On My Own: The Aversion to Being Observed during the Preference-Construction Stage

YONAT ZWEBNER
ROM Y. SCHRIFT

Previous research in consumer behavior and decision-making has explored many important aspects of social observation. However, the effect of social observation during the specific time wherein consumers construct their preferences remains relatively understudied. The present work seeks to fill this knowledge gap and adds to this literature by studying how consumers react to being observed during the preference-construction stage (i.e., prior to reaching their decision). While existing research on social observation focuses on accountability and self-presentation concerns, the present study uncovers an additional unique concern. Specifically, eight studies (three additional studies reported in the web appendix) find that being observed prior to reaching the decision threatens consumers' sense of autonomy in making the decision, resulting in an aversion to being observed. Furthermore, we find that such threats lead consumers to terminate their decision by avoiding purchase or by choosing default options. Given the extent to which consumers are observed in the marketplace by other individuals and by online platforms, and given the rise in consumers' privacy concerns associated with such practices, understanding consumer reactions to being observed in the pre-decisional stage is an important topic with practical implications.

Keywords: constructed preferences, privacy concerns, sense of autonomy, social influence, online tracking

INTRODUCTION

Throughout our lives, many decisions are made in the presence of others. Whether deciding which products to purchase at a store, which dish to order from a restaurant menu, or when making decisions as part of a group, people around us such as friends, family members, colleagues, sales associates, and even strangers may observe us during the time wherein we construct our preferences (i.e., deliberate), and also when we reveal them (i.e., actively select our preferred option). Today, the pervasiveness of situations in which we are observed (or even merely feel observed; Gilovich, Victoria, and Kenneth 2000) goes beyond direct human interactions: companies invest increasing resources to track, monitor, and analyze consumers' marketplace activities, both online and off-line, at different stages of the decision process. Technological advances enable firms not only to record and track transactions but also to analyze consumers' responses to their offerings even prior to making their decisions. For example, retailers are now "using new spy techniques to monitor customers' facial expressions" (*The Telegraph*, UK, 2017); machine learning systems gauge consumers' reactions to online content through webcams (e.g., Realeyesit.com),

Yonat Zwebner (zwebner.yonat@idc.ac.il) is an assistant professor of marketing, Arison School of Business, Interdisciplinary Center (IDC), Herzliya 4610101, Israel. Rom Y. Schrift (rschrift@iu.edu) is an associate professor of marketing, Kelley School of Business, Indiana University, Bloomington, IN 47405, USA. Please address correspondence to Yonat Zwebner. The majority of this work was completed while Yonat Zwebner was a postdoctoral research fellow at The Wharton School, University of Pennsylvania. The authors are grateful for the financial support of the Wharton Behavioral Lab. Supplementary materials are included in the web appendix accompanying the online version of this article.

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and smart devices in retail establishments track consumers' behavior and movement in the store (e.g., Brickstream.com, Retailnext.com).

Moreover, online retailers (e.g., AMAZON.com, NETFLIX) often use messages that highlight whether recommended products are based on consumers' ultimate choice (e.g., "inspired by your purchases") or based on their deliberation process (e.g., "inspired by your browsing history"). Accordingly, various messages commonly used in the online marketplace make it salient to consumers that both their final purchase and pre-purchase activities are being monitored and tracked. Thus, given the extent to which consumers are observed in the marketplace, and given the rise in consumers' privacy concerns associated with such practices (Malhotra, Sung and James 2004; Peltier, George, and Joseph 2009), understanding consumer reactions to being observed is an increasingly important topic with both theoretical and practical implications. How do consumers react to being observed during the time they construct their preferences? Are these reactions unique compared to being observed during the time consumers reveal their preferences? If so, why?

We find that consumers are particularly averse to being observed during the time they construct their preferences and that such aversion stems from threats to their sense of autonomy in making the decision. That is, even if the observing entity may not see what consumers end up choosing, the mere act of being observed during the preference-construction stage makes consumers feel exposed to outside influence, which undermines their sense of independence and decision autonomy. This, we show, leads consumers to avoid, if possible, being observed in the preference-construction stage. Moreover, if such observation does occur, consumers distort their preferences and behave in a manner that enables them to resolve the decision with as little conflict as possible (e.g., choose default options or not purchase at all).

We contend that this study, which lies at the intersection of social influence and decision-making, makes several theoretical and practical contributions. First, although previous research has explored many aspects of social observation, the effect of social observation during the specific time in which consumers construct their preferences remains relatively understudied. The present work seeks to fill this knowledge gap and adds to this literature by studying how consumers react to being observed during the preference-construction stage (i.e., prior to reaching their decision). More broadly, while the extant literature has mainly focused on accountability and self-presentation concerns, the present study uncovers an additional and unique concern, namely, threats to consumers' sense of decision autonomy. Relatedly, the present study adds to a recent and growing body of research demonstrating that the choice process (as opposed to the choice outcome) is an important factor to consider in studying social influence (Critcher, Yoel, and David 2013; Kupor et al. 2014; Lamberton, Rebecca, and Kelly 2013; Schrift and Amar 2015).

Second, this study adds to the ample research on consumer-constructed preferences (Bettman, Mary, and Jonn 1998). Specifically, decades of research demonstrate that preferences are often constructed and, therefore, cues in the environment shape and influence consumers' ultimate choice. Our findings suggest that, at some level, consumers are sensitive to the potential influence that may ensue specifically during the preference-construction phase. Thus, while existing research focuses on how external cues impact preferences and choice, the present study explores how consumers' sensitivity to such external influence affects their behavior.

Third, adding to the research on privacy concerns in consumer settings, we demonstrate that consumers' aversive reactions to being observed stem not only from concerns relating to how companies use and share their information (Malhotra et al. 2004; Peltier et al. 2009) but also from concerns relating to consumers' ability to independently reach a choice, free of external influence. Thus, we add to this literature by documenting concerns that are specific to the pre-decisional stage.

In what follows, we review relevant literature, develop our theoretical framework, and state our hypotheses. We then report eight studies that explore (i) consumers' aversion to being observed during the preference-construction phase, (ii) the impact of such aversive reactions on consumers' ultimate choices, and (iii) the underlying psychological mechanism involved. In addition, we rule out several rival accounts and demonstrate that the effect goes beyond (and often opposite to) what may be expected from increased accountability and self-presentation concerns. We conclude by discussing the contribution of this research and its limitations and suggest avenues for future research.

THEORETICAL DEVELOPMENT

How the presence and observation of others around us affect our own actions and behavior is one of the oldest questions in the field of social psychology (Triplett 1898; Zajonc 1965). Over recent decades, various aspects of social observation have been studied, inspiring and informing many streams of research, one of which is the social facilitation literature that has mainly focused on how mere presence and social observation influence performance on various physical and cognitive tasks (Cottrell et al. 1968; Guerin 1986; Sanna and Shotland 1990). In the decision-making and consumer behavior literatures, social observation and mere-presence effects have garnered much attention, attesting to the prevalence of situations in the marketplace wherein consumers are observed or merely

feel observed (see, e.g., the spotlight effect, Gilovich et al. 2000). When considering how consumers react to observations that occur at different stages of the decision, we need to first examine existing findings regarding consumers' accountability and self-presentation concerns.

Accountability and Self-Presentation Concerns

Research in judgment and decision-making suggests that decision-makers feel a greater sense of accountability over their decisions when observed by others. Accountability concerns are broadly defined as "implicit or explicit expectations that one may be called on to justify one's beliefs, feelings, and actions to others" (Lerner and Tetlock 1999, 255; for a review see Lerner and Tetlock 1999). Findings in the accountability stream show that people often seek approval from their respective audience (Baumeister and Leary 1995), tend to conform to the observers' opinions and preferences (Cialdini et al. 1976; Tetlock 1983), and choose the more socially desired options (Andreoni and Bernheim 2009; Ariely, Anat, and Stephan 2009; Dana, Daylian, and Robyn 2006; Van Rompay, Dorette, and Marieke 2009).

Pertinent to the distinction that we advance in the present study between being observed during the preference-construction stage and the time at which one announces his or her choice, the literature distinguishes between two types of accountability: process and outcome accountability (Escalas and Luce 2004; Hui et al. 2004; Siegel-Jacobs and Yates 1996; Simonson and Staw 1992). Outcome accountability pertains to evaluating the decision-maker based on the outcome of the decision, regardless of the process leading thereto, whereas process accountability refers to situations wherein the decision-maker is evaluated based on the decision process, regardless of its outcome.

Several findings support the notion that outcome accountability triggers greater stress (Janis and Mann 1976; Siegel-Jacobs and Yates 1996), narrows attentional capacity (Skitka, Kathleen, and Mark 2000), increases the likelihood of choosing defaults (Garg, Jeffrey, and Vikas 2017), leads to the escalation of commitment, and heightens the need for self-justification (Arkes, Robyn, and Caryn 1986; Simonson and Staw 1992). In contrast, process accountability was found to lead decision-makers to engage in more comprehensive evaluation of alternatives, decrease the need for self-justification, and improve accuracy and confidence in judgment (Ashton 1992; Chaiken 1980; De Dreu et al. 2006; Doney and Armstrong 1996; Hagafors and Brehmer 1983; Siegel-Jacobs and Yates 1996; Simonson and Staw 1992). Thus, from an accountability perspective, one would expect consumers to be more bothered by being observed at the time at which they reveal their preferences (i.e., actively reveal their chosen option) than during the time they deliberate and construct their preferences.

While highly informative for the research question at hand, it is important to note that research examining process accountability typically did not focus on active observation that occurs during the deliberation phase. Rather, decision-makers were told that, after they reached their decision, they would be asked to justify how or why they arrived at a particular response, regardless of the outcome (Scholten et al. 2007; Siegel-Jacobs and Yates 1996; Zhang and Mittal 2005). We contend, and empirically demonstrate, that the aforementioned paradigms, which involve post-choice justification, are distinct from observation that occurs in real time during the deliberation phase. That is, while the former gives rise to process accountability, real-time observation of one's decision-making process gives rise to unique concerns that are not prevalent when one needs to justify the decision process post hoc.

Strongly linked to accountability study, consumer behavior research has explored how the mere presence of others, as well as reference-group considerations, triggers self-presentation concerns (Argo, Darren, and Rajesh 2005; Argo and Main 2008; Bearden and Etzel 1982; Childers and Rao 1992; Dahl, Rajesh, and Jeniffer 2001; Moschis 1976; Ratner and Kahn 2002). Such self-presentation concerns are distinct in that they capture consumers' motivation to be viewed in a positive light and, therefore, lead them to engage in impression-management behaviors (Argo et al. 2005; Leary and Kowalski 1990; Leigh and Gabel 1992).

