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Is Satisficing Really Satisfying?

Satisficers Exhibit Greater Threat Than Maximizers During Choice Overload

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Abstract

When selecting from too many options (i.e., choice overload), *maximizers* (people who search exhaustively to make decisions that are *optimal*) report more negative post-decisional evaluations of their choices than do *satisficers* (people who search minimally to make decisions that are *sufficient*). Although ample evidence exists for differences in responses after-the-fact, little is known about possible divergences in maximizers' and satisficers' experiences *during* choice overload. Thus, using the biopsychosocial model of challenge/threat, we examined 128 participants' cardiovascular responses as they actively made a selection from many options. Specifically, we focused on cardiovascular responses assessing the degree to which individuals (a) viewed their decisions as valuable/important and (b) viewed themselves as capable (vs. incapable) of making a good choice. Although we found no differences in terms of the value individuals placed on their decisions (i.e., cardiovascular responses of task engagement), satisficers—compared to maximizers—exhibited cardiovascular responses consistent with feeling less capable of making their choice (i.e., greater relative threat). The current work provides a novel investigation of the nature of differences in maximizers'/satisficers' momentary choice overload experiences, suggesting insight into why they engage in such distinct search behaviors.

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1. Introduction

People tend to prefer larger (vs. smaller) arrays of options (e.g., Berger, Draganaska, & Simonson, 2007), but they hold more negative subjective evaluations of their choices after selecting from many (vs. fewer) options, a phenomenon termed *choice overload* (Chernev et al., 2015; Haynes, 2009; Markus & Schwartz, 2013; Schwartz, 2004). However, the extent to which individuals experience choice overload in a negative way depends on their decision-making style; specifically, their inclinations to *maximize* versus *satisfice.* Maximizers, or those who tend to search exhaustively for the best possible option, spend more time and effort making decisions than do satisficers, who tend to only search minimally to find an adequate option (e.g., Chowdury, Ratneshwar & Mohanty, 2009; Dar-Nimrod, Rawn, Lehman & Schwartz, 2009; Polman, 2010; Schwartz et al., 2002; Yang & Chiou, 2010). Despite this additional time and effort, maximizers are generally less satisfied with their choices than satisficers (Chowdhury et al., 2009; Dahling & Thompson, 2012; Iyengar, Wells, & Schwartz, 2006; Leach & Patall, 2013; Sparks, Ehrlinger & Eibach, 2012; Schwartz et al., 2002), and report more negative affect and regret as a result of their choice (Chowdhury et al, 2009; Dar-Nimrod et al., 2009; Spunt et al., 2009).

Although these post-decisional evaluations are well understood, it is unclear how maximizers and satisficers may differ in their experiences *while* immersed in a choice overload scenario. Specifically, given prior theorizing, there remain two motivational dimensions on which maximizers and satisficers may reasonably differ as they form their decision: the degree to which they (1) view their decisions as valuable/important and (2) view themselves as capable/incapable of making a good choice. For instance, in terms of the decision’s value and importance, it could be the case that satisficers search less exhaustively through their options because they simply care less about their choices than do maximizers (e.g., Vohs & Olsen, 2013). In terms of capability/incapability of choosing, maximizers—compared to satisficers—may feel they lack the time and ability to carry out their more exhaustive search when given so many options. However, it is also possible that satisficers may view themselves as less capable of reaching a good decision compared to maximizers, searching less exhaustively to avoid the onerous duty of deciding. To test these distinct possibilities, we used cardiovascular measures from the perspective of the biopsychosocial model of challenge/threat (BPSC/T; for reviews, see Blascovich, 2008; Seery, 2011, 2013; Seery & Quinton, 2016), which monitored these two motivational dimensions during a decision-making task. In doing so, the current work is a novel investigation of differences in maximizers' and satisficers' experiences in the moment of choice overload, providing possible insight into why they engage in such distinct search behaviors.

1.1. The Biopsychosocial Model of Challenge/Threat (BPSC/T)

The BPSC/T applies specifically to motivated performance situations, which entail actively performing instrumental responses to reach valued goals (e.g., giving a speech, taking a test). Individuals' level of *task engagement* reflects the degree to which a given goal is evaluated as personally important, with greater task engagement corresponding to evaluating greater subjective value. Assuming task engagement, evaluations of personal resources and situational demands determine the degree to which individuals experience psychological states of challenge versus threat. Whereas *challenge* occurs when individuals evaluate high personal resources relative to situational demands, *threat* occurs when individuals evaluate low resources relative to demands. Despite discrete labels, challenge and threat represent two anchors of a single bipolar continuum (for additional discussion, see Seery & Quinton, 2016). Notably, divergences along this bipolar continuum indicate how one's evaluated resources compare to evaluated demands in the moment, and do not necessarily provide information about resources or demands in isolation. For instance, one could evaluate a motivated performance situation as being exceedingly demanding, but evaluate holding relatively high personal resources (indicating greater challenge) or relatively low personal resources (indicating greater threat) to meet these situational demands.

