The Psychological Record, 2011, 61, 547–560

THE "TYRANNY OF CHOICE": CHOICE OVERLOAD AS A POSSIBLE INSTANCE OF EFFORT DISCOUNTING

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When making a choice, people like to have options, but an emerging literature on "choice overload" suggests that the provision of too many *options results in adverse experiences, including a depletion of cognitive resources and postdecision feelings of regret. A strong implication is that individuals should shy away from situations involving too many options. The present study examined whether this expression of choice overload would emerge when human services workers confronted hypothetical scenarios involving choices of treatment strategies. On different trials, the participants indicated preference for single-option, limited-options, and extensive-options scenarios, wherein the number of extensive-options alternatives geometrically increased across successive trials. In general, preference for extensive-options scenarios decreased with the number of options that they incorporated. Preference for extensive options was well described by a negatively decelerating, hyperbolic-like function that typically is employed in studies of discounting. Moreover, as expected based on the choice overload framework, participants who were categorized as "maximizers" using the Maximization and Regret Scales demonstrated lower discounting (i.e., lower* k *value) than those categorized as "satisficers." We discuss how a quantitative discounting framework may be fruitfully applied to advance the study of choice overload.*

Key words: choice, choice overload, discounting, effort discounting

Choice is "the manner in which individuals allocate their time or responding among available response options" (Fisher & Mazur, 1997, p. 387),

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and, as Schwartz (2004a) has pointed out, it is widely assumed that having multiple options from which to choose is a good thing. Recent research, however, suggests that choosing can have some detrimental effects. In one seminal study, Iyengar and Lepper (2000) demonstrated that, compared to consumers who were given only a few options of goods to procure, those who were provided with many options were less likely to feel satisfied with the purchases that they made and to make subsequent purchases. It has been speculated that having too many options creates an unpleasant experience that has been labeled *choice overload* (Iyengar & Lepper, 2000; Scheibehenne, Greifeneder, & Todd, 2010) or, more informally, the “tyranny of choice” (Schwartz, 2000, p. 81).

Several possible adverse effects of choice overload were illustrated in a study by Vohs et al. (2008), which found that an increasing number of options from which to choose was associated with a deterioration of (a) self-control, (b) physical stamina and pain tolerance, (c) persistence in the face of failure, and (d) performance during numerical calculations. Vohs and colleagues speculated that choosing among many alternatives is effortful and, therefore, depletes cognitive resources that are important to skills like those just mentioned. Consistent with the findings of Iyengar and Lepper (2000), a number of studies now indicate that choosing among many alternatives promotes subjective feelings of regret and dissatisfaction with the outcomes of the choices (e.g., Iyengar, Wells, & Schwartz, 2006; Schwartz et al., 2002).

It has been proposed that choosing is effortful in part due to *search costs,* the “time, effort, risk, and regret associated with pursuing a particular end” (Wieczorkowska & Burnstein, 1999, p. 98). The greater the array of options to be considered, the greater the effort required to identify and consider them. Schwartz et al. (2002) suggested that this general effect is modulated by individual differences in temperament. For reasons that are not well understood, in choice situations some individuals (“maximizers”) may be driven to identify the best possible outcome, whereas others (“satisficers”) may regard any of several possible outcomes as acceptable. From this observation can be derived two predictions: Maximizers are, first, expected to be less deterred than satisficers by situations involving large numbers of options but, second, are expected to be more susceptible to postchoice feelings of doubt and regret. To be clear, Schwartz et al. (2002) proposed that all individuals fall along a satisficing–maximizing continuum. The preceding statements describe differences thought to be most pronounced between individuals at opposite ends of the continuum.