Indeed, research in shopping environments has demonstrated that, although in some cases consumers seek interaction with others (Argo et al. 2005; Baumeister and Leary 1995), sensing the physical presence of others and in-store crowding can elicit negative emotional states such as embarrassment (Dahl et al. 2001; Edelmann 1987; Miller and Leary 1992), tension, and discomfort, as individuals may feel that their personal space is violated (Hui and Bateson 1991; Xu, Hao, and Robert 2012; Zhang et al. 2014).

Note that while previous research did examine various facets of social observation in shopping and decision-making contexts, it did not specifically focus on active observation that occurs in the preference-construction stage. For example, Argo et al. (2005) explored how the mere presence of other shoppers increases consumers' tendencies to manage their impressions. Accordingly, as the focus of their study was on mere-presence effects, the procedure ensured that confederates avoid directly observing subjects. As we argue and later empirically demonstrate, active observation that occurs during the preference-construction stage leads to unique aversive reactions that are not triggered by, and that go beyond, mere-presence effects and impression management.

Similarly, while Dahl et al. (2001) acknowledged that negative emotional states may ensue when being observed at different stages of the decision, they focused on the stage in which consumers reveal their preferences (e.g., actively

state or select their preferred product) and not on the pre-decisional stage. Additional research that tracked consumers in retail environments (Hui, Eric, and Peter 2009; Zhang et al. 2014) provides important insights about the impact of various social factors and interactions such as shopper density, group size, within-group discussions, and sales associate contact. However, while some of the findings are consistent with the patterns we find, it is difficult to determine based on such data exactly when shoppers were, or merely felt, observed and to cleanly isolate the pre-decisional stage.[1]

Taken together, existing research has mainly focused on observations that occur at the time when consumers actively reveal their final choice and mainly explored consumers' self-presentation and accountability concerns. We argue that being observed during the preference-construction stage gives rise to a unique and understudied concern that emanates from threats to consumers' sense of autonomy in making the decision. While accountability and self-presentation concerns are focused outward (e.g., being judged by others and engaging in impression-management behavior), threats to sense of autonomy are focused inward, as they relate to consumers' perceived ability to choose independently and free from external influence.

Threats to Sense of Autonomy

Sense of autonomy is directly linked to the freedom of choice (Deci, Koestner, and Ryan 1999; Kim et al. 2015; Ryan, Scott, and Andrew 2006) and is one of the most fundamental intrinsic motivations in humans (Deci et al. 1999; Ryan and Deci 2000). Sense of autonomy has been studied quite broadly, mainly as a moral, political, and social ideal (Dworkin 1988). Specific to decision-making contexts, we adopt the definition of several theorists (Bandura 1989; Ekstrom 2005; Ryan and Deci 2006) who regard sense of autonomy as the feeling that decisions are made free from external influence. Accordingly, sense of autonomy is expressed by focusing attention inward and being independent of others' influence (Feist 1999) and often involves the differentiation of self from others (Feist 1999; Kerr and Gagliardi 2003). We contend, however, that being observed triggers the exact opposite feelings: instead of feeling independent and differentiated from others, being observed reduces feelings of independency and threatens the decision-maker's sense of autonomy.

Given that sense of autonomy is central to one's sentiment for choice freedom, we argue that this fundamental motivation is most pronounced during the time individuals construct their preferences and are sensitive to external influence (Bettman 1979; Bettman and Park 1980; Bettman et al.1998; Lichtenstein and Slovic 2006; Payne, James, and Eric 1992; Slovic 1995; Tversky, Shmuel, and Paul 1988). Therefore, while decision-makers strive to be autonomous, differentiated from the other, and free from external influence (Ryan and Deci 2006), being observed specifically during the time they construct their preferences may lead to the exact opposite feelings.

Indeed, extant research suggests that being observed may foster the feeling that one is conceptually integrated with others and therefore go against one's desire to feel as an independent and an autonomous entity. Specifically, findings suggest that one may integrate the observer's thoughts and perceptions into their own (Shteynberg 2015; Smith and Mackie 2016). More so, individuals are found to establish a shared reality with an observer, simultaneously perceiving themselves through their own lens and through that of the observer (Hardin and Higgins 1996), and spontaneously construct mental representations of others' responses and experiences (Smith and Mackie 2016). Research on shared experiences further highlights instances in which one incorporates multiple perspectives, their own and of others, when performing certain actions (Boothby, Margaret, and John 2014; Shteynberg 2015; Steinmetz et al. 2016).

Relatedly, research on perspective taking (Davis et al. 1996; Hass 1984; Hatfield, John, and Rapson 1993; Howard and Gengler 2001; Schrift and Amar 2015) has demonstrated that taking others' perspectives often involves the incorporation of the self within the boundary of the other and can blur self-other distinctions (Cialdini et al. 1997; Lerner 1980; Neuberg et al. 1997; Wegner 1980). As Davis et al. (1996) noted, "... the effect of active perspective taking will be to create a merging of self and other." Finally, previous research also found that people tend to overestimate the extent to which their behavior and appearance are noticed and evaluated by others (Gilovich et al. 2000) and also tend to overestimate the extent to which their internal states leak out and are detectable by others, a tendency referred to as the "Illusion of Transparency" (Gilovich, Kenneth, and Victoria 1998).

Taken together, ample research suggests that being observed may reduce people's sense of independence due to several processes that may be at play. Since feelings of independence is strongly tied to sense of autonomy, such integration with an observer, and a shared experience rather than a solitary one, could therefore reduce one's sense of autonomy, which is critical especially during the preference-construction stage. That is, given that decision-makers strive to be autonomous, and free from external influence especially while constructing their preferences, we hypothesize that being observed during the preference-construction stage will threaten consumers' sense of decision autonomy, leading to aversive reactions.

1 Zhang et al. (2014) tried to isolate the pre-decisional stage by also modeling consumers' tendency to touch the product prior to purchase. In the general discussion, we elaborate on how our findings relate to some of the findings by Hui et al. (2009) and Zhang et al. (2014).

Note that, in the current context, we conceptualize threat to sense of decision autonomy as localized and specific to the decision at hand. That is, we do not contend that being observed in the pre-decisional stage challenges individuals' general beliefs in their sense of autonomy in their lives. Rather, we contend that such threats are specific to the impending decision and pertain to subjects' perceived ability to choose their preferred option free of external influence. Accordingly, after the preference-construction stage has ended and consumers already know what they are about to choose, such aversive reactions should attenuate.

Before moving forward, it is also important to distinguish sense of autonomy from sense of control, which is related yet distinct constructs. Specifically, Skinner (1996) argued that the constructs related to autonomy are outside the proper domain of control: "The need for competence is often confused with the need for autonomy, and hence perceived control constructs are often confused with the belief systems that result from experiences of autonomy, such as locus of causality" (DeCharms 1981; Rodin 1990). Similar to Skinner (1996), Deci and Ryan (1985) suggested that there are important differences between the concepts of control and autonomy. Control refers to there being a contingency between one's behavior and the outcomes one obtains, whereas autonomy refers to the experience of freedom in initiating one's behavior. Thus, the need for autonomy refers to the innate desire to experience one's self as the true origin of one's own actions (DeCharms 1981; Deci and Ryan 1985), which is distinct from the desire to experience oneself as effective in producing and preventing desired and undesired outcomes. To elucidate this distinction, imagine that you are asked to choose between two lotteries. As the outcomes are determined randomly, you would likely feel a relatively low level of control. However, provided that the choice of a lottery was volitional and independent, you could still feel a sense of autonomy. Being able to freely and independently choose the desired option, regardless of one's control over the outcome, is what distinguishes autonomy from control.

Process versus Outcome Stages

Our conceptual and experimental framework distinguishes between two different stages of the decision in which consumers may be observed. In particular, the preference-construction stage (which we also refer to as the pre-decisional or process stage) captures the stage wherein consumers are still deliberating about the impending choice, reviewing the available information about the alternatives, and examining the trade-offs they are willing to make. Distinctly, the stage wherein consumers' preferences are *already* constructed (which we also refer to as the post-decisional or outcome stage) captures the stage in which consumers already know their preferences and reveal them by either announcing their choice (e.g., asking a sales associate for a particular product) or actively acting upon it (e.g., taking a product off the shelf). Notably, this distinction pertains to whether consumers are still in the midst of constructing their preferences while being observed or had already finished constructing their preferences and are being observed while indicating their choice.

Relatedly, our theorizing, which suggests that threats to sense of decision autonomy will ensue only if consumers are observed prior to finalizing their choice, leads to predictions that are distinct from those made based on accountability and self-presentation concerns. Specifically, we hypothesize that even in cases wherein consumers are observed during their preference-construction stage, only observation that occurs in real-time should threaten their sense of autonomy. If consumers learn, for example, that someone will observe their deliberation phase but will do so only after they have reached their decision (e.g., through a video recording), threats to sense of decision autonomy should not ensue (as their choice will already be finalized by the time the observation takes place). Unlike these specific threats to autonomy, process-related accountability and self-presentation concerns should ensue regardless of whether the decision process is observed in real time or off-line (later in a recording). Concerns about being judged and evaluated based on the decision-making process, as well as the motivation to present oneself in a positive light, are equally likely to arise when being observed in real time and off-line. Accordingly, teasing apart autonomy-related concerns from accountability and self-presentation concerns, we hypothesize that the aversive reactions to being observed during preference construction will be more pronounced when consumers are observed in real time as opposed to off-line.

Overview of Studies

We divide the empirical section into three parts. In the first (studies 1 and 2), we highlight the importance of studying consumers' reactions to being observed during the pre-decisional stage. We demonstrate that active observation that occurs during this stage impacts consumers' choice beyond observations that occur when consumers reveal their choice or by the mere presence of others (without active observation). As the goal of these studies was to examine consumers' reactions in a relatively realistic setting, we intentionally did not use intrusive process measures and inferred consumers' aversion to being observed based on their decisions. In both studies, we found that consumers are more likely to avoid the deliberation stage by opting out (study 1) or by choosing defaults (study 2) when they are observed—or even anticipate being observed—during the preference-construction stage.

In the second part of the empirical section (studies 3–6), we test the proposed underlying psychological mechanism. We find that the aversion to being observed during the

pre-decisional stage is mediated by a decreased sense of decision autonomy and not by self-presentation concerns (study 3). Consistent with threats to sense of autonomy, and inconsistent with accountability and self-presentation concerns, we find that such aversion is more pronounced when the observation occurs in real time as opposed to offline (studies 4 and 5). Unlike studies 1 and 2, studies 3–5 employed more direct measures of consumers' aversive reactions, such as self-reported (studies 3–5) and physiological measures (study 5). Study 6 further validates the role of preference construction by demonstrating that consumers' aversive reactions attenuate if their preferences are already constructed at the time the observation occurs.

In the third part of the empirical section (studies 7a and b), we examine additional implications in an online setting. We find that consumers are bothered more by online platforms that track their decision process compared to decision outcome (study 7a) and that this aversion decreases consumers' intention to use such online platforms (study 7b).