Four cardiovascular measures are used to index the psychological experiences of task engagement and challenge/threat: heart rate (HR); preejection period, a measure of contractile force in the left ventricle (reactivity multiplied by −1 for presentational purposes and referred to as ventricular contractility, VC); cardiac output (CO), the volume of blood pumped by the heart; and total peripheral resistance (TPR), a measure of net arterial constriction versus dilation. Task engagement is theorized to elevate sympathetic-adrenomedullary axis activity, increasing HR and VC from baseline (occurring across the challenge/threat continuum; Seery 2011, 2013). Greater increases in HR and VC further reflect greater task engagement (e.g., Blascovich, Mendes, Hunter, & Salomon, 1999; Seery, Weisbuch, & Blascovich, 2009; also see Fowles, Fisher, & Tranel, 1982; Tranel, Fisher, & Fowles, 1982; for additional discussion, see Seery, 2013). Given task engagement, the model suggests that challenge leads to greater release of epinephrine than threat, resulting in relative arterial dilation to supply skeletal muscles with blood (e.g., in the arms and legs). This assists the heart to pump more blood (Seery 2011, 2013), and thus, challenge is marked by lower TPR and higher CO than threat. In other words, lower TPR and higher CO reflect relatively greater challenge/lesser threat. Rather than equating to challenge/threat itself, these cardiovascular responses represent measures of the underlying psychological states. Dozens of published studies support the validity of these cardiovascular markers (for reviews, see Blascovich, 2008; Seery, 2013; Seery & Quinton, 2016).

1.2. Overview and Hypotheses

Previous work has used the BPSC/T to examine choice overload, finding that participants who selected from many options versus few exhibited cardiovascular responses consistent with both greater task engagement and greater threat (Saltsman, Seery, Kondrak, Lamarche, & Streamer, 2019). In other words, choice overload leads people to simultaneously feel that making a good decision is highly important, but beyond their reach. In the current investigation, we tested maximizing/satisficing as an individual difference that plausibly impacts these motivational dimensions. Though maximizers report having a more negative decision-making experience than satisficers, the current work was able to use the BPSC/T to directly examine specific aspects of their psychological experiences in the moment. We generated three plausible hypotheses.

1.2.1. Hypothesis 1

Maximizers tend to exhaustively search through their options, but satisficers only search minimally before arriving at a decision. Given these different search behaviors, satisficers may find the act of deciding less important or valuable than maximizers in the moment. If this is the case, satisficers should exhibit cardiovascular responses consistent with lower task engagement (lower HR, VC) compared to maximizers.

1.2.2. Hypothesis 2a and 2b

We held competing hypotheses for differences in challenge/threat responses. First, it is plausible that maximizers, relative to satisficers, feel they lack the time and ability to carry out their decision-making process, given that they tend to search more effortfully and exhaustively than satisficers. This may lead maximizers to evaluate lower personal resources relative to demands, and thus exhibit cardiovascular responses consistent with greater relative threat than satisficers (higher TPR, lower CO; Hypothesis 2a). However, even if maximizers evaluate that searching exhaustively through their options is highly demanding, they could at the same time evaluate that they are fully capable of undertaking this search. In this case, satisficers—compared to maximizers—may feel they lack the ability to make their decision, thus settling for adequate options and avoiding the onerous duty of choosing more ideal options. If this is the case, when choosing from many options, satisficers—compared to maximizers—should evaluate lower resources relative to demands and exhibit cardiovascular responses consistent with greater threat (higher TPR, lower CO; Hypothesis 2b).

Although Hypothesis 2b seems potentially inconsistent with research arguing that satisficers generally report a more positive experience after choice overload than maximizers, it is supported by other work. Compared to maximizers, satisficers not only focus more on feasibility concerns when approaching their options (Luan & Li, 2017), but may broadly hold lower expectations for their likelihood of succeeding (Jain, Bearden, & Filipowicz, 2011). Importantly, given that maximizing/satisficing reflects decision styles, differences between maximizers and satisficers should only emerge during tasks that specifically involve making choices.

2. Method

2.1. Participants

To test our hypotheses, 128 (56 female) undergraduate students participated in exchange for course credit. Please see Table 1 for detailed demographic information. Approximately 10-15 percent of the sample may typically be lost due to recording problems in studies examining challenge/threat responses. In addition to the 128 analyzed participants, 14 participants were excluded from analyses for the following reasons: 6 due to missing or unusable blood pressure readings, 4 due to unusable impedance cardiography data, 3 due to no recorded physiological data, and 1 due to a participant’s heart condition. Notably, 2 participants did not have cardiovascular data during a secondary speech task, and thus were included in analyses for the choice task, but not for the speech task.

Using G*Power (Faul, Erdfelder, Buchner, & Lang, 2009), we conducted a post-hoc sensitivity analysis to compute the effect size that our sample size was adequately powered to detect. This power analysis suggested that a sample size of 128 participants should provide adequate power (.80) to detect a moderate effect size of η_p^2 = .062. Although maximizing tendencies have not been investigated in the context of challenge/threat responses, a moderate effect size seemed appropriate given past research in the challenge/threat literature (see Hase, O'Brien, Moore, & Freeman, 2018). Importantly, results were not analyzed until after data collection was complete.