That maximizers are relatively undeterred by search costs was demonstrated in a study in which participants were presented with an opportunity to sacrifice time and money to gain access to more options (Dar-Nimrod, Rawn, Lehman, & Schwartz, 2009). Those with maximizing tendencies (as measured by the self-report Maximization Scale; Schwartz et al., 2002) were more likely to sacrifice resources than those with a satisficing profile. Evidence also supports the notion that maximizers are especially prone to regret. Schwartz et al. (2002) found a strong positive correlation between scores on the Maximization Scale and a similarly constructed self-report Regret Scale. Put simply, these results suggest that a maximizer is more likely to believe that a better choice may exist that he or she has not yet explored, and this tendency is exacerbated as the number of options increases. By contrast, the greater the range of options, the greater the likelihood that the satisficer will identify one that is "good enough."

The present study was undertaken with two goals. First, we sought to examine choice overload involving a broader range in number of options than has been the focus of many studies. Second, we sought to extend the choice overload framework to the experiences of human services workers, who often face many options concerning the type of treatment strategy that may be employed in a given case. The participants indicated their preferences among scenarios involving many, or a limited number of, treatment options. We expected preference to be negatively affected by the number of options (and, thus, positively related to the magnitude of presumed search costs) and that this effect would be more pronounced in maximizers than in satisficers.

Herein we describe findings relevant to these predictions but focus mainly on the serendipitous finding that the relationship between preference and number of options was strongly reminiscent of hyperbolic-like (i.e., hyperboloid) discounting. Briefly, *discounting* refers to a systematic erosion of subjective value (i.e., devaluation) caused by such factors as delay, uncertainty of occurrence, and, most relevant to the present study, effort. Our goal, therefore, is to suggest that choice overload may be an expression of effort discounting and to explore some implications of taking this perspective.

Method

Participants

One hundred forty-six employees (35 men, 111 women) were recruited from a private, not-for-profit residential school in New England serving individuals with autism and other developmental disabilities. Participants were informed that the study was investigating decision making and that by agreeing to participate they would be eligible for a lottery in which a $25 gift card would be awarded to two randomly selected individuals. Participants were told that participation was voluntary and not a requirement of their jobs. Volunteers ranged in age from 22 to 48 years (M = 27.2 years, SD = 4.4 years). A majority had earned a bachelor's degree (n = 112), with the remaining having earned a master's degree (n = 34).

Setting

Participants completed the study in a large auditorium (maximum seating 120) before the start of a regularly scheduled staff meeting. They worked in a group while facing a screen (3 m by 3 m) mounted on the front wall, on which study-related information was projected.

Measures

The study employed two questionnaires, each derived from Schwartz et al.'s (2002) Maximization and Regret Scales. The Maximization Scale is a 13-item Likert-type scale in which participants rate each of 13 statements from 1 (*completely disagree*) to 7 (*completely agree*). Total scale scores can range from 13 to 91, and scores of 40 or below are considered indicative of satisficing, while scores of 65 or higher are considered indicative of maximizing. The Regret Scale is a 5-item Likert-type scale involving ratings as just described. Scores can range from 5 to 35, with higher scores being more representative of a postdecision regret tendency. Consistent with the approach in research on stable individual differences, these scales are described by their authors as exposing situation-independent behavior tendencies related to satisficing/maximizing and regret traits. For more information on either scale, the reader is directed to Schwartz et al., 2002.

Procedure

After signing a consent form, completing a written demographic questionnaire, and completing both the Maximization and Regret Scales, participants read on-screen instructions and then completed a series of hypothetical choice trials, guided by displays like Figure 1. Specifically, participants were asked to imagine having to find a suitable residential treatment program for a hypothetical student with whom they worked. This was a task that the participants routinely faced in their positions. Instructions, projected on the auditorium's screen by a computer running Microsoft Office Power Point®, were as follows:

> You will be presented with three scenarios (each in their own column) on each page. One scenario column features one program from which to choose. One scenario column features two programs from which to choose. One scenario column features more than two programs from which to choose. On each page, please select the column representing the number of options you would MOST like to have available in finding a new program for your student. Fill in the bubble on the recording sheet marked Program Placement corresponding with your selection. Treat each page as an independent choice. That is, your preference on one page should not influence your preference on another.
>
> Assume that each program has similar treatment philosophies, with equal probabilities of success, and are equal in distance from your current setting.
>
> Each program is denoted by the icon: [Participants shown picture of school/program icon.]