Throughout the studies, we operationalized the observation in various ways such as direct observation (studies 1, 2, and 5), computer's camera (studies 5 and 6), or imaginary scenarios (studies 3, 4, and 7). It is noteworthy that there are several experimental challenges of examining consumers' reactions to being observed. Because an experimental setting requires individuals to consent explicitly to participate in the study, examining their reactions to being observed and trying to detect aversive reactions is challenging. That is, after providing consent to participate (and essentially agreeing to be observed), participants may feel less comfortable explicitly stating their aversion to being observed even if such aversion exists. To address this experimental challenge, other than employing self-report measures, we used proxies for aversion in the form of choice (studies 1 and 2), as well as physiological measures such as galvanic skin response (study 5). Furthermore, the observations, in most cases, supposedly occur outside the context of the main study (e.g., being observed by a bystander or a research assistant after the study has concluded).

STUDY 1: BEING OBSERVED DURING VERSUS AFTER THE PREFERENCE-CONSTRUCTION STAGE

The main purpose of this study was to test whether active observations that occur during the preference-construction stage (decision-process condition) trigger aversive reactions beyond those triggered by (i) observations at the stage wherein consumers reveal their choice (decision-outcome condition) or (ii) the mere presence of others (mere-presence condition). This study used a relatively realistic setting in which participants made a purchasing decision involving real monetary consequences while observed by a confederate, who was ostensibly a bystander. We operationalized participants' aversive behavior by their decision to opt out and purchase nothing. We predicted that participants' aversion to being observed – and therefore, their likelihood of opting out – would be higher in the decision-process condition than in the decision-outcome and mere-presence conditions.

Method

Participants. Two hundred individuals (*Mean* age = 24.69, 50.9% females) were recruited on the university campus by two blind-to-hypothesis experimenters. Passersby on the university's main campus were approached by the experimenter, who requested their participation in the study in exchange for a pack of gum. Although the experimenters did not keep specific track of participation rate, it was relatively high and estimated at 40%. Of these individuals, 21 decided to leave the study prior to receiving the full instructions of the study and prior to being assigned to conditions (i.e., prior to the administration of the manipulation) and, therefore, could not be included in the analysis. An additional six respondents were rated by the experimenter as being inattentive to the study procedure and instructions and/or failing to follow its procedures. These participants were excluded, yielding a total sample size of 173 (including these six participants does not substantially change the pattern of results; see Results section for further details).

Procedure. Due to the elaborate design and the use of a confederate, each participant was recruited and tested separately. Upon agreeing to participate and signing the consent form, the participant received a $1 bill and was accompanied by the experimenter to a relatively quiet area on campus, where the materials for the study were set up. The experimenter then pointed to a table that was located a few feet away and explained to the participant that on this table s/he will find 10 baskets, each containing different products with a value of $0.10 each. Furthermore, the participant was informed that he or she could use the $1 bill to purchase between 0 and 10 products and receive change accordingly, or not purchase anything and walk away keeping the $1 bill. The experimenter also instructed that only one product from each basket may be chosen.

Next, the participant was handed a slip with a chart of numbers from 1 to 10 corresponding to each basket and was instructed that when deciding at the table which products, if any, to purchase, to indicate on the slip their chosen products, before heading back to the experimenter to announce their choice. On the table, each of the 10 baskets carried a sign listing the names of the products and their prices (i.e., $0.10 apiece). Products included flashing rings, temporary tattoos, bracelets, emoji stamps, bookmark

sticky notes, glowing eyeglasses, binder clips, beach balls, emoji stickers, and neon sunglasses.

During the time the experimenter was explaining the study's procedure to the participant, the confederate, ostensibly a bystander, approached and asked the experimenter: "Hi. is there a survey running here?" After the experimenter replied in the affirmative, the confederate asked if s/he could also participate. The experimenter agreed, and his reply followed one of the three scripts corresponding to the three experimental conditions: In the *decision-process condition*, the goal was to have participants observed during their deliberation process without the confederate knowing what they decided to purchase. Accordingly, in this condition, the experimenter instructed the confederate to stand next to the table and wait until the current participant approached the table and finished selecting the products. After the confederate did so, the experimenter concluded the instructions for this study and the participant walked a few feet to the purchasing table while the experimenter remained in place. The confederate was standing near the purchasing table and was observing the participant from the moment s/he approached the table to the moment s/he left the table and headed back to the experimenter. We assigned the confederate's location such that he could not see which products the participant marked on the slip. Furthermore, by asking participants to use the slip to mark their chosen products, we ensured that participants did not feel that their choices were being observed by the confederate at the table.

In the *decision-outcome condition*, the goal was to have participants observed during the time they revealed their decision, but not during deliberation. Accordingly, in this condition, the experimenter instructed the confederate to stand and wait near the experimenter until the participant returned to the experimenter to reveal his/her purchasing decision. Therefore, in this condition, although the confederate did not observe the participant's deliberation stage, participants were made aware that the confederate was waiting near the experimenter and would watch and learn about their final choices. Furthermore, asking participants to confidentially mark their chosen products on the slip after deliberating while still at the table ensured that participants had finished constructing their preferences prior to announcing it in front of the experimenter and the confederate.

In the *mere-presence condition*, the goal was to have participants in the presence of the confederate during the time they deliberate their decision, but without being actively observed. Accordingly, similar to the decision-process condition, the confederate was instructed to stand next to the table and wait until the current participant approached the table and finished marking the selected products on the slip. However, in the mere-presence condition, the confederate conspicuously stood with his back to the participant and to the table, thus, merely being present but not actively observing the participant during the preference-construction stage.

The role of the confederate was switched after every participant, so as to randomly assign passersby to one of the three experimental conditions. Participants in all three conditions approached the experimenter after making their decisions and handed the experimenter their slip. Based on their decisions, participants paid the experimenter and received their chosen products, along with their change (if their purchases totaled less than \$1). If participants decided to purchase nothing, they kept the \$1 bill without receiving any products. The dependent variable in this study was participants' decision to pocket the money and not purchase any of the products.

Results and Discussion

A χ^2 test revealed that the aversion to being observed significantly differed across conditions ($\chi^2(2) = 6.74$, $p = .034$). As predicted, participants assigned to the *decision-process* condition were significantly more likely to opt out and keep the \$1 bill (41.3%) than were those assigned to the *decision-outcome* condition (24.1%; $\chi^2(1) = 4.01$, $p = .045$) or the *mere-presence* condition (21.2%; $\chi^2(1) = 5.28$, $p = .022$). No significant difference was found between the decision-outcome and mere-presence conditions ($\chi^2(1) = 0.14$, $p = .709$).[2]

Examining the average sum spent across conditions reveals a weaker though similar pattern ($F(2, 172) = 2.67$, $p = .072$): on average, participants in the decision-process condition spent less money ($M = \$0.15$, SD = 0.17) than did those in the decision-outcome condition ($M = \$0.21$, SD = 0.23, $t(119) = 1.76$, $p = .081$, $d = 0.30$) or those in the mere-presence condition ($M = \$0.24$, SD = 0.26, $t(113) = 2.27$, $p = .025$, $d = 0.42$). No significant difference was found between the decision-outcome and mere-presence conditions ($t(108) = 0.58$, $p = .563$).

In a relatively realistic setting, this study finds that individuals who were observed during their decision process were more likely to opt out and purchase nothing than were individuals who were observed when announcing their choice or deliberated in the mere presence of others. Notably, although the confederate who observed participants during their decision process could not see what they eventually chose, participants were still more likely to pocket the money and purchase nothing. Accordingly, outcome-accountability concerns (i.e., that the observer

2 When including the six individuals who were dropped (see Method) the results do not substantially change: χ^2 revealed that the aversion to being observed significantly differed across conditions ($\chi^2(2) = 7.71$, $p = .021$): Participants in the *decision-process* condition were significantly more likely to opt out (43.1%) than were those in the *decision-outcome* condition (26.2%; $\chi^2(1) = 3.93$, $p = .047$) or the *mere-presence* condition (20.8%; $\chi^2(1) = 6.57$, $p = .010$). No significant difference was found between the decision-outcome and mere-presence conditions ($\chi^2(1) = .47$, $p = .493$).

would learn about their chosen options) cannot explain the observed pattern of results. Moreover, the results cannot be explained by mere-presence accounts, as purchase likelihood did not decrease in the mere-presence condition. Finally, accounts relating to participants feeling rushed by the observer while making their decision are also less plausible, as it was salient across all conditions that the confederate was waiting until participants finalized their choice. The next study further explores the aversion to being observed during the preference-construction stage by examining participants' likelihood of choosing a default option.

STUDY 2: CHOICE OF DEFAULT OPTIONS WHEN OBSERVED DURING THE PREFERENCE-CONSTRUCTION STAGE

Prior research demonstrated that the effects of social presence on behavior do not necessitate the physical presence of others. Even thinking, anticipating, or imagining others' presence can lead to similar effects (Dahl et al. 2001; Edelmann 1981; Latané 1981; Miller and Leary 1992). Accordingly, in study 2, participants were entered in a raffle for winning a t-shirt and were given a choice to either design their preferred t-shirt or receive a default t-shirt. We tested whether the mere expectation of being observed during the configuration process triggers aversive reactions resulting in preferences for the default option.

Method

Two hundred seventeen paid participants recruited in the university's laboratory participated in this study (*Mean* age = 21.29, 67.3% females). After completing unrelated studies, participants were entered in a raffle for a university-branded t-shirt. Participants had the option of either configuring their t-shirt or choosing the default t-shirt (based on the gender and size they had indicated earlier). Critically, they learned that configuring the t-shirt entailed selecting their preferred color, neck type, logo, and style.

Prior to making their choice, participants were randomly assigned to one of the two conditions: decision process or decision outcome. Those randomly assigned to the *decision-process* condition also learned that for tracking purposes, if they chose to configure their t-shirt, the research assistant would observe them doing so. Participants assigned to the *decision-outcome* condition were not told that their process would be observed. Finally, controlling for outcome accountability, all participants learned that at the end of the study they would need to inform the research assistant which t-shirt they chose. Thus, though in both conditions it was clear that the final choice would be revealed to the research assistant, in the decision-process condition, participants knew that configuring their t-shirt entailed being observed during their decision process. Our dependent variable in this study was participants' choice of the default t-shirt. We predicted that participants' aversion to being observed – and therefore, their likelihood of choosing a default option – would be higher in the decision-process condition than in the decision-outcome condition.