"INSERT TABLE 1 ABOUT HERE"

2.2. Cardiovascular Measures

Following accepted guidelines, cardiovascular measures were recorded noninvasively (Sherwood et al., 1990) using the following equipment manufactured and/or distributed by Biopac Systems, Inc (Goleta, CA): NICO100C impedance cardiography (ICG) noninvasive cardiac output module, ECG100C electrocardiogram (ECG) amplifier, and NIBP100A/B noninvasive blood pressure module. ICG signals were detected with a tetrapolar aluminum/mylar tape electrode system, which recorded basal transthoracic impedance (Z0) and the first derivative of impedance change (dZ/dt), sampled at 1kHz. ECG signals were detected and sampled at 1kHz using a Standard Lead II electrode configuration (additional spot electrodes on the right arm and left leg, with ground provided by the ICG system), A wrist-mounted blood pressure monitor collected continual readings (every 10-15 seconds) from the radial artery of participants' nondominant arm. Together, ICG and ECG recordings allowed computation of HR, VC (i.e., preejection period reactivity×-1), and CO, and blood pressure data was additionally used to calculate TPR (mean arterial pressure×80/CO; Sherwood et al., 1990). Recorded measurements were stored on a computer and analyzed off-line with Biopac Acqknowledge 3.9.2 for Macintosh software, including ensemble averaging in 60 s intervals (Kelsey & Guethlein, 1990). Importantly, scoring of cardiovascular data was performed blind to other participant data. Our approach adheres to standard techniques from previously published challenge/threat research using various equipment configurations (e.g., de Wit, Scheepers, & Jehn, 2012; Jamieson, Nock, and Mendes, 2012; Lupien, Seery, & Almonte, 2012; Seery, Kondrak, Streamer, Saltsman, & Lamarche, 2016; Shimizu, Seery, Weisbuch, & Lupien, 2011; Turner et al., 2013; Vine, Freeman, Moore, Chandra-Ramanan, & Wilson, 2013).

2.3. Materials

2.3.1. Preliminary Questionnaires

To assess individuals' maximizing/satisficing tendencies, we administered the Maximization Scale (13 items, $\alpha = .65$, $M = 4.761$, $SD = 0.734$, Range = 2.46 - 7; Schwartz et al., 2002; Cheek & Schwartz, 2016), a commonly used instrument to assess this construct. Although the reliability coefficient for this scale is relatively low by conventional standards ($\alpha < .70$), it is consistent with past work. For instance, across seven separate samples, Schwartz and colleagues (2002) observed similar reliability coefficients, ranging from $\alpha = .60$ to $\alpha = .73$. For this reason, Schwartz and colleagues (2002), as well as other researchers (see Nenkov, Morrin, Ward, Schwartz, & Hulland, 2008), have suggested that the Maximization Scale may be best conceptualized as three underlying sub-factors, including the degrees to which individuals are (1) willing to search exhaustively through alternatives, (2) experience difficulty with decisions, and (3) hold high standards for their choices. Notably, in the current investigation, the pattern of responses is consistent across all sub-factors, and thus, we examine maximizing as a unitary construct.

The Maximization Scale is assessed on a 7-point Likert scale (1 = Completely disagree to 7 = Completely agree); sample items include “When shopping, I have a hard time finding clothing that I really love,” “When I’m faced with a choice, I try to imagine what all the other possibilities are, even ones that aren’t present at the moment,” and “I often fantasize about living in ways that are quite different from my actual life.” The total score was calculated by averaging across scale items and treating the resulting average as a continuous measure of maximizing/satisficing, such that higher values reflected higher maximizing/lower satisficing. Participants then completed additional questionnaires related to individuals’ desire for and importance placed upon choices broadly (i.e., Free Will and Determinism Plus Scale, Paulhus & Carey, 2009; Dispositional Social Power, Anderson & Galinsky, 2006; Self-Determination Scale, Sheldon, Ryan, & Reis, 1993; and Self-Control Scale, Tankney et al., 2004).

2.3.2. Post-decisional self-report evaluations

After engaging in a choice task (described in detail below), participants completed nine self-report items assessing negative post-decisional evaluations, including satisfaction (1 item: “How satisfied are you with your decision-making process?”, reverse-scored), regret (1 item: “How much do you regret how you went about the decision-making process?”), confidence (1 item: “How confident are you in your decision-making process?”, reverse-scored), difficulty (1 item: “How difficult did you find this task?”), desire to change decision (2 items: “If given the opportunity to change your decision, how likely would you be to change it?”, “How much do you want to change your decision?”), and frustration/enjoyment (3 items: “How frustrating did you find this task?”; “How much did you enjoy this task?”, reverse-scored; “How much would you want to do this task again?”, reverse-scored). Items were assessed on a scale ranging from *1 = Not at all* to *7 = Very* and averaged into a single composite scale ($\alpha = .81$).

2.4. Procedures

Participants completed the study individually. Upon entering the laboratory, participants first completed the Maximization Scale (Schwartz et al., 2002), as well as additional questionnaires related to individuals' desire for and importance placed upon choices. These measures included individuals' levels of free will beliefs, dispositional power, self-control, and self-determination. Next, participants were attached to the physiological sensors and sat quietly for a 5-min resting baseline period, which was introduced with audio instructions explaining a cover story: Physiological equipment needed to be calibrated, which occurred entirely in the experimenter's control room, so it would seem to participants like nothing was happening; all they needed to do was sit quietly for the next few minutes until told it was time to continue.