The options in each trial appeared on screen as depicted in Figure 1, with each of the three options shown in a separate column (designated by the letter A, B, or C) in which the number of available treatment programs was depicted via building icons.[1]

1 Electronic copies of the data sheets and stimuli used in this study are available from the first author upon request.

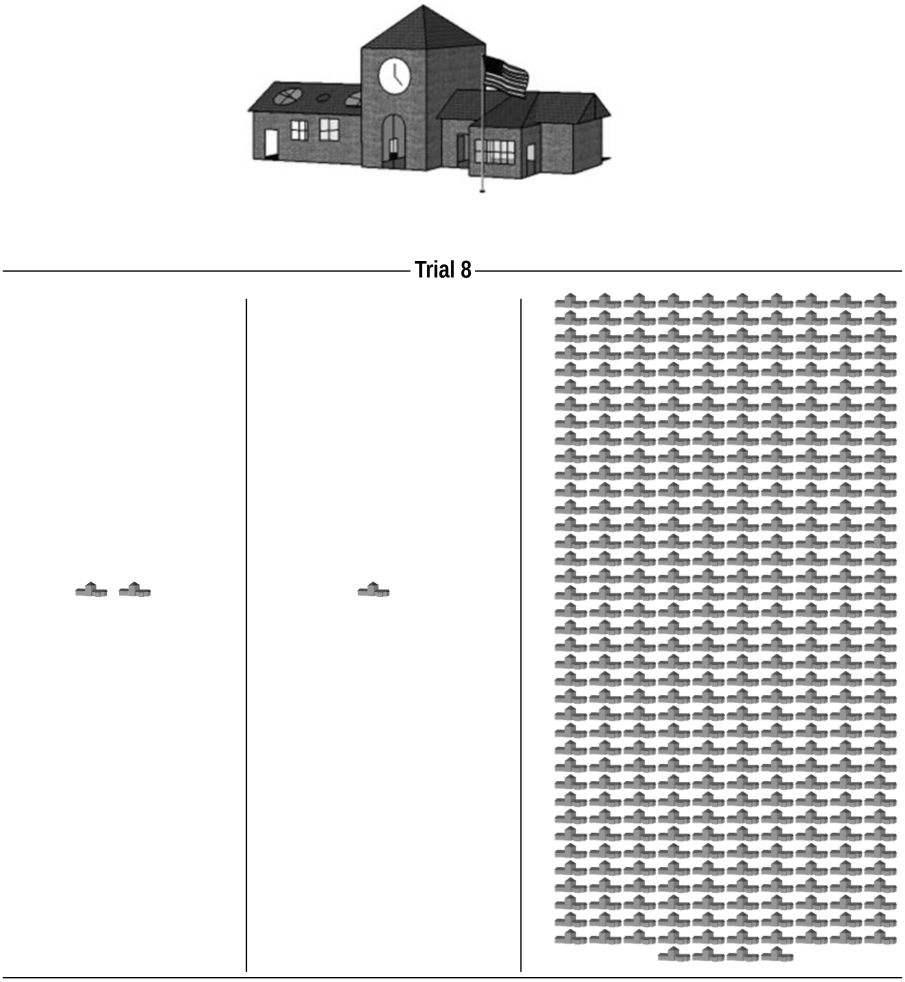

Figure 1. Top panel represents the icon depicting an option for a school placement. Bottom panel depicts a sample (Trial 8) of the hypothetical choice procedure (left column depicts limited options, middle column depicts single option, right column depicts extensive options).