Finally, at the end of the study, we also measured participant's sense of apprehension over being evaluated by others using the Social Anxiety Scale (Fenigstein, Michael, and Arnold 1975; Scheier and Carver 1985; see appendix A for list of items). Participants indicated their agreement with each of the eight items (on a 0–4 scale ranging from *extremely uncharacteristic* to *extremely characteristic*; Cronbach's $\alpha = .72$). This measure allowed us to test whether our proposed effect goes beyond individuals' innate and general aversion to being observed by others due to self-presentation concerns. The responses to this scale were not affected by the manipulation ($p = .875$).

Results and Discussion

Pretest. Because we did not want participants to infer the main purpose of the study, a separate pretest was performed to ensure that being observed in the decision-process condition indeed triggered greater threats to sense of decision autonomy ($N = 146$). Using the same manipulation and stimuli reported in the main study, we measured participants' sense of decision autonomy (using seven items adapted from Rakos et al. 2008; Stroessner and Green 1990; Cronbach's $\alpha = .88$). Results confirmed that participants' sense of decision autonomy was significantly lower in the decision-process condition ($M = 4.65$, SD = 1.43) than in the decision-outcome condition ($M = 5.15$, SD = 1.13, $t(144) = 2.35$, $p = .020$, $d = 0.39$). The full description and analysis of the pretest and the items used to measure threats to sense of autonomy are reported in appendix B.

Main Study. As hypothesized, participants in the decision-process condition were significantly more likely to choose the default t-shirt (51.41%) than were those in the decision-outcome condition (30%; $\chi^2(1) = 10.31$, $p = .001$). Thus, as predicted, these results demonstrate that, to avoid being observed during the preference-construction stage, individuals were willing to take a default option rather than construct their preferences.

Social Anxiety Scale. A binary logistic regression with condition and Social Anxiety Scale as independent variables revealed a main effect for Social Anxiety Scale ($B = 0.63$, SE = 0.31, $p = .043$) and also the expected main effect of condition ($B = 2.55$, SE = 0.99, $p = .010$). Thus, the results indicate that the aversion to being observed during the decision process is still significant even after controlling for individuals' general aversion to being observed. Note that the interaction merely reached

marginal significance ($B = -0.73$, SE $= 0.41$, $p = .079$) and was driven by the difference in the outcome condition. However, since this unexpected and marginally significant interaction did not replicate in subsequent studies, we do not analyze it further.

Taken together, studies 1 and 2 demonstrate that to avoid being observed during the preference-construction stage, participants either opted out (study 1) or choose a default option (study 2). Notably, in study 1, the confederate who observed participants during their decision process could not see what they eventually chose, as opposed to in study 2, where the observer in both conditions was expected to see what participants eventually chose. Yet in both studies, participants preferred to opt out once observed in their decision process. Thus, these results cannot be explained by outcome-accountability concerns.

While both studies 1 and 2 demonstrate that being observed during the preference-construction stage influences consumers' ultimate choice, study 2 also provides initial evidence in support of the proposed mechanism. Next, we further explore the underlying mechanism and rule out rival accounts.

STUDY 3: THREATS TO SENSE OF DECISION AUTONOMY

Study 3 tests whether decreased sense of autonomy mediates aversive reactions to being observed in the deliberation stage. We directly measure individuals' aversion by asking participants to report how bothered they would feel by being observed either during their deliberation phase (process) or when revealing their preferences (outcome) and also measure participants' self-presentation concerns to further test for rival accounts.

Method

We recruited 199 paid online participants from the online panel Amazon Mechanical Turk (hereinafter: MTurk; *Mean* age = 35.26, 40.2% females) and instructed them to think of various decisions they make throughout their lives. To emphasize the distinction between the focal stages of the decision (i.e., process vs. outcome), we asked participants to read a short sentence distinguishing the two main stages of a typical decision (Thinking of the decisions we make in life, there is the first stage in which we are engaged in the decision-making process, considering the alternatives and thinking about our preferences, and then there is the final stage when the choice is made). Participants were then randomly assigned to one of the two conditions and asked to imagine a situation wherein another person was observing them either while deliberating their decision (decision-process condition) or while announcing their choice (decision-outcome condition): "Imagine you need to make a decision, and someone else is watching you only [in the first stage, while you are making this decision vs. in the final stage, while you are announcing the choice you made]."

As our main dependent variable, we measured participants' aversion to being observed using two items. Participants indicated the extent to which being observed would bother them and how anxious they would feel (both on a 1–7 scale ranging from *not at all* to *very much;* $r = .85$, $p < .001$). Next, we measured participants' sense of autonomy in making the decision and self-presentation concerns. Sense of autonomy was measured using the same seven items reported in study 2's pretest (see appendix B; Cronbach's $\alpha = .92$). The order of the items was randomized, and participants were asked to state the extent to which they agree/disagree with each statement (on a 1–7 scale ranging from *strongly disagree* to *strongly agree*).

Participants' self-presentation concerns were measured in two ways. First, we used two items that directly measured the degree to which they were concerned about showing themselves in the best light, and the extent to which they would be attempting to control their impression while being observed (adapted from Barasch, Gal, and Kristin 2018; $r = .78$, $p < .001$; on a 1–7 scale ranging from *not at all* to *very much*). Second, we also measured participants' innate tendency to focus on self-presentation concerns using two individual difference scales: (i) the Social Anxiety Scale used in study 2 (see appendix A; Cronbach's $\alpha = .88$) and (ii) the Public Self-Consciousness Scale (Fenigstein et al. 1975; Scheier and Carver 1985; Cronbach's $\alpha = .87$), which measures individuals' tendencies to think about self-aspects that are matters of public display (see appendix C). Both scales were not affected by the manipulation ($p = .460$ and $p = .541$, respectively).

Results

Testing the main hypothesis, we find that participants assigned to the decision-process condition were more averse to the observation ($M = 4.96$, SD $= 1.65$) than were those in the decision-outcome condition ($M = 4.38$, SD $= 1.94$; $t(197) = 2.28$, $p = .024$, $d = 0.32$). Furthermore, consistent with the proposed mechanism, participants reported a lower sense of decision autonomy in the *decision-process* condition ($M = 4.06$, SD $= 1.24$) than in the *decision-outcome* condition ($M = 4.61$, SD $= 1.49$; $t(197) = -2.81$, $p = .005$, $d = 0.40$). A mediation analysis (using model 4 of the macro PROCESS; Hayes 2013) verified that this difference in aversion across the two conditions was mediated by participants' decreased sense of autonomy ($B = 0.48$, SE $= 0.18$; 95% confidence intervals [CIs] [0.14, 0.83]; see appendix C for the full results of the mediation analysis).

Self-Presentation Concerns. First, analyzing the two items that directly measured self-presentation concerns did

not reveal a significant difference across conditions ($M_{process} = 4.36$, SD = 1.83; $M_{outcome} = 4.32$, SD = 1.74, $t(197) = 0.16$, $p = .873$) and did not mediate the observed effect ($B = 0.03$, SE = 0.18; 95% CIs [−0.31, 0.39]). Second, examining the two individual difference scales casts further doubt that the effect is driven by self-presentation concerns. Specifically, a regression analysis with condition, the two individual difference scales,[3] and all interactions revealed three significant main effects and no significant interactions. As expected, the Social Anxiety Scale had a positive and significant effect on aversion ($B = 1.23$, SE = 0.32, $p < .001$) and so did the Public Self-Consciousness Scale ($B = 0.67$, SE = 0.31, $p = .033$). Importantly, even after controlling for these individual differences, the effect of stage of observation (process vs. outcome) on aversion remained significant ($B = 2.09$, SE = 1.04, $p = .046$). A mediation analysis (model 4 of the macro PROCESS; Hayes 2013), which included the two individual difference scales as covariates, revealed that the mediating role of decreased sense of autonomy was still significant ($B = 0.32$, SE = 0.12; 95% CIs, [0.11, 0.57]).

Discussion

This study provides additional evidence that consumers' aversion to being observed during the preference-construction stage is driven by threats to their sense of decision autonomy. Consistent with the previous studies, these results cannot be explained by participants' outcome-accountability concerns. Notably, self-presentation concerns were not found to be affected by the stage of observation (i.e., process vs. outcome) and did not mediate the observed effect.

Admittedly, although this study directly supports the proposed account, one could argue that the deliberation stage often takes longer, and participants' aversion is mainly a function of the time duration in which they are actively being observed. Furthermore, while the results rule out outcome-related accountability concerns, it is possible that process-related accountability concerns are driving the results. For example, individuals might be averse to being observed during deliberation because they feel uncomfortable portraying difficulty, or are concerned about being perceived as indecisive. Similarly, individuals may feel judged and evaluated based on the quality of their decision process. Although the mediational results support the proposed account of threats to sense of autonomy, mediation analyses in general are limited in that they provide only correlational evidence in support of a mechanism. Studies 4 and 5 directly address these and other concerns.

3 The two scales were loaded onto two separate factors and were therefore included in the analysis as separate independent variables.

STUDIES 4 AND 5: REAL-TIME VERSUS OFF-LINE OBSERVATIONS

Based on our theorizing, aversive reactions that emanate from threats to sense of autonomy should occur only if consumers have not yet reached their choice and are still deliberating. After the decision is finalized and consumers actively pick their product, external forces such as being observed cannot impact what consumers choose and, hence, do not pose a threat to their sense of autonomy. Accordingly, realizing that the preference-construction phase will be observed only after consumers have finalized their choice should alleviate such concerns and attenuate threats to sense of decision autonomy. Thus, we hypothesize that consumers will be bothered by observations that occur in real time, that is, prior to reaching their ultimate choice. However, being recorded during the preference-construction stage and observed only after they have reached their choice should attenuate threats to sense of autonomy and bother consumers less.

Such a design enables us to disentangle our proposed mechanism from other process-related mechanisms that may drive consumers' aversion. In particular, as aforementioned, it is possible that individuals are simply averse to being observed while deliberating because they feel accountable for their decision process. However, such concerns should arise also when consumers know that their decision process will later be observed off-line. Thus, based on these rival accounts, consumers should be equally averse to being observed in real time as off-line. However, according to our suggested sense-of-autonomy account, such aversion should attenuate when participants' decision process is observed off-line (e.g., a recording is viewed after they had already made their decision). Studies 4 and 5 directly test these predictions and also control for the length of time participants are observed.

STUDY 4

Method

We recruited 385 participants from MTurk (*Mean* age = 34.77, 45.7% females) and asked them to imagine going to an electronics store for the purpose of purchasing a TV set. Participants were told that cameras are placed in the store to film customers as part of the marketing team's effort to learn more about their customers. This study employed a 2 (decision stage: process vs. outcome) × 2 (observation time: real-time vs. off-line) between-subjects design. As in study 3, we manipulated the decision stage wherein the observation takes place (process vs. outcome). Specifically, in the *decision-process* condition, participants were told that the cameras are placed in the purchasing aisles, enabling the marketing team to observe their customers during the time they deliberate. In the *decision-outcome*

condition, they were told that the cameras are located where the products are picked up by consumers, enabling the marketing team to observe their customers during the time they indicate and collect their chosen product. We intentionally chose TV sets as stimuli because consumers typically do not pick their chosen TV from the shelf, but rather go to the checkout or to a sales associate and ask for the product. To control for the duration of the observation, in both conditions, participants were told that the observation lasts for about 3 minutes.