Following this baseline period, participants were introduced to the first motivated performance situation: an online personal profile task. Participants heard instructions that they would be viewing a series of online personal profiles and would later be asked to report their choice regarding their most preferred profile among 15 total options (a large number of options). Participants were provided a small envelope of laminated cards. Each card represented a personal profile and was labeled with an identification number printed in the top left corner and contained five experimenter-generated "facts" about the profile target, ranging across academics (e.g., "I'm getting my bachelor's degree in architecture"), occupation (e.g., "I work at a bakery"), and leisure activities (e.g., "I'm addicted to medical dramas"). Participants were provided 3 min to review the profiles, and then were asked to report their decision out loud. Although using a different design and testing a separate research question, Saltsman et al. (2019) found evidence that this personal profile paradigm not only reliably elicits self-reported post-decisional choice overload responses, but impacts the same cardiovascular indices of task engagement and challenge/threat recorded in the current study.

Embedded in initial choice task instructions was a manipulation that described participants' choice as either final or non-final. Although much research on maximizing/satisficing has focused on main effects, Shiner (2015) found that maximizers and satisficers respond differently to final versus reversible decisions. Specifically, maximizers report more positive experiences after making reversible decisions, whereas satisficers report more positive experiences after making final decisions. As a secondary research question, we explored possible divergences between maximizers and satisficers *during* these different kinds of decisions by attempting to manipulate the finality of individuals' choices.

All participants then completed the nine post-decisional self-report items, before sitting quietly for a second 5-min rest period, during which they were told that the experimenter was re-calibrating the physiological equipment. Immediately following this rest period, participants were exposed to a second exploratory manipulation before the speech task, wherein they either "accidentally" overheard their experimenter tell another research assistant that the participant's decision was a good choice (a popular, normal choice) or a poor choice (an option that the experimenter was surprised anyone would ever pick). There was no clear basis in maximizing/satisficing or choice overload literatures to expect this manipulation to interact with maximizing/satisficing, and it occurred after the choice task of primary interest, so we do not consider it further. Nonetheless, we included dummy-coded feedback condition in analyses of cardiovascular responses during the speech.

After this exploratory manipulation, participants were asked to complete a 2-min speech task wherein they discussed their post-collegiate goals and plans. This particular speech topic was used because it held elements of choice (e.g., deciding which career to pursue), but did not require participants to make a decision specifically. Thus, the speech topic provided an opportunity to test the extent to which any responses associated with maximizing/satisficing are specific to situations that require an explicit choice (i.e., from a presented array of options). Following the speech task, participants completed a brief set of questionnaires assessing demographic/background information, before physiological sensors were removed, and participants were debriefed and thanked. For a detailed step-by-step procedural overview, please see Figure 1.

"INSERT FIGURE 1 ABOUT HERE"

3. Results

3.1. Analytical Strategy

3.1.1. Physiological Data Reduction and Preliminary Analyses

Consistent with other published challenge/threat research (e.g., Lupien et al., 2012; Scheepers et al., 2012; Seery, Leo, Lupien, Kondrak, & Almonte, 2013), cardiovascular reactivity values were computed by subtracting responses observed during the final minute of the initial baseline period from those observed during each choice task minute (4 total minutes: 3-min evaluation period, plus an additional untimed period to report one’s choice) and the 2-min speech task. For means and standard deviations of raw values during the initial baseline period and the subsequent rest period (not used for calculating reactivity), as well as for reactivity during each task period, please see Table 2. For each cardiovascular variable, the mean of the four reactivity values for the choice task (one value for each of the four minutes in the task) and, separately, the mean of the two reactivity values for the speech task (one value for each of the two minutes in the task) were used in analyses (see Llabre, Spitzer, Saab, Ironson, & Schneiderman, 1991, for psychometric justification for change scores in psychophysiology). For extreme reactivity values greater than 3.3 SDs from the mean (p = .001 in a normal distribution; Tabachnick & Fidell, 1996), values were winsorized by adjusting each to be 1% above the next-highest nonextreme value (choice task: 0 for HR, 1 for VC, 1for CO, and 2 for TPR; speech task:

0 for HR, 1 for VC, 1 for CO, and 1 for TPR), thereby maintaining the rank order in the distribution while decreasing the influence of extreme values.

"INSERT TABLE 2 ABOUT HERE"

Changes in TPR and CO should theoretically reflect common underlying sympathetic-adrenomedullary activation and both indicate relative challenge/threat differences. Thus, TPR and CO reactivity values were combined into a single index (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004; de Wit, Scheepers, & Jehn, 2012; Saltsman et al., 2019; Seery et al., 2009). The use of a single index served to (1) maximize the reliability of the cardiovascular measures, and (2) assess relative patterns across TPR and CO within participants (e.g., differentiating between individuals with low CO and high TPR vs. those with moderate CO and high TPR). We converted participants' TPR and CO reactivity values into z-scores and summed reverse-scored TPR with CO (i.e., TPR was multiplied by -1 because TPR and CO typically respond in opposite directions), such that lower index values represent cardiovascular reactivity consistent with greater threat. The resulting index was then standardized for ease of interpretation ($M = 0$, $SD = 1$). Differences on this index are relative: The zero point represents the sample mean, and is not a demarcation point between challenge versus threat.