The three scenarios presented on screen during each trial differed in terms of the number of treatment programs available to the hypothetical client. Specifically, a participant could choose to have (a) single option (i.e., only one treatment program available), (b) limited options (i.e., two programs available), or (c) extensive options (in which more than two programs were available). The number of programs described as available in the extensive-options scenario increased geometrically across trials (3, 6, 12, 24, 48, 96, 192, and 384). Although human services workers would likely never have to choose from more than 100 options, we used extreme values to examine the boundary conditions surrounding preference for multiple options. Position (left, middle, or right column) of the three sets of options (single, limited, or extensive) was randomized across trials. Building icons were of a consistent size regardless of the number of icons displayed in a column (see bottom panel of Figure 1). Participants were given approximately 15 s to mark the letter on the data sheet representing their choice before the slide advanced to the next trial, thereby doubling the extensive options.

Results and Discussion

Choice Overload Effects

Consistent with other studies on choice overload (cf. Scheibehenne et al., 2010), we expected three outcomes. First, we predicted that participants would tend to choose the limited-options scenario more often than the single-option scenario ("options are good"). Second, we predicted that the extensive-options scenario would be preferred over the limited-options scenario, but only when the number of options that it presented was slightly higher than in the limited-options scenario. Otherwise, we expected preference for the extensive-options scenario to decrease as the number of treatment options increased, presumably because of growing search costs. Third, we predicted that individuals with maximizing profiles would be less impacted by these presumed search costs than those with satisficing profiles.

The top panel of Figure 2 shows that, as expected, participants almost never selected the single-option scenario (selected by fewer than 5% of participants in all conditions), instead selecting more often the limited-options scenario. The extent to which the extensive-options scenario was preferred depended on the number of treatment options that it incorporated. When the extensive-options scenario incorporated only three treatment options, compared to the two in the limited-options scenario, about 86% of participants chose the extensive-options scenario.

When the number of options (and, presumably, search costs) doubled to six for the extensive-options scenario, only about 48% of participants chose this extensive-options scenario. Thereafter, as the number of options in the extensive-options scenario increased, preference for this scenario decreased.

Maximizing and Satisficing

On the Maximization Scale, 17 participants (about 12% of the sample) exhibited a satisficing profile (score ≤ 40; range = 26–40; median = 38), and 12 participants (about 8% of the sample) exhibited a maximizing profile (score ≥ 65; range = 66–76; median = 69). Due to the skewness/nonnormality of the distribution of scores, we used a nonparametric analysis of independent groups (i.e., Mann-Whitney U test) to examine differences between maximizer and satisficer groups. Not surprisingly, given the lack of overlap in scores of these two subgroups, our analyses verified a statistically significant difference in the Maximization Scale scores, $U = 204$, $p < .001$. For correlations, we used a Spearman's rank order correlation to examine the correlation between the Maximization Scale and the Regret Scale scores. For all participants, scores on the Regret Scale ranged from 5 to 33 and, as expected in the choice overload framework (e.g., Schwartz et al., 2002), were positively correlated with Maximization Scale scores, $r_s(144) = .44$, $p < .001$. Regret