The second factor that we manipulated was the time in which the observation occurred (real time vs. off-line). Participants assigned to the *real-time* condition were told that the marketing team would be observing them in real time, whereas participants assigned to the *off-line* condition were told that the marketing team would observe the recording of the camera off-line, only 3 days later.

To measure the aversion to being observed, participants then indicated the extent to which the observation would bother them (on a 1–7 scale ranging from *not at all* to *very much*) and the extent to which they would rather not be observed in such a situation (on a 1–7 scale ranging from *I do not mind being observed* to *I strongly prefer not being observed*). The two items were highly correlated ($r = .78$, $p < .001$) and were therefore collapsed to form a single measure of aversion to being observed. Finally, to further address rival process-related accounts such as concerns of being perceived as indecisive, we measured participants' sensitivity to appearing either decisive or indecisive. Specifically, participants indicated their general beliefs regarding the importance of being decisive (on a 1–7 scale anchored at *it is more important to be a decisive decision maker* to *it is more important to take your time and carefully consider the pros and cons of each option*).

Results

A 2 (decision stage: process vs. outcome) × 2 (observation time: real time vs. off-line) Analysis of Variance revealed a significant main effect of observation time on aversion: participants were more averse to being observed in real time ($M = 5.16$, SD = 1.74) than in off-line ($M = 4.66$, SD = 1.76; $F(1, 384) = 7.94$, $p = .005$, $d = 0.29$). No main effect was found for observation stage ($p = .615$). Importantly, the interaction between decision stage and time of observation was significant ($F(1, 381) = 4.28$, $p = .039$). As predicted, participants assigned to the decision-process condition were significantly more averse to being observed in real time ($M = 5.39$, SD = 1.74) than in off-line ($M = 4.52$, SD = 1.87; $t(190) = 3.32$, $p = .001$, $d = 0.48$). However, no significant difference was found between real time and off-line for participants assigned to the decision-outcome condition ($M_{\text{real-time}} = 4.93$, SD = 1.71; $M_{\text{off-line}} = 4.80$, SD = 1.63, $t(191) = 0.55$, $p = .581$).

FIGURE 1

AVERSION TO BEING OBSERVED ACROSS EXPERIMENTAL CONDITIONS IN STUDY 4

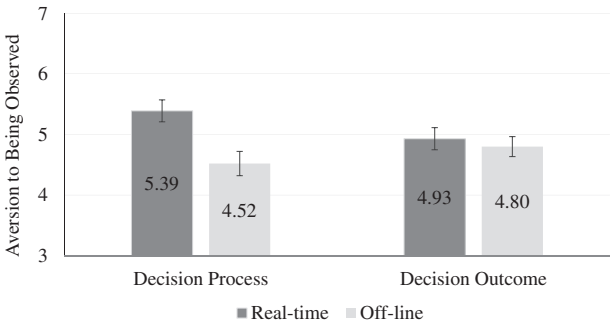


Figure 1 depicts participants' aversion to being observed across the experimental conditions.

Next, we examined whether the observed aversion was moderated by participants' concerns about appearing as indecisive. Although this account cannot explain the difference observed between the real-time and off-line conditions, to further test such an account, we included this measure in our analysis. First, no three-way interaction was found between stage of decision, time of observation, and decisiveness importance ($p = .987$). Furthermore, examining participants' responses on the decisiveness scale, we find that the majority of participants (73%) indicated responses above the scale's mid-point (anchored at four, median = 5.0), which means that, generally, most participants considered being careful and thoughtful more important than being decisive.

Discussion

This study provides additional support for the proposed underlying psychological mechanism. We found that, while participants in the decision-outcome condition were indifferent to whether the observation occurred in real time or off-line, participants in the decision-process condition who were observed while constructing their preferences were more averse to being observed when the observation occurred in real time versus off-line.

Importantly, these results eliminate several alternative process-related accounts. In particular, concerns about (i) one's accountability for the decision process or decision outcome, (ii) being perceived as indecisive, (iii) total time of being observed, and (iv) feeling uncomfortable by being observed while experiencing difficulty, should all persist even if one is observed off-line after the decision was made.

Next, we replicate the findings of this study using a more realistic context wherein participants are actually

observed. Furthermore, in addition to measuring participants' stated aversion to being observed, study 5 used a validated and widely used physiological measure that monitors mental stress, namely, galvanic skin response.

STUDY 5

Method

Seventy-four paid participants recruited at the university's laboratory participated in this study (*Mean* age = 21.24, 59.5% females; the data of the physiological measures for one participant was missing, which brought the sample size for the physiological analyses to 73). Because the study included physiological measurements, we tested each participant separately. Upon arrival, participants sat at a computer and the research assistant (blind to hypothesis and condition) set up and calibrated the equipment measuring the participant's galvanic skin response (Shimmer galvanic skin conductance [GSR] unit).[4] Additional details about the equipment and the calibration process are in the web appendix. After the experimenter calibrated the measuring devices, participants advanced to viewing the instructions for the study on the computer screen and the experimenter left the room.

Participants were informed that a company that offers vacation packages to the student population is interested in learning more about students' preferences. Accordingly, participants were told that they will review several vacation packages and choose their preferred option. Furthermore, participants learned that the computer's web cam will be filming them while making their decision. Participants were then assigned to one of the two conditions. In the *real-time condition*, they were informed that two of the company's representatives are currently in the laboratory behind a one-sided mirror to observe participants' decision-making process in real time. Participants assigned to the *off-line condition* were told that the company's representatives would observe the recording of their decision-making process only after the session is over.

Next, the webcam turned on, and participants viewed information regarding three different vacation packages (varying on five attributes and including a picture of each resort) and were asked to choose their preferred one. During participants' decision-making process, we measured their GSR, a validated physiological measure for individuals' emotional stress and anxiety (Bakker, Mykola, and Natalia 2011; Fernandes et al., 2014; Katkin 1965; Kurniawan, Alexandr, and Mykola 2013; Monat, James, and Richard 1972). Although the equipment we used measured GSR (i.e., Shimmer GSR unit), it also allowed us to measure participants' heart rates, but it did not enable us to measure heart rate variability, which is another validated measure for stress (Berntson et al. 1997; Hjortskov et al. 2004; Taelman et al. 2009; Thayer et al. 2012; see web appendix for heart rate analysis). Participants' self-reported aversion was also measured using three items (i.e., feeling uncomfortable, being bothered, and preference not to be observed; all on a 1–7 scale ranging from *not at all* to *very much*; Cronbach's $\alpha = .89$). Notably, to address potential rival accounts, we also measured the actual time that participants spent making the decision.

Results and Discussion

Self-Reported Aversion. Testing our main hypothesis, a *t*-test confirmed that participants assigned to the real-time condition were significantly more averse to being observed ($M = 2.99$, SD = 1.45) than were participants in the off-line condition ($M = 2.27$, SD = 1.34; $t(72) = 2.22$, $p = .030$, $d = 0.52$). Analyzing participants' time spent making their decision, we found no significant difference across conditions ($M_{\text{real-time}} = 31.83$ seconds, SD = 14.78; $M_{\text{off-line}} = 32.40$, SD = 14.09, $p = .865$), suggesting that aversion to being observed was not driven by differing observation durations, nor by feeling rushed, across conditions.

Galvanic Skin Conductance. The data were analyzed using iMotions peak detection algorithm. By default, the algorithm attains the calibrated GSR signal (μSiemens), calculates sample rate based on samples, extracts the phasic data using a sliding window filter, applies an additional filter on the phasic data (default 5 Hz) to remove noise, detects peaks in the phasic data signal using onsets and offsets, peak amplitude threshold, and signal jump threshold, and bins the data (Bakker et al. 2011; Benedek and Kaernbach 2010a, 2010b; Dawson, Schell, and Filion 2000; Guo et al. 2013; see web appendix for additional information on the Shimmer Peak Detection algorithm).

In the final phase, the algorithm breaks the continuous data of each individual into 5 second intervals (with a 1 second overlap between two successive intervals) and assigns a value of 1 to intervals containing at least one GSR peak, and 0 otherwise. Therefore, instead of using GSR amplitudes, which are typically noisy, the algorithm uses the binary values of peak detection.

The average number of total intervals did not vary across conditions ($M_{\text{real-time}} = 7.54$; $M_{\text{off-line}} = 7.44$; $t(71) = 0.12$, $p = .909$). However, to control for variation at the individual level, we calculated for each participant the relative number of intervals that contained GSR peaks out of the

4 Following this study, participants stayed in the laboratory to complete an additional unrelated study that measured their facial expressions. To avoid delay between the two studies, participants were also given the calibration task for the facial expression reader at the beginning of the laboratory session. We used two independent facial expression modules, namely, AFFDEX and FACET. For exploratory purposes, we also examined whether participants' facial expressions varied systematically across conditions in the current study. The two modules diverged substantially in their estimation and did not produce significant patterns (data available upon request).

total intervals. A *t*-test confirmed that participants assigned to the real-time condition had a significantly greater proportion of segments with peaks ($M = 41.6\%$) than did those assigned to the off-line condition ($M = 21.5\%$; $t(63.7)$[5] $= 2.61$, $p = .011$, $d = 0.61$), suggesting an increased aversion to being observed in real time. Nonparametric tests that do not impose any assumptions on the distribution provided additional support for a significant difference across conditions (Kolmogorov–Smirnov test: $p = .012$; Mann–Whitney U test: $p = .06$).

GSR Peak Intensity. A similar analysis was performed to analyze the maximum intensity peak for each participant (coded 0 if no peaks were detected during the entire decision-making process). Again, we find that on average, the maximum intensity peak was higher for participants assigned to the real-time condition ($M = 0.32$) than to those assigned to the off-line condition ($M = 0.07$; $t(71) = 2.07$, $p = .042$; Kolmogorov–Smirnov test: $p = .012$; Mann–Whitney U test: $p = .047$, $d = 0.49$), again indicating greater aversion to being observed in real time. For completeness, dropping participants with no peaks during the entire decision-making process (35.1% in the real-time condition and 41.6% in the off-line condition) produced a similar pattern of maximum intensity peaks ($M_{\text{real-time}} = 0.49$; $M_{\text{off-line}} = 0.12$; $t(43) = 2.00$, $p = .052$; Kolmogorov–Smirnov test: $p = .003$; Mann–Whitney U test: $p = .003$, $d = 0.62$).