Because increases in HR and VC during task performance are necessary to interpret challenge/threat cardiovascular patterns, we needed to first confirm that participants as a whole exhibited significant increases from baseline in HR and VC during tasks. One-sample *t* tests revealed that HR and VC reactivity were significantly greater than zero during the choice task, ts > 6.41, ps $< .001$, and during the secondary speech task, ts > 4.31, ps $< .001$, justifying tests of relative differences in challenge/threat responses. After evidence of task engagement was established, HR and VC were also combined into a single index by summing their z-scores to examine differences in task engagement across conditions. The resulting index was standardized, with zero representing the sample mean rather than baseline levels. See Table 3 for a correlation matrix and descriptive statistics for all individual and composite measures.

"INSERT TABLE 3 ABOUT HERE"

3.1.2. Primary Statistical Analyses

For each dependent measure of interest (i.e., cardiovascular responses of task engagement, challenge/threat, and self-reported choice overload), we conducted analyses using standard multiple regression, treating maximizing/satisficing as a continuous independent variable and controlling for dummy-coded condition (final vs. reversible choice). The exploratory pre-speech feedback manipulation was added as a covariate for tests of the speech task. We used partial eta squared (η_p^2) as a measure of effect size. As described in Steiger (2004), 90% confidence intervals (CIs) rather than 95% CIs reflect alpha = .05 for η_p^2 and correspond to p values, given that η_p^2 cannot be negative.

3.2. Task Engagement (Hypothesis 1)

Hypothesis 1 predicted that satisficers should exhibit cardiovascular responses consistent with lower task engagement than maximizers. Failing to support this first hypothesis, maximizers and satisficers did not significantly differ in terms of task engagement responses during the choice task, $t(125) = 0.17$, $b = .015$, $p = .866$, $\eta_p^2 = .000$, 90% CI = [0, .016]. Similarly, we found that maximizers and satisficers did not differ in terms of task engagement during the secondary speech task as well, $t(122) = -0.31$, $b = -.028$, $p = .758$, $\eta_p^2 = .000$, 90% CI = [0, .025]. The interaction between maximizing/satisficing and final/reversible choice condition failed to reach significance for both the choice task, $t(124) = 0.41$, $b = .074$, $p = .684$, $\eta_p^2 = .001$, 90% CI = [0, .030], and the speech task $t(122) = 1.33$, $b = 0.24$, $p = .185$, $\eta_p^2 = .014$, 90% CI = [0, .067]. Notably, there was no main effect of final/reversible choice condition on task engagement responses in either task, ts < 0.82, bs < .147, ps > 413. See Table 4 for a summary of all primary analyses examining the role of maximizing/satisficing tendencies on cardiovascular and self-report outcome measures.

"INSERT TABLE 4 ABOUT HERE"

3.3. Challenge/threat (Hypotheses 2a and 2b)

We held competing hypotheses for differences in maximizers versus satisficers' challenge/threat cardiovascular responses (Hypotheses 2a and 2b). On the one hand, exposure to a large number of options could result in maximizers, but not satisficers, exhibiting greater threat, as they may feel they lack the time and ability to carry out the highly exhaustive search required to make an optimal choice (Hypothesis 2a). In contrast, compared to maximizers, satisficers' tendency to settle for an adequate option may be driven by feeling as though they lack the resources to make a good, reasoned decision (resulting in greater relative threat, Hypothesis 2b).

We found evidence for Hypothesis 2b. Specifically, during the choice task, satisficers exhibited cardiovascular responses consistent with greater relative threat compared to maximizers, $t(125) = 2.73$, $b = .236$, $p = .007$, $\eta_p^2 = .056$, 90% CI = [.008, .131]. No such difference emerged during the secondary speech task, $t(122) = 0.78$, $b = .069$, $p = .438$, $\eta_p^2 = .005$, 90% CI = [0, .044]. providing support for the assertion that differences between maximizers' and satisficers' cardiovascular responses should be specific to tasks entailing making choices. To formally test this divergence between individuals' responses during the choice and speech tasks, we used a mixed model to test the interaction between maximizing/satisficing and task type (within-subjects variable) on challenge/threat responses. This analysis revealed a marginally significant interaction, $b = -.197$, $z = -1.78$, $p = .075$, such that satisficers exhibited greater threat than maximizers during the choice task ($b = .292$, $p = .013$), but not during the speech task ($b = .095$, $p = .421$). Overall, differences between maximizers' and satisficers' momentary responses tended to be more pronounced when the task entailed making an explicit choice.