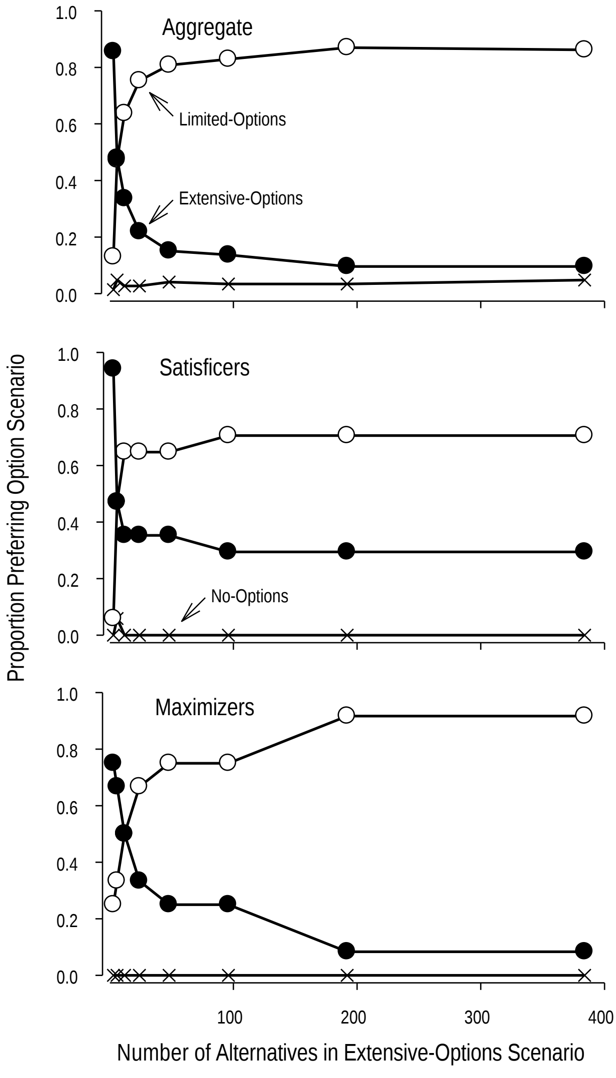

Figure 2. Proportion of participants choosing each of the three scenarios as a function of the number of alternatives presented in the extensive-options scenario for the aggregate (top panel), as well as satisficer (middle panel) and maximizer (bottom panel) groups.

Scale scores were used mainly to compare the maximizer (median = 24.5) and satisficer (median = 15) subgroups. Consistent with previous studies (Iyengar et al., 2006; Schwartz et al., 2002), maximizers showed significantly more decision regret, $U = 190$, $p < .001$.

Figure 2 shows that both satisficers (middle) and maximizers (bottom) exhibited the same general pattern of preference as the overall sample by rarely selecting the single-option scenario and by preferring the limited-options scenario over the single-option scenario. Consistent with the overall sample, for both subgroups preference for the extensive-options scenario was a negative function of the number of options that it incorporated. As predicted by a choice overload framework, this relationship was more pronounced for maximizers than for satisficers. To arrive at a quantitative description of these differences, we chose to compare the slope of the decreasing trend in the proportion of individuals choosing the extensive-options scenario across the maximizer and satisficer groups using a one-phase exponential decay model applied to the data and following the procedures outlined in Motulsky and Christopoulos, 2004. In the one-phase exponential decay model,

$$Y = \text{Span}\,(e^{-kx}) + \text{Plateau}, \quad (1)$$

where Span equals the difference between the highest Y value and the value of Y at the plateau (i.e., the value of Y at infinite times) of the nonlinear best fit curve. Thus, solving for k yields the slope value for the nonlinear best fit curve. Using the nonlinear regression function of GraphPad Prism® 5.03 for Windows (GraphPad Software, San Diego, CA, www.graphpad.com), we derived the k values from the one-phase exponential decay equation across the maximizer and satisficer groups. We then evaluated whether the k value for satisficers (.46) was significantly different from that of maximizers (.05) using the extra sum-of-squares F test (i.e., comparing whether there is a significant difference when satisficers' k values were constrained to that of maximizers or left unconstrained). Results suggest a statistically significant difference, such that the satisficers' slope was significantly greater than that of the maximizers, $F(1, 5) = 132.6$, $p < .0001$.