Similar to study 4, the results of this study provide additional support for the proposed underlying psychological mechanism. Participants in the decision process who were observed while constructing their preferences were more averse to being observed when the observation occurred in real time than to an observation that occurred off-line and that could not threaten their ability to make a free choice. Note that because participants were not given a way out in the form of not choosing or choosing a default option (as in studies 1 and 2), their ultimate choices did not differ by condition ($p = .951$). Similarly, although the observation in real time bothered participants more, we did not observe a difference in average decision time, possibly because the decision time was relatively short (about half a minute) and because participants were tested one at a time.

STUDY 6: THE ROLE OF PREFERENCE CONSTRUCTION

According to our theorizing, if consumers already know their preference structure, and therefore know what they will end up choosing, aversion that stems from threats to sense of autonomy in decision-making should diminish. Accordingly, in a repeated decision context, in which preferences have already been constructed, participants should be less averse to being observed during their decision process. Study 6 directly tests this hypothesis.

Method

One hundred ninety paid participants recruited at a university laboratory participated in this study (*Mean* age = 20.3, 66.1% females; seven participants were excluded from the analysis due to incomplete responses). After completing an unrelated laboratory study, participants were informed that they would be entered in a raffle for a chance to win a free yogurt of their choice. To indicate their yogurt preferences, participants were asked to choose their preferred (i) flavor out of nine options, (ii) chocolate topping out of nine options, and (iii) healthy topping out of nine options. Participants were told that they would get their chosen yogurt should they win the raffle.

Participants were then told that the webcam would begin filming as soon as they advance to the yogurt selection page and that they will be observed in real time by another participant during their decision process. Therefore, they were instructed to ensure that they are positioned in front of the camera during the time they select their preferred yogurt. Participants were then assigned to one of the three conditions. In the *single-decision* condition, participants turned on the webcam as they started configuring their preferred yogurt. Thus, in this condition, we expected to replicate our findings and find an aversion to being observed.

In the *repeated-decision* condition, participants first configured their preferred yogurt without being told anything about the pending observation. Only after constructing their preferences and entering their selection, were participants asked to configure their preferences again, but this time, they were asked to turn on the webcam so they could be observed in real time by another participant. Thus, this condition was identical to the single-decision condition with the exception that, prior to being observed, participants had already constructed their preferences. We predicted that being observed after they had already constructed their preferences would not trigger threats to their sense of autonomy.

To ensure that any changes in aversion to being observed in the repeated condition did not stem from participants being accustomed to the yogurt-preference interface, we employed a *control* condition. This condition was identical to the repeated-decision condition with the exception that, at the first stage, instead of choosing their preferred yogurt, participants in the control condition chose their preferred ice cream. The ice cream selection interface and procedure were identical to those of the yogurt. Thus, participants familiarized themselves with the selection interface before advancing to the yogurt selection task in which they were observed. We expected that both in the

5 Because the null hypothesis of equal variance was rejected by Levene's test, we ran a test relaxing this assumption. Both tests reveal a significant difference between conditions.

single-decision and the control conditions, participants would be averse to being observed during their yogurt selection process, as in both conditions they have not yet constructed their preferences for the target stimulus. Pictures of the selection interface and stimuli used across conditions are available in appendix D.

Prior to selecting their yogurt preferences, participants across all conditions indicated the extent to which they would prefer not to be observed while making their decision (on a 1–7 scale ranging from *not at all* to *very much*). Finally, at the end of the study, we asked participants to indicate the extent to which being observed bothered them and how uncomfortable they felt being observed (both on a 1–7 scale ranging from *not at all* to *very much* and *very comfortable* to *very uncomfortable*, respectively).

Results and Discussion

As hypothesized, a one-way Analysis of Variance revealed that the aversion to being observed significantly differed across conditions ($F(2, 182) = 3.74$, $p = .026$). Planned contrasts indicated that the aversion to being observed in the repeated-decision condition ($M = 3.75$, SD = 2.02) was significantly lower than in the single-decision condition ($M = 4.59$, SD = 2.13, $t(120) = 2.22$, $p = .028$, $d = 0.40$) and compared to the control condition ($M = 4.64$, SD = 1.97, $t(123) = 2.49$, $p = .014$, $d = 0.45$). Combining the aversion measure with the additional discomfort measures (Cronbach's $\alpha = .83$) yields a similar yet weaker pattern ($p = .116$ and $p = .088$). Consistent with our conceptual framework, we find that the aversion to being observed during the decision process attenuates if one's preferences are already constructed.

In an additional study ($N = 205$; study 8, fully reported in the web appendix), we further find that the aversion to being observed during the decision process attenuates when one's preferences are relatively stable. Specifically, we manipulated whether one is observed during a decision that entails high conflict and, therefore, necessitates deliberation and construction of preference versus being observed during a decision that entails low conflict (i.e., preferences are relatively formed). As predicted, we find that the aversion effect was replicated in the high-conflict condition ($p < .001$) but not in the low-conflict condition ($p = .265$).

As aforementioned, observations that occur in the pre-decisional stage are not limited to contexts of direct human interaction. Nowadays, such observations frequently occur online and especially when companies are trying to learn consumers' preferences. Accordingly, in the next studies, we examine the effect of pre-decisional observation and its implications in online environments.

STUDY 7A: AVERSION TO ONLINE MONITORING DURING VERSUS AFTER THE PREFERENCE-CONSTRUCTION STAGE

Study 7a tests whether consumers are more averse to online platforms that track and monitor their preference-construction stage (decision-process condition) than to those who track the stage wherein they reveal their preference (decision-outcome condition).

Method

We recruited 147 paid participants at the university laboratory (*Mean* age = 20.56, 69.4% females). Participants were told that "A large Marketing Research company is interested in examining consumer behavior. It seeks to record data of various actual online purchases." Next, those randomly assigned to the *decision-process* condition were told that: "For this purpose, the company is planning to examine consumers' purchases in real time by monitoring and recording only their decision-making process and their online behaviors during their decision-making process until they reach their final choice. They do not record the final consumption choice." In contrast, participants assigned to the *decision-outcome* condition read that: "... by monitoring and recording only the final choices consumers make. They do not record the decision-making process nor their online behaviors during the decision-making process, which lead to the final consumption choice." After reading the scenario, we measured participants concerns about such monitoring. Participants indicated the extent to which such monitoring would feel intrusive and the extent to which they would have privacy concerns (both on a 1–7 scale ranging from *not at all* to *very much*). The two items were highly correlated ($r = .82$, $p < .001$) and were therefore collapsed to form a single measure of aversion.

Results

Manipulation Check (Posttest). To ensure participants understood the focal manipulation, we conducted a posttest ($N = 78$; *Mean* age = 20.41, 30.8% females; university laboratory) randomly assigning participants to one of the two conditions and asking them to choose which statement best captures the information they read: (i) "The company tracks your behavior only during the decision-making process (i.e., prior to the time you reached your decision)" and (ii) "The company only tracks which option you decided to choose". As expected, the results show that while 94.9% of participants in the process condition indicated that the company tracks their decision process (i.e., statement 1), only 12.8% of participants in the outcome condition indicated so ($\chi^2(1) = 52.83$, $p < .001$). Thus, the manipulation worked as intended.

Aversion to Online Monitoring. As expected, participants felt significantly more averse to the online monitoring in the *decision-process* condition ($M = 4.57$, SD = 1.52) than in the *decision-outcome* condition ($M = 3.62$, SD = 1.66, $t(145) = 3.61$, $p < .001$, $d = 0.59$). In the next study, we replicate this finding in another online context and examine its impact on consumers' use intentions.

STUDY 7B: INTREST IN USING ONLINE PLATFORMS AS A FUNCTION OF AVERSION TO BEING OBSERVED

Study 7b tests whether the aversion to being observed by an online platform during the preference-construction stage influences consumers' intentions to use such platforms.

Method

We recruited 196 paid online participants on MTurk (*Mean* age = 33.40, 40.3% females). We told participants about a new e-retailer that is now launching a new platform for purchasing vacation packages. We then manipulated the stage of the observation, and participants were told either that this online platform tracks and monitors their decision-making process (*decision-process* condition) or that it tracks and records their final choice (*decision-outcome* condition). The second factor that we manipulated was the motivation behind such monitoring. Specifically, participants were told that the motivation behind tracking and monitoring their behavior was either to enable the retailer to learn their personal preferences or to improve the website interface (between subjects).

Participants across all conditions were then asked to indicate their interest in using such an online platform (comprised four items: willingness to use, interest, value, and willingness to pay; Cronbach's $\alpha = .84$). Participants' aversion to being observed was measured using two items (feeling uncomfortable and privacy concerns; $r = .63$, $p < .001$) and served as the mediator. All items are detailed in appendix E.

Results and Discussion

Manipulation Check (Posttest). Procedure and stimuli of the posttest were identical to that reported in study 7a ($N = 80$; *Mean* age = 20.34, 33.8% females; university laboratory). Again, results confirmed that participants understood the focal manipulation as intended. Specifically, while 97.4% of participants in the process condition indicated that the company tracks their decision process (i.e., statement 1), only 19.5% of participants in the outcome condition indicated so ($\chi^2(1) = 49.66$, $p < .001$).

Interest in Using the Online Platform. Results confirm that participants were significantly less interested in using the online platform if it tracked their decision process ($M = 3.06$, SD = 1.14) compared to their decision outcome ($M = 4.07$, SD = 1.22, $t(194) = -5.97$, $p < .001$, $d = 0.86$). Furthermore, the motivation for the online observation (learning about consumers' personal preferences vs. improving the website interface) did not interact with the stage of observation ($p = .756$) and did not produce a main effect ($p = .118$), indicating that the interest in using a platform that tracks consumers' preference-construction stage decreased regardless of the motivation underlying such observation.

Aversion to Online Monitoring. Next, we examined participants' aversion to being monitored and tracked and its role as the underlying mechanism for evaluating the online platform. First, participants reported greater aversion to being observed in the *decision-process* condition ($M = 4.80$, SD = 1.58) than in the *decision-outcome* condition ($M = 3.21$, SD = 1.38; $t(194) = 7.48$, $p < .001$, $d = 1.08$). Both main effect and interaction of the second factor were insignificant ($p = .539$ and $p = .957$, respectively). A mediation analysis (using model 4 of the macro PROCESS; Hayes 2013) verified that the difference in usage intention across the two conditions was mediated by participants' aversion to being observed ($B = -0.75$; 95% CIs [−1.01, −0.53]).

GENERAL DISCUSSION

Whether people occasionally observe us in a consumption environment, or companies track and learn our decision-making behaviors, throughout our lives we make many decisions while being observed by others. This study investigates consumer reactions to being observed while making a decision, finding that consumers are particularly averse to being observed during their preference-construction stage. Furthermore, we find that this aversion stems from threats to consumers' sense of decision autonomy and freedom of choice.