Finally, the interaction between maximizing/satisficing and final/reversible choice condition failed to reach significance for both the choice task, $t(124) = 1.22$, $b = .213$, $p = .225$, $\eta_p^2 = .012$, 90% CI = [0, .061], and the speech task $t(121) = 0.11$, $b = .020$, $p = .910$, $\eta_p^2 = .000$, 90% CI = [0, .007]. The main effect of final/reversible choice condition was not significant for challenge/threat responses in either task, *t*s < 0.95, *b*s < 0.164, *p*s > .344.

3.4. Self-report

In addition to cardiovascular responses, we assessed participants' post-decision self-reports, including the extent to which they felt dissatisfied, regretful, and frustrated about their decision-making process. We found no differences on this post-decisional self-report measure of choice overload as a function of maximizing/satisficing, $t(124) = -0.40$, $b = -.038$, $p = .689$, $\eta_p^2 = .001$, 90% CI = [0, .022], and maximizing/satisficing did not significantly interact with final/reversible choice condition, $t(123) = -0.30$, $b = -.058$, $p = .765$, $\eta_p^2 = .000$, 90% CI = [0, .025]. Further, the main effect of final/reversible choice condition was not significant for self-reported choice overload, $t(124) = -0.58$, $b = -.112$, $p = .563$, $\eta_p^2 = .003$, 90% CI = [0, .037].

Similar to our mixed-model approach testing cardiovascular responses during each task period (treated as a within-subjects variable), we also examined divergences between individuals' challenge/threat responses during the choice task and their self-reported responses after-the-fact. The self-report measure was standardized (the challenge/threat index was already standardized) and reverse-scored so that higher values on both measures reflected more positive valence. The mixed model analysis revealed a marginally significant interaction between maximizing/satisficing and within-subjects outcome variable (challenge/threat vs. self-report), $b = .273$, $z = 1.78$, $p = .075$, such that satisficers exhibited more negative responses (i.e., greater threat) than maximizers during the choice task ($b = .322$, $p = .007$), but did not significantly differ from maximizers in terms of self-reported choice overload ($b = .048$, $p = .684$). This analysis provided additional qualified evidence that the relative differences between maximizers and satisficers observed during the choice process changed at the point of reflecting after the choice.

3.5. Assessing the Role of Related Constructs

Considering the correlational nature of our examination, significant challenge/threat findings during the choice task could reflect individual differences in some construct other than maximizing/satisficing. Thus, we also tested this association controlling for constructs related to individuals' levels of free will beliefs, dispositional power, self-control, and self-determination. Similar to maximizing/satisficing, all of these constructs are related to individuals' desires for and beliefs about autonomy, choice, and control. Importantly, differences in maximizers'/satisficers' challenge/threat responses remained significant when including all other constructs (separately and simultaneously) as covariates in the analyses, ts > 2.64, bs > .239, ps < .009, providing evidence that the observed differences are specific to individuals' tendencies to maximize versus satisfice.

4. Discussion

Maximizing entails seeking out optimal decisions, whereas satisficing entails settling for adequate ones. In the current study, we sought to test the experiences of maximizers and satisficers *while* they evaluated and decided among many options. Specifically, we monitored the degree to which maximizers/satisficers evaluated their choice as subjectively important (reflected in cardiovascular responses of task engagement), and the extent to which individuals evaluated themselves as relatively capable versus incapable of managing their decision (reflected in cardiovascular responses of challenge/threat). In total, we had three hypotheses, two of which were competing hypotheses. First, we expected satisficers to exhibit cardiovascular responses consistent with lower task engagement during a choice task than maximizers, following from placing less subjective value on their choice (Hypothesis 1). However, we found no evidence of differences in cardiovascular responses consistent with task engagement, suggesting that maximizers and satisficers did not differ in the degree to which they placed subjective value or self-relevance on their decision.

We held competing hypotheses for challenge/threat responses. On the one hand, when given too many options, maximizers could exhibit cardiovascular responses consistent with greater threat than satisficers because making an optimal decision seems more daunting relative to satisficers merely making an adequate decision (Hypothesis 2a). However, it is also plausible that even if maximizers evaluate that their exhaustive search is highly demanding, they simultaneously feel capable of undertaking it (i.e, evaluations of high resources), whereas satisficers do not. In this case, satisficers could exhibit greater threat than maximizers. In other words, it may be the case that satisficers settle for adequate options because they feel more daunted by the prospect of choosing (Hypothesis 2b). We found support for Hypothesis 2b, not 2a. Specifically, satisficers—compared to maximizers—exhibited cardiovascular responses consistent with greater relative threat during the choice task, suggesting that satisificers evaluated themselves as less capable of managing their choice in the moment than did maximizers. This difference did not emerge during a secondary speech task. Though only approaching significance, mixed model analyses revealed a marginal interaction between maximizing/satisficing and task type, providing initial evidence that the observed effect could be specific to the choice domain.