Outcomes Considered Within a Discounting Framework

In evaluating the results, we noticed that the shape of the functions depicting preference for the extensive-options scenario was quite similar to the negatively decelerating functions usually seen in research on discounting. Moreover, when we applied the one-phase exponential decay model—which served as the basis for many early models of discounting—to our data, we obtained fits that accounted for 98.6% and 95.4% of the variance for the satisficer and maximizer groups, respectively. Most relevant to the present case are studies on *effort discounting*, in which an outcome is devalued as a function of the effort required to obtain it. A small number of investigations (e.g., Grossbard & Mazur, 1986; Sugiwaka & Okouchi, 2004) have presented subjects with options involving (a) a larger and more effortful-to-obtain reward and (b) a smaller but easier-to-obtain reward, while varying the amount of effort required to obtain the former. In general, large rewards were highly preferred when effort was low, with preference decreasing as effort increased. For individuals in these within-subjects experiments, the relationship between effort and large-reward preference was well described by the function

$$P_S = A \,/\, (1 + kE)^S, \quad (2)$$

in which P_s is the proportion of choices for the large reward, which is taken as an index of the "subjective value" of the large-reward option; A is the amount (size) of the large reward; and *E* is a measure of effort. The fitted parameter *k* describes the degree of negative deceleration in this hyperbola-like function, and *s* describes individual differences possibly related to one's sensitivity to the nonlinear scaling of the number of extensive options presented in each trial (i.e., the sensitivity to search costs associated with making a decision given extensive options). More specifically, Myerson and Green (1995) described *s* as the ratio of the exponent that scales the values of the independent variable being regressed on to the exponent of the amount (size of the larger reward) that scales function (see also, Green & Myerson, 2010). Thus, *k* and *s* both aid in describing the degree of participants' discounting, with *k* representing rate of discounting as search costs increase and *s* representing the general shape of the discounting curve (specifically at lesser extensive-option sizes).

A rough analogy can be drawn between effort discounting, as described previously, and choice overload, as examined here. For simplicity, let us ignore the single-option scenario, since it was almost never selected. (We will discuss some interesting implications of this scenario below.) Functionally speaking, this places emphasis on participants' selection of the limited-options versus extensive-options scenarios. Thus, in an experiment like that of Grossbard and Mazur (1986), participants chose between two single-option "scenarios" (fixed-time and fixed-ratio schedules), which led to different sized rewards. In the present analogy, the choice is between multiple-option scenarios involving *different numbers of potential courses of action*.

In the scenarios presented to our participants, the "reward" was assumed to be successfully placing the hypothetical student in a treatment program. This reward would be the same across trials for each scenario. Because *A* in Equation 2 is the objective value of the reward to which discounting is expected to apply (here, finding a placement through the extensive-options scenario), any constant will suffice. In applying Equation 2 to our data, we arbitrarily applied a value of 100. Note that in our procedure, unlike in Mazur and Grossbard (1986), objective value was the same for the two types of option scenarios. On this basis, no a priori reason existed to prefer the limited-options or extensive-options scenario.

In Equation 2, P_s is a behavior-based measure conveying the subjective value of *A*, that is, whether it has been discounted. For Grossbard and Mazur (1986), P_s was the proportion of selections of the scenario involving the larger reward. That experiment, like many discounting experiments, used a within-subjects design, so the relevant proportion was of selections made by each individual participant in confronting each pair of option scenarios many times. There is, however, precedent for applying models like Equation 2 to group data, in which case P_s becomes the proportion of choices aggregated across individuals who confronted each pair of option scenarios only once (Holt, Green, Myerson, & Estle, 2008). That is the approach employed here. Because we are currently not considering the rarely selected single-option scenario, preference was defined as the proportion of times that the extensive-options scenario was selected out of all times that either the extensive-options or limited-options scenario was selected.

Because equal objective value could be obtained from the limited-options and extensive-options scenarios, any differences in subjective value may be traced to the number of specific options incorporated in each case. Consistent with the choice overload framework, let us assume that search costs are associated with examining the various placement alternatives within a scenario, and that the magnitude of search costs correlates positively with the number of placement options. This allows the number of options subsumed by the extensive-options scenario to be employed as *E* in Equation 2. Thus, just as effort diminished the value of (i.e., preference for) a reward in studies like Grossbard and Mazur (1986), presumed search costs should diminish the value of multiple-option scenarios.