Review of Key Findings

Eight studies consistently demonstrated the aversion to being observed during preference construction. We find that being observed or even anticipating being observed during the preference-construction stage leads consumers to opt out (study 1) or choose default options (study 2). We find that such aversion to being observed during the decision process is mediated by threats to consumers' sense of decision autonomy. Furthermore, using both self-report and physiological measures, we find that participants are particularly averse to being observed in real time (as

opposed to off-line). Such aversive reactions attenuate if consumers' preferences are already formed, such as in the context of a repeated (study 6) or a relatively easy decision (study 8 in the web appendix). We also explore the effect in online settings and find that consumers' sense of autonomy is threatened by online platforms that track consumers during the preference-construction stage (study 7a) and that such aversive reactions impact intentions to use such platforms (study 7b).

Alternative Explanations

A rival account for the observed effect would contend that an aversion to being observed may be associated with concerns about revealing their final preferences and choices. Though such accountability concerns may exist in some situations, we demonstrate that individuals are significantly more averse to being observed during their deliberation phase than when they reveal their choice (studies 1–4 and 7a and b). Importantly, individuals were averse to being observed even if the observation included only the deliberation stage without the observer's ability to learn about the participant's final choice (studies 1, 3, 4, 7a, and b).

As discussed, accountability as well as self-presentation concerns could also come into play in one's decision-making process. However, such explanations cannot account for the mediation results observed in study 3 and are inconsistent with the fact that the aversion attenuated when the observation occurred off-line (studies 4 and 5), or during a repeated decision (study 6). Similarly, accounts pertaining to feeling rushed or fearing critical feedback from observers (or a possible lack of approval) are less plausible. First, several studies controlled the duration of observation (studies 4 and 5) and, in some studies, participants should have felt rushed to a similar extent across all experimental conditions (e.g., in study 1, participants were aware of the confederate who was waiting for them to finish their purchase in both conditions). Second, in several studies, it was either implied (studies 2, 4, 7a, and b) or directly stated (studies 6 and 9 in the web appendix) that observers will not interact with participants or give feedback. Third, in study 6, participants in all conditions were observed in real time and, therefore, concerns about critical feedback should have emerged across all conditions.

Note that we do not claim that the threat to sense of autonomy is the only mechanism that may be at play. We do acknowledge that, in some situations, accountability and self-presentation concerns may be important drivers of behavior. However, our results suggest that threats to sense of autonomy are separate, distinct, and constitute an important driver of behavior in the context of social observation, particularly when consumers' preferences are yet to be constructed.

Observer's Identity and Motivation

Throughout the studies, the identity of the observing entity and associated motivation for observation varied from a bystander interested in participating in the study (study 1), research assistant tracking choices (study 2), an unspecified "other person" (study 3), marketing research team learning about the store's customers (study 4) or about students' preferences (study 5), a fellow participant with unspecified motivation (study 6), or online platforms (studies 7a and b). Note that in study 7b, we directly manipulated the company's motivation for observing customers: either learning about consumers' preferences or improving the website's interface. Across all of these studies, we observed a consistent and robust effect regardless of the observing entity's identity and motivation.

To further examine the robustness and generalizability of the results, in study 9 (fully reported in the web appendix), we manipulated the observer's identity to be an unfamiliar person, market researcher, fellow consumer, close friend, or significant other. Although we do find a main effect of observing identity (i.e., people are generally more averse to being observed by an unfamiliar person and market researcher than a fellow consumer, close friend, or their significant other), we did not find a significant interaction with the stage of observation. That is, individuals were more averse to being observed during the preference-construction stage regardless of the observer's identity. Note that the only simple effect that failed to reach statistical significance was when the observer was a significant other. Whether the attenuation of the effect is because individuals consider a significant other to be part of their own decision-making entity (and thus, their autonomy is not threatened), or whether this occurs because of other or additional reasons such as the activation of ingroup versus outgroup social identity is beyond the scope of the present study. We believe that further exploring ingroup versus outgroup distinctions, as well as additional motivations (e.g., helping and giving advice), are fruitful directions for future research.

Contributions, Relation to Prior Research, and Future Directions

From a theoretical perspective, this study explores a relatively understudied aspect of social influence. While existing research in consumer behavior has mainly focused on the impact of social observation and mere presence at the time during which consumers actively commit and reveal their preferred options, relatively less attention has been given to observations that occur during the preference-construction stage. Furthermore, this study adds to the ample research on consumer-constructed preferences by exploring consumers' reactions and sensitivity to external influence during the preference-construction stage.

As alluded to in the theoretical development section, several streams of research support the notion that social observation may reduce sense of autonomy. Specifically, taking others' perspective (Hass 1984), shared attention and reality (Hardin and Higgins 1996; Shteynberg 2015), and a potential asymmetry in observer–observee perceptions (Pronin 2008), could all reduce one's sense of independence, and therefore its associated sense of autonomy. While it is beyond the scope of the present study to tease apart these specific mechanisms, future research can further explore and examine under what conditions each may apply. Indeed, some of our findings may shed light, to some extent, on these mechanisms. For example, a shared reality account would predict a moderation effect of social closeness (Echterhoff, Rene, and Tory 2013). While we find that social proximity reduces threats to sense of autonomy in general (study 9 in the web appendix; main effect), the difference between the process and outcome conditions was not moderated by this factor. Therefore, though study 9 demonstrates the robustness of the proposed effect across social proximity, it is difficult to interpret the results as supporting or refuting one mechanism over the other and more nuanced studies may be required to doing so.

An additional theoretical contribution this study makes relates to emerging research that is placing greater emphasis on the intersection of social influence and decision processes (Critcher et al. 2013; Kupor et al. 2014; Lamberton et al. 2013; Schrift and Amar 2015). For example, Schrift and Amar (2015) demonstrated how observing others' pre-decisional stage behavior (such as pre-decisional conflict) influences the observers' subsequent preference. Thus, the present study adds to this literature in demonstrating the importance of considering pre-decisional aspects when studying the effect of social influence on decision-making.

From an applied perspective, this study adds to research examining consumers' privacy concerns, which has mainly focused on consumers' concerns with respect to disclosing socioeconomic data or information about their final choice. We add to this literature by documenting concerns that are specific to the pre-decisional stage.

Furthermore, nowadays, online retailers use messages that highlight that consumers' purchase activities and pre-purchase activities are being tracked and monitored. We find that consumers are more averse to being tracked and monitored by marketers during the pre-decisional stage and that such aversion impacts individuals' online consumption behaviors. Specifically, individuals were significantly less interested in using an online platform that monitors their online deliberation behavior than they were to a platform that merely tracks their final choices (studies 7a and b). Indeed, in an additional study (study 10, fully reported in the web appendix), we find that messaging used by online recommendation platforms can increase or decrease consumers' aversive reaction to being observed. Specifically, messages that highlight process tracking (i.e., "inspired by your browsing history") triggered greater aversion than did messages that highlight outcome tracking (i.e., "inspired by your previous choices"). While there may be some clear benefits for marketers to observe consumers' deliberation stage, our findings suggest that there are also potential downsides that companies should consider when employing such practices. Specifically, aside from decreasing consumers' liking and usage intentions of platforms that observe the decision-making process (e.g., studies 7a and b and 10), such practice may also systematically bias the way consumers behave (e.g., increase their likelihood of opting out or choosing default options). Thus, companies should take these into account when deciding whether the benefits of observing consumers will outweigh the potential associated costs.

Future research may examine more broadly how consumers react to online tracking and how different messaging used by companies as well as other actions could mitigate sense of autonomy concerns. In addition, while the present study focused on concerns that arise at the time of choice, future research could examine the impact of being observed on post-choice behaviors. That is, how would being observed during the deliberation process impact consumers' post-choice evaluation of their products? How would such observations impact consumers' regret, counterfactuals, and likelihood of switching, are open and potentially important questions for future research.

It may also be fruitful and informative to examine findings from previous research that focused on social influence in retail environments and how such findings relate to those observed in the present study. For example, Zhang et al. (2014) found that shoppers are less likely to touch products as the size of their shopping group increases and are less likely to buy merchandise when the store is crowded. Similarly, Hui et al. (2009) found that the presence of other shoppers attracts consumers toward a store zone but reduces their tendency to purchase. While several different drivers could explain such patterns, these results are consistent with our theorizing. Further exploring consumers' sensitivity to being observed by others and sense of autonomy threats in the retail environment may shed additional light on these observed patterns of behavior.

From a methodological perspective, it is noteworthy that in many behavioral research studies, participants are aware that their behaviors are observed by a researcher. If so, what do our findings imply about such practices? First, in most cases participants know in advance and expect to be observed (and even sign a consent form to that effect); therefore, they should be, to some extent, less averse to it. Second, we speculate that participants typically assume that researchers' observations take place only after the study has concluded (i.e., off-line). As our results show (studies 4 and 5), this type of observation is less threatening to one's sense of autonomy and therefore should not result in aversive reactions.

Nevertheless, it may be important to examine whether systematic shifts in behavior occur in cases where participants in laboratory studies are explicitly observed at the time they are engaged in the study and while deliberating. For example, studies in which participants are examined separately in the laboratory and in which experimenters actively observe them in real time may trigger aversive reactions that impact participants' preferences and choice and could lead to systematic biases. Indeed, conspicuous recording of participants during experiments is becoming an increasingly common practice in psychological research (Noah, Yaacov, and Ruth 2018a, 2018b), and as Noah et al. (2018b) demonstrated, video-recording participants may lead to erroneous conclusions regarding various phenomena.

To conclude, decades of research demonstrate that consumers' preferences are often malleable and, therefore, could be influenced by external factors. Although the role of preference construction has been extensively studied in the consumer setting, research on how consumers may react to social observations in the pre-decisional stage remains scarce. This study aims to fill this knowledge gap and underscores the importance of a relatively understudied consumer concern in the context of social influence, namely, threats to sense of autonomy.

DATA COLLECTION INFORMATION

Study 1: The first author supervised the collection of data by research assistants at the University of Pennsylvania in the summer of 2016. The second author analyzed these data.

Study 2 and pretest: The first author supervised the collection of study 2's data by research assistants at the University of Pennsylvania in the winter of 2016. The first author supervised the collection of the pretest data by research assistants at the University of Pennsylvania in the winter of 2018. The first author analyzed these data.

Study 3: The first author supervised the collection of data using Amazon Mechanical Turk panel in the spring of 2016. The first author analyzed these data.

Study 4: The first author supervised the collection of data using Amazon Mechanical Turk panel in the fall of 2016. The first author analyzed these data.

Study 5: The first author supervised the collection of data by research assistants at the University of Pennsylvania in the fall of 2017. The second author analyzed these data.

Study 6: The first author supervised the collection of data by research assistants at the University of Pennsylvania in the spring of 2016. The first author analyzed these data.

Study 7a: The first author supervised the collection of data by research assistants at the University of Pennsylvania in the winter of 2015–2016. The first author analyzed these data.