These findings notably diverge from previous research showing that *after* choosing, satisficers report more *positive* evaluations of their choices compared to maximizers (e.g., Chowdhury et al., 2009; Dahling & Thomas, 2012; Iyengar et al., 2006; Leach & Patall, 2013; Sparks et al., 2012; Schwartz et al., 2002). In the moment of actively choosing from many options, satisficers—compared to maximizers—exhibited cardiovascular responses consistent with evaluating low resources relative to the demands associated with making their choice. Though the current work cannot directly speak to this possibility, it is plausible that this psychological experience could underly why some individuals satisfice more than others. If individuals evaluate an inability to reach a good, reasoned decision at the outset, they may search minimally through their options, selecting haphazardly to avoid the onerous duty of deciding. Satisficers may search minimally through their options not because they are less particular or simply place less importance on their choices than maximizers (a possibility for which we found no evidence), but may do so because they feel incapable of choosing from so many options. Thus, the current work provides evidence of a novel conceptualization of satisficing, one that is more defensive and reactionary in nature, rather than relatively easy and carefree. Although we failed to observe differences in post-decisional reports as a function of maximizing/satisficing, the pattern of results for challenge/threat cardiovascular responses nonetheless diverged from the pattern for these reports (the mixed-model test of which was only marginally significant). It may be the case that the typical positive post-decisional reports by satisficers are also defensive, reflecting motivation to distance from the decision and minimize any negative aspects of it.

4.1. Alternative Explanations, Limitations, and Future Directions

Despite similarities to past prototypical choice overload conditions, capturing momentary cardiovascular responses ultimately took precedence in our study design. Modifications to past paradigms made to facilitate the collection and interpretation of physiological data may have affected other aspects of participants' experiences. For instance, in order to ensure task engagement, participants were asked to publicly report their thoughts about each option, as well as their decision to the experimenter, which is uncommon in the literature (although see Saltsman et al., 2019). Similar think-aloud paradigms have been used to assess qualitative responses to many options broadly, and have largely been found to not affect these processes (e.g., Pan & Zhang, 2012; Woll, 1986). However, recent work suggests that maximizers tend to engage in more maximizing behaviors when their decision is public versus private, whereas satisficers show no such differences (Luan & Li, 2019).

Given that maximizers tend to search more exhaustively through their options than do satisficers, it is possible they may have engaged in more active motor behavior during the think-aloud task (e.g., speaking, card movement), thereby impacting the cardiovascular responses of interest. However, past work demonstrates that evaluative speaking tasks lead to generalized increase in levels of sympathetic nervous system activity, including both HR and VC (Blascovich et al., 2004; de Wit et al., 2012; Le et al., 2019; Lynch, Thomas, Long, Malinow, Chickadonz, & Katcher, 1980; Seery, et al., 2009). Notably, we only observed differences in challenge/threat responses in the current work and did not find significant differences between maximizers' and satisficers' task engagement responses (a composite measure of HR and VC; see Table 4). Further, in an additional model controlling for task engagement responses, satisficers still exhibited significantly greater threat than did maximizers during the choice task. Taken together, the lack of evidence for task engagement findings suggests that differences in maximizers' and satisficers' challenge/threat responses are not simply due to maximizers being more active during the choice task.

In addition to requiring participants to speak out loud, our paradigm also created a highly evaluative and self-relevant decision context, explaining that participants would be making an important decision that would ultimately be scrutinized by the experimenter. Because maximizing is associated with perceiving one's choices as more reflective of the self (Vohs &

Olson, 2013), maximizers may generally be more accustomed to thinking about their choices in this way than are satisficers. Thus, when explicitly directed to think of their choices as highly important and evaluative, it may be the case that satisficers feel relatively inexperienced with these types of decisions, and thus less capable than maximizers of managing their choice (resulting in greater relative threat). Although this possibility is still theoretically interesting in terms of understanding maximizers and satisficers, it does potentially limit the generalizability of the current results to choices that are perceived to be highly important or evaluative. Future work should further examine differences in maximizers' and satisficers' responses across a range of decision contexts, including choices that are designed to seem relatively high and low in importance.

Because the primary focus of this investigation was on testing relationships with maximizing/satisficing within the context of choosing in particular, we did not counterbalance task order. Thus, although we found evidence that the observed effects emerged only during the process of choosing, we did not test this issue in an optimal way. Conclusions regarding the specificity of our effects should hence be regarded as preliminary. Future research could more thoroughly investigate whether challenge/threat differences are specific to a choice task. For instance, subsequent studies could include additional types of tasks unrelated to choosing, counterbalancing the order of these non-choice tasks with a choice task.

4.2. Conclusions

Individuals who tend to maximize (search exhaustively to make decisions that are optimal) have been shown to report more negative post-decisional evaluations than do those who tend to satisfice (search minimally to make decisions that are sufficient; Iyengar et al., 2006; Polman, 2010; Schwartz et al., 2002). However, existing research was unclear regarding differences between maximizers' and satisficers' experiences in the moment of making choices.

In the current work, we reasoned that maximizers and satisficers may differ along two dimensions during a choice task: the degree to which they (1) view their decisions as valuable or important, and (2) view themselves as capable versus incapable of making a good choice. We found no evidence that maximizers and satisficers differed in terms of the degree to which they placed importance on their decision. However, defying traditional wisdom that satisficers should generally have a more positive experience when making decisions, we found evidence for the opposite response. Compared to maximizers, satisficers exhibited cardiovascular threat responses, consistent with evaluating themselves as less capable of managing their choice in the moment. Taken together, it may not be the case that satisficers search minimally because they are genuinely satisfied with a merely adequate option, but instead because they view themselves as incapable of finding the best possible option.