Equation 2, adapted as just described, was fit to the data shown in Figure 2 using the nonlinear regression function of GraphPad Prism 5.03. Figure 3 shows that Equation 2 accounted for most of the variance in preference for participants overall (R^2 = .92). In this broad sense, choice overload functions approximated the hyperboloid shape that has been described in numerous studies of discounting (e.g., Madden & Bickel, 2010). Equation 2 also provided a good account for maximizers (R^2 = .92).

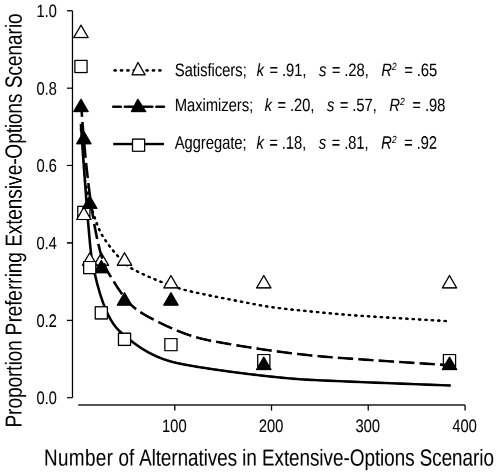

Figure 3. Proportion of participants choosing the extensive-options scenario as a function of the number of alternatives presented in the extensive-options scenario for satisficer (open triangles) and maximizer (closed triangles) groups, as well as the aggregate (open circles). Curved lines represent best fits (nonlinear regression) using Equation 2.

We expected that satisficers would differ from maximizers in two ways. Recall that in the choice overload framework, satisficers are thought to react differently to multiple-option scenarios than maximizers. In selecting an extensive-options scenario, maximizers, who systematically examine all possible options to find the best one, might be expected to experience the full burden of associated search costs. By contrast, in selecting an extensive-options scenario, satisficers, who seek only a "good enough" option, might not come into contact with all potential search costs. That is, perhaps satisficers are *affected* by the search costs they experience in the same way as maximizers but tend to search less within the same set of options and thus simply *encounter* search costs to a lesser degree. We suggest, therefore, that *experienced* search costs scale to number of options in a scenario differently for satisficers than for maximizers, in which case Equation 2 would not provide as good an account of preference by satisficers.[2] This was indeed the case: for satisficers, $R^2 = .65$.

Additionally, satisficers tended to choose an extensive-options scenario less often than maximizers (see Figure 2), which is consistent with the assumption that the value of the extensive-options scenario is differentially discounted, presumably because of the anticipation of search costs. A maximizer may regard an extensive-options scenario as more likely than a limited-options scenario to yield the best possible option, in which case the associated search costs would be "worth it." A satisficer, however, may view a limited-options scenario as likely to yield something that is good enough, with fewer potential search costs than an extensive-options scenario (in which case such a scenario becomes decreasingly attractive as the number of options increases). This would express as more pronounced effort discounting, and indeed the discounting index (k) of Equation 2 was higher for satisficers ($k = .91$) than for maximizers ($k = .20$). Using the same analytic methods described previously for comparing k values of satisficers and maximizers using the one-phase exponential decay model (i.e., using the extra sum-of-squares F tests to compare whether there is a significant difference when satisficers' k values were constrained to that of maximizers or left unconstrained), the difference for the hyperboloid model was statistically significant, $F(1, 6) = 21.06$, $p < .005$.

It is also noteworthy that maximizers' sensitivity to the scaling of search costs (i.e., s in Equation 2) was 2.04 times greater than that of the satisficer group but .70 times less than the aggregate.[3] These data confirm our choice overload analyses in that the sensitivity to search costs was greater for the satisficer group than the aggregate or maximizer group, despite the finding that the plateau of the satisficer group's extensive-options preference trend was higher than that of the aggregate or maximizer group. That is, while the plateau of the satisficer group's data was higher than that of the maximizers, satisficers discounted extensive options greater than maximizers, as described by both the rate of discounting (k) and the shape of the curve (s) at smaller extensive-option sizes.

