096 *** (.007)	.095 *** (.009)	.093 *** (.009)	.097 *** (.007)	.097 *** (.007)
Reflection Condition	-.409 ** (.120)	-.441 (.333)	-.411 ** (.120)	-.352 (.382)	-.402 ** (.120)
Distraction Condition	-.423 *** (.120)	-.423 *** (.121)	-.595 (.332)	-.426 *** (.120)	-.683 (.399)
Need For Cognition	____	____	____	.025 (.014)	.019 (.281
IBT*Reflection	____	.002 (.015)	____	____	____
IBT*Distraction	____	____	.009 (.016)	____	____
NFC*Reflection	____	____	____	-.003 (.022)	____
NFC*Distraction	____	____	____	____	.015 (.023)
Adj. R^2	.198	.197	.198	.202	.202

$^{*}p < .05$ $^{**}p < .01$ $^{***}p < .001$

Table 34: Study 5 regression models testing interaction terms

APPENDIX 4.8

Regression Models Predicting the Change in Impulse Buying Urge (Study 5)

Regression models predicting the change in impulse buying urge (i.e., pre-impulse buying urge minus post-impulse buying urge) for the reflection and distraction conditions. Reflection Condition is a dummy variable with Distraction condition as the reference variable. Models and predictors are not statistically significant.

	Model 10 $F(2, 508)=.358, p = .699$	**Model 11** $F(3,507)=.817, p = .485$
constant	.497 * (.192)	.453 * (.195)
Reflection Condition	-.046 (.082)	-.045 (.082)
Intervention difficulty	.018 (.044)	.021 (.044)
Time spent on intervention	——	.0001 (.0001)
Adj. R^2	-.003	-.001

$^*p < .05 \quad ^{**}p < .01 \quad ^{***}p < .001$

Table 35: Study 5 regression models predicting the change in impulse buying urge between reflection and distraction conditions.

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