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Table 1

Demographics of Study Sample

Factor	*n*
Total n	128
Gender	
Male	72
Female	56
Age	
18-19	98
20-21	22
22-23	6
24 or older	1
Other or Not provided	1
Race	
Caucasian	70
Asian	29
African or African-American	8
Latino/Hispanic	15
Native American	3
Middle Eastern	2
Other or Not provided	1
Native Language	
English	
Yes	98
No	29
Other or Not provided	1
Country of Origin	
United States	
Yes	98
No	29
Other or Not provided	1

Table 2

Means and Standard Deviations for Raw Cardiovascular Responses (Not Reactivity)

	Baseline		Choice period		Rest period		Speech Period	
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
HR	73.674	11.180	80.931	10.974	74.325	10.751	83.254	11.483
PEP	76.469	13.219	72.445	13.436	76.328	13.206	73.700	14.002
CO	11.960	4.780	11.065	4.233	11.850	4.789	11.740	4.796
TPR	574.011	242.291	722.516	302.984	605.320	250.794	702.008	283.557

Note. TPR = total peripheral resistance dyne-s/cm^5), CO = cardiac output (L/min), HR = heart rate (beats/min), PEP = preejection period (ms; VC = preejection period reactivity × −1). Reactivity means in Table 3 may differ slightly from subtracting raw baseline mean from the corresponding raw task mean due to the winsorizing procedure.

Table 3

Correlations and Descriptive Statistics

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Maximizing-Satisficing	-													
<u>Choice task</u>														
2. Challenge/threat index	.236**	-												
3. TPR reactivity	-.204*	-853***	-											
4. CO reactivity	.200*	.853***	-.456***	-										
5. Task engagement index	.015	.139	.067	.304***	-									
6. HR reactivity	.010	.028	.100	.147	.844***	-								
7. VC reactivity	.016	.207*	.012	.366***	.844***	.425***	-							
<u>Speech Task</u>														
8. Challenge/threat index	.070	.571***	-.492***	.480***	.086	.015	.130	-						
9. TPR reactivity	-.032	-.492***	.607***	-.232**	.066	.087	.025	-.887***	-					
10. CO reactivity	.092	.521***	-.266**	.619***	.219*	.113	.256**	.887***	-.572***	-				
11. Task engagement index	-.028	.234**	-.056	.341***	.747***	.669***	.592***	.304***	-.098	.441***	-			
12. HR reactivity	-.019	.151	-.042	.214*	.643***	.793***	.294***	.188*	-.055	.278**	.820***	-		
13. VC reactivity	-.026	.233**	-.050	.345***	.581***	.304***	.677***	.311***	-.107	.445***	.820***	.344***	-	
14. Self-reported choice overload	-.036	-.165	.133	-.148	.115	.137	.058	-.015	-.011	-.038	.036	.032	.027	-
M	4.761	0	143.820	-0.870	0	7.257	4.023	0	139.657	-0.322	0	9.565	2.787	3.266
SD	0.734	1	125.736	1.494	1	6.176	7.099	1	140.065	1.732	1	7.496	7.255	1.074

Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$. TPR = total peripheral resistance dyne-s/cm^{5}), CO = cardiac output (L/min), HR = heart rate (beats/min), VC = ventricular contractility (ms). Values reflect the subsample with no missing data from the specific task (choice task $N = 128$; speech task $N = 126$).

Table 4

Summary of Primary Analyses for the Effects of Maximizing/Satisficing Tendencies on Cardiovascular Reactivity and Self-reported Choice Overload

Measure	*b*	η_p^2	ΔR^2	Raw *p*-value	Adjusted *p*-value (FDR)
Choice Task					
Task engagement	0.015	.000	.000	.866	>.999
HR reactivity	0.060	.000	.000	.913	>.999
VC reactivity	0.112	.000	.000	.860	>.999
Challenge/threat index	0.236**	.056	.056	.007	.007
CO reactivity	0.298*	.040	.040	.024	.028
TPR reactivity	-25.641*	.042	.042	.021	.023
Speech period					
Task engagement	-0.028	.001	.001	.758	>.999
HR reactivity	-0.145	.000	.000	.829	>.999
VC reactivity	-0.190	.001	.001	.772	>.999
Challenge/threat index	0.069	.005	.005	.438	.627
CO reactivity	0.157	.008	.008	.312	.402
TPR reactivity	-4.481	.001	.001	.717	>.999
Post-decisional					
Self-reported choice overload	-0.038	.001	.001	.688	>.999

Note. $^{+}p < .1$ $^{*}p < .05$. $^{**}p < .01$. ΔR^2 reflects the change in model R^2 after adding maximizing/satisficing to the other terms in the model. Adjusted *p*-values were calculated using a False Discovery Rate (FDR) approach (see Benjamini & Hochberg, 1995). TPR = total peripheral resistance dyne-s/cm^5), CO = cardiac output (L/min), HR = heart rate (beats/min), VC = ventricular contractility (ms).

Figure 1 *Step-by-step Overview of Study Methods*