Toward a Synthesis of Choice Overload and Effort Discounting

Prior to the proliferation of choice overload literature during the past decade, behavioral economists such as Wilde (1987) were already proposing that "researchers should focus on the link between search costs and choice processes" (p. 235) when individuals face multi-option decisions. Because search-cost effort is expected to devalue outcomes, and discounting is a quantitative description of the behavioral "process of devaluing . . . outcomes" (Madden & Johnson, 2010, p. 13), the discounting framework may be

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2 Because in the present study search costs are inferred rather than directly measured, it is impossible to know precisely what search costs were experienced by either group. For the sake of promoting discussion and future investigation, however, consider a linear relationship between experienced search costs and number of options, with slope = 1 for maximizers and slope < 1 for satisficers. One implication is that, for satisficers, experienced search costs would deviate increasingly from number of options as the latter increases.

3 Because the derived value of s was substantially smaller than 1.00, it is apparent that a hyperboloid function is a necessary model for this research question (see McKerchar et al., 2009, and McKerchar, Green, & Myerson, 2010).

well matched to Wilde's call to action. Because discounting is a parametric analysis of choice across differing dimensions of reinforcement (e.g., probability, effort, and/or delay), we believe this model of analysis is ideally suited for the examination of choice behavior across increasing search costs. That said, effort discounting has received relatively little attention from discounting investigators. Its possible relevance to important topics like choice overload may provide incentive for new studies on this aspect of discounting.

As far as we are aware, the present study represents the first attempt to use an effort discounting equation (Equation 2) to model choice overload, and the results were encouraging. First, regarding the discounting parameter *k* of Equation 2, satisficers demonstrated a significantly higher degree of discounting as choice options increased, providing quantitative data in support of the maximization and choice overload theories of Schwartz (2002, 2004a, 2004b) and Iyengar and colleagues (2006). Second, regarding the scaling parameter *s*, we found a twofold difference between maximizers and satisficers. As a means of stimulating new research, we propose that *s* may be the parameter to model individual differences associated with search-cost sensitivity (e.g., maximizers vs. satisficers).

Our data highlight the advantage of the use of quantitative models of behavior—such as discounting equations—to examine choice overload effects and to test hypotheses such as this (i.e., that choice overload is influenced by search costs in an effort discounting framework). Specifically, such analyses permit precise tests of theory in an objective mathematical approach. This form of analysis allows for unbiased conclusions in ways that verbal descriptions cannot (see Critchfield & Reed, 2009; Mazur, 2006). Moving forward, researchers can utilize such quantitative methods to test competing theories of what moderates the "too much choice" phenomenon.

No synthesis of discounting and choice overload can be confidently proposed, however, until some weighty procedural and conceptual issues are resolved. For example, the subjective "value" of the extensive-options scenario in our study was estimated from the proportion of participants in each group choosing this option, whereas in effort discounting research value is determined directly from indifference point in choices between larger/more effortful and smaller/less effortful rewards. Future integrative studies should adopt a more conventional means of assessing subjective value (see Sugiwaka & Okouchi, 2004). Additionally, we inferred search costs from the number of options available, but in our hypothetical scenarios participants did not actually sift through the options one at a time, and even had they done so it is not clear how cumulative effort might have scaled to the number of options. Future studies should be designed to make search costs directly measurable.

Finally, even with procedural refinements like these, it may prove difficult to isolate "pure" effects of effort, and effort discounting, in choice overload. As Grossbard and Mazur (1986) have noted, variations in effort often will be confounded with variations in reinforcement delay, because effort usually takes time to expend. Risk—the probability of a given outcome (such as a suitable treatment placement) occurring among an array of outcomes—may be important as well, in which case probability discounting becomes relevant. Whether one dimension of discounting or several applies, however, the prospect of a synthesis involving discounting and choice overload remains appealing.

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