Study 7b: The first author supervised the collection of data using Amazon Mechanical Turk panel in the winter of 2015–2016. The first author analyzed these data.

Posttests for Studies 7a and 7b: The second author supervised the collection of data by research assistants at Indiana University in the fall of 2019. The first author analyzed these data.

Study 8 (web appendix): The first author supervised the collection of data by research assistants at the University of Pennsylvania in the summer of 2016. The first author analyzed these data.

Study 9 (web appendix): The first author supervised the collection of data using Amazon Mechanical Turk panel in the summer of 2018. The first author analyzed these data.

Study 10 (web appendix): The second author supervised the collection of data using Amazon Mechanical Turk panel in the summer of 2018. The first author analyzed these data.

APPENDICES

APPENDIX A: SOCIAL-ANXIETY SCALE ITEMS USED IN STUDIES 2 AND 3

1. It takes me time to overcome my shyness in new situations;
2. I have trouble working when someone is watching me;
3. I get embarrassed very easily;
4. I don't find it hard to talk to strangers (R);
5. I feel anxious when I speak in front of a group;
6. Large groups make me nervous;
7. My behavior is usually an expression of my true inner feelings, attitudes, and beliefs; and
8. I feel a bit awkward in public and do not show up quite as well as I should.

APPENDIX B: DESCRIPTION OF PRETEST FOR STUDY 2

Method

We recruited 146 paid participants at a northeastern university laboratory (*Mean* age = 20.4, 70.5% females). Procedure and stimuli were identical to that of study 2 (described in the main text) except for the dependent variable measure. Specifically, in the pretest, we measured how anticipating being observed during the *decision process* compared to the *decision outcome* would threaten participants' sense of autonomy in making the decision. Seven items (adapted from Rakos et al. 2008; Stroessner and Green 1990) were used:

1. While being observed, I would feel complete control over my decision;
2. Being observed will not influence my sense of free will;
3. My decision will not be limited by the fact I am observed;
4. When someone observes me, I will feel as if I have less free will (R);
5. My decision will be completely volitional;
6. The observer's presence will have no effect on my decision; and
7. I am confident I will make the right decision.

The order of these items was randomized, and participants were asked to state the extent to which they agree or disagree with each statement (on a 1–7 scale ranging from *strongly disagree* to *strongly agree*). The responses were highly correlated (Cronbach's $\alpha = .88$) and were therefore collapsed to form a measure of threats to decision autonomy.

Results

As expected, a *t*-test analysis confirmed that sense of decision autonomy was significantly lower in the decision-process condition ($M = 4.65$, SD = 1.43) than in the decision-outcome condition ($M = 5.15$, SD = 1.13, $t(144) = 2.35$, $p = .020$, $d = 0.39$).

FIGURE C1

STUDY 3: MEDIATION ANALYSIS MODEL

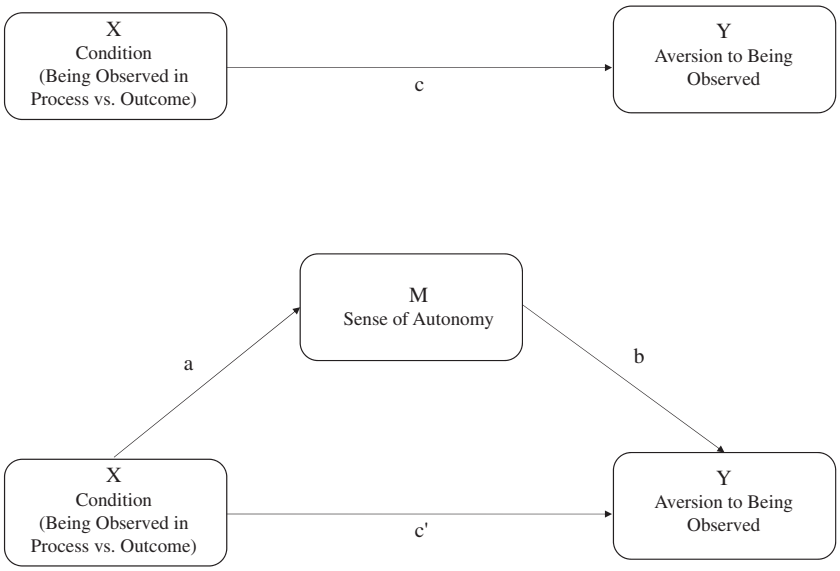


TABLE C1

STUDY 3: MEDIATION RESULTS

Model-path estimates				
	Coefficient	SE	*t*	*P*
A	−0.55	0.19	−2.81	.006
b	−0.88	0.07	−12.62	.000
c′	0.10	0.19	0.53	.600
c	0.58	0.26	2.28	.024

Indirect effect (with bootstrap 95% confidence interval and standard errors)				
	Effect	LL 95% CI	UL 95% CI	SE
X → Y	0.10	−0.28	0.48	0.19
X → M → Y	0.48	0.14	0.83	0.18

APPENDIX C: MEDIATION ANALYSIS AND ITEMS USED IN STUDY 3

As depicted in figure C1, the dependent variable (Y) was the aversion to being observed, the potential mediator (M) was participants' measured sense of decision autonomy, and the independent variable (X) was the stage of the decision in which the observation occurs (process vs. outcome). The 95% Monte Carlo CI generated using 10,000 bootstrap samples estimated and supported the mediating role of sense of autonomy on the relation between stage of observation and aversion to the observation (see table C1).

Public Self-Consciousness Scale items:

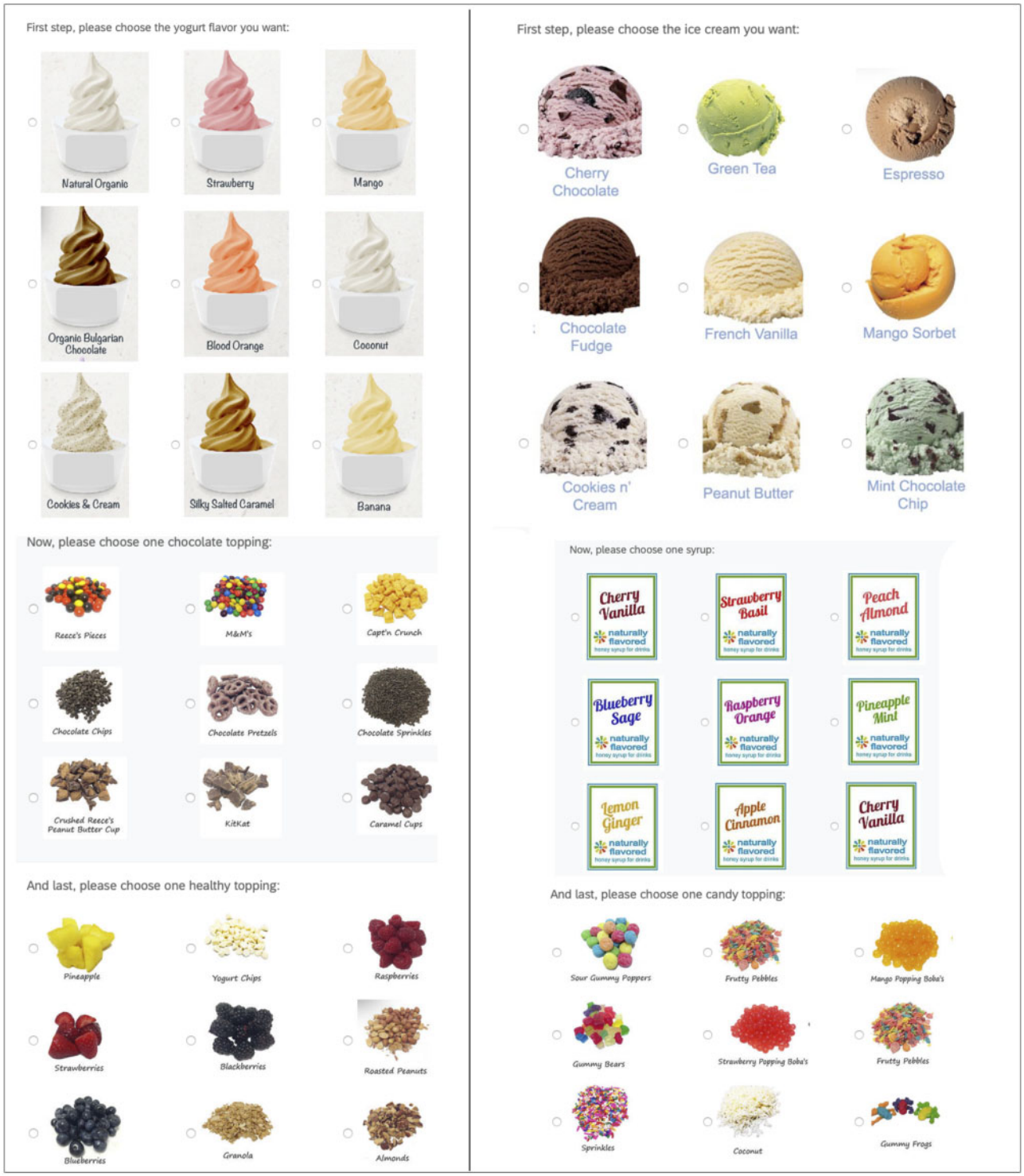
1. I'm concerned about my style of doing things;
2. I'm concerned about the way I present myself;
3. I'm self-conscious about the way I look;
4. I usually worry about making a good impression;
5. One of the last things I do before I leave my house is look in the mirror;
6. I'm concerned about what other people think of me; and
7. I'm usually aware of my appearance.

Self-presentation concerns items:

1. How worried will you be to make a decision that would show yourself in the best possible light?
2. To what extent will you be attempting to control your impression while making the decision?

APPENDIX D: SCREENSHOTS OF THE SELECTION INTERFACE AND STIMULI ACROSS CONDITIONS IN STUDY 6

The left pane depicts the stimuli and selection interface used in all conditions. Participants in the control condition first observed the stimuli depicted in the right pane.



APPENDIX E: ITEMS USED IN STUDY 7B

Usage/Purchase Intentions

1. To what extent would you be willing to use such a system? (1–7 scale ranging from *not at all* to *very much*);
2. How interested would you be in such a system? (1–7 scale ranging from *definitely not interested* to *extremely interested*);
3. To what extent would you value such a system? (1–7 scale ranging from *not at all* to *very much*); and
4. How much would you be willing to pay for such a system? (ranging from $1 to $7, using $1 intervals. Scale was converted to a 1–7 scale).

Aversion to being observed (all on a 1–7 scale):

1. To what extent you will feel comfortable using such a system? (R; ranging from *very uncomfortable* to *very comfortable*) and
2. To what extent you will have privacy concerns when using such a system? (R; ranging from *many concerns* to *no concerns*).

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