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Time flies when you maximize — Maximizers and satisficers perceive time differently when making decisions

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ABSTRACT

Three experiments assessed whether maximizing and satisficing decision-making types were associated with differences in perception of time, as a consequence of their different cognitive workloads. Findings showed that maximizers and satisficers perceived time differently during decision-making, but not during other tasks. In particular, compared to satisficers, maximizers tended to underestimate time while choosing, independently of the number of options and the specific task requirements. Satisficers instead tended to underestimate time only when the number of options or the task requirements were more challenging. Our findings suggest that the perception of time may serve as a measure of the cognitive workload associated with decision-making types. The findings furthermore suggest that satisficers adopt a more malleable decision-making process than maximizers.

1. Introduction

In the 1950s (1955, 1956, 1957), Simon proposed for the first time the distinction between two decisional types: maximizers and satisficers. Maximizers attempt to examine every single option before choosing the best one, whereas satisficers tend to consider a more limited range of options to find an option that is satisfactory or "good enough". For example, in a pumpkin patch, a maximizer might engage in an exhaustive comparison of all available pumpkins, spending lots of time and effort trying to find the very best shape, color, and size. A satisficer on the other hand would most likely consider only some pumpkins until he or she encounters the first one that meets a threshold of acceptability. Simon postulated that people generally satisfice. Their cognitive limitations make, indeed, the maximizing goal impossible to realize.

Half a century later, building on Simon's work, Schwartz et al. (2002) conceptualized the tendency to satisfice as an individual difference or trait, rather than a universal behavioral tendency. In Schwartz et al.'s conception, thus, some people consistently attempt to maximize (to find the "best" solution), while others consistently attempt to satisfice (to find a solution that is satisfactory or "good enough"). To measure the degree to which individuals report to maximize or satisfice several maximization scales have been developed by different authors (Diab, Gillespie, & Highhouse, 2008; Lai, 2010; Nenkov, Morrin, Ward, Schwartz, & Hulland, 2008; Schwartz et al., 2002; Turner, Rim, Betz, & Nygren, 2012). Particularly relevant is the finding that maximizers, despite their efforts to find the best possible option, appear less satisfied with their decision outcomes and regret their decisions more often than satisficers (Schwartz, 2004a, 2004b; Schwartz et al., 2002) even when maximizing pays off with better outcomes (Iyengar, Wells, & Schwartz, 2006; Parker, de Bruin, & Fischhoff, 2007; Polman, 2010). Indeed, in their pursuit of the ideal, maximizers consider more options, which increase their expectations, opportunity costs, and potential regret (Iyengar et al., 2006). Furthermore, by exploring multiple options, maximizers increase their chances not only for positive but also for negative outcomes, which may be responsible for their unhappiness and regret (Polman, 2010; see also Tversky & Kahneman, 1991).

Previous studies have always assumed that maximizers differ from satisficers in their cognitive workload, that is, the amount of information they process. So far, this was measured by either self-reports (e.g., Iyengar et al., 2006) or by counting the number of options or information that individuals considered (Jain, Bearden, & Filipowicz, 2011; Lai, 2011; Polman, 2010). The present study instead aimed to investigate the underlying mechanism of the decision making process of

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maximizers and satisficers by using the perception of time as evidence of their different amounts of information processing.

We make use of the established knowledge that perception of time is affected by the complexity of the task solved and by the number of stimuli processed over the time interval. For example, Priestly (1968) found a *negative* linear relationship between complexity and time estimation. People seem to experience a time interval as longer if they process a simple stimulus (e.g., a meaningful sequence of words) than if they process a complex stimulus (e.g., a meaningless sequence of the same words combined in a random fashion; see also Chetta, 1970; Hicks, Miller, & Kinsbourne, 1976; Hicks, Miller, Gaes, & Bierman, 1977; McBain, 1970; White, 1973). After Priestly (1968), other authors have provided empirical support for the inverse relationship between complexity and time perception (e.g., Brown, Stubbs, & West, 1992; Brown & West, 1990; Carmeci, Misuraca, & Cardaci, 2009; Fasolo, Carmeci, & Misuraca, 2009; Mantel & Kellaris, 2003; Thomas & Weaver, 1975). Fasolo et al. (2009), in particular, showed that a task requiring a high mental workload, such as choosing from large choice sets, is associated with the underestimation of the time elapsed, whereas a task requiring a low mental workload, such as choosing from small choice sets, is associated with the overestimation of the time elapsed.

Based on the finding that the more complex the task, the greater the underestimation of the time spent solving it, the main purpose of the present study is to investigate whether individual differences in maximizing tendencies are associated with differences in perception of time, as a consequence of their different cognitive workloads. Experiment 1 examined the question whether maximizers, compared to satisficers, underestimate the time spent performing decision tasks, as well as tasks that are unrelated to decision-making. Experiments 2 and 3 examined respectively the hypotheses that maximizers' and satisficers' perception of time is affected by the number of options, and by the specific format of the instructions.

2. Experiment 1: do maximizers perceive time differently than satisficers in both decisional and non-decisional tasks?

The goal of the first experiment was to assess whether maximizers differ from satisficers in their perception of time — in decision tasks as well as in tasks that are unrelated to decision-making. We hypothesized that when making decisions, maximizers – due to increased information processing in their pursuit of the best option – would tend to underestimate the time spent performing the task, compared to satisficers. We expected that there would be no such group difference in tasks that were not related to decision-making, such as looking at pictures or solving syllogisms.

2.1. Method

Participants (N = 39, 72% female, mean age 25) were undergraduate students, recruited from various courses at Washington State University in Vancouver and compensated with course credit. All participants were tested individually, and asked to (1) look at 16 pictures, (2) solve 8 syllogisms, and (3) choose 1 out of 6 cell phones, in counterbalanced order.

In the "picture task" participants were invited to look at 16 digital pictures, presented sequentially on a computer screen. The pictures represented landscapes, food, flowers, airplanes and animals. The participants were instructed to look at each picture as long as they wanted, proceeding to the next picture at a self-paced speed by pressing the "page down" button on the keyboard. In the "syllogism task" participants received a description of the term "syllogism" followed by an example. They were then instructed to solve eight different syllogisms. In the "choice task" participants were presented with descriptions of six different cell phones along five attributes (price; weight; battery life; number of functions; and memory), and asked to choose the one that they would most likely want to buy.

The time they spent completing each task (actual time) was recorded by the experimenter. After each of the three tasks, participants were asked to estimate the time spent performing it (perceived time). They then completed a 13-item Maximizing Scale (Schwartz et al., 2002), in which the answers ranged from 1 (=strongly disagree) to 5 (=strongly agree).

2.2. Results and discussion

To distinguish between participants with greater or lower tendency to maximize (for simplicity we will call them maximizers and satisficers here), we performed a median split on the total score of the measure (median = 41). Thus our analysis compared the participants who were most maximizers (41 and up) with those who were more satisficers (40 and below). Although we recognize that dichotomous splits are associated with problems such as loss of power (MacCallum, Zhang, Preacher, & Rucker, 2002), we believe that they are preferable over correlations in this particular study because of the skewed distribution of the maximizing variable (MacCallum et al., 2002), and in order to make our results more comparable to previous research that separated maximizers and satisficers by a median split (e.g., Iyengar et al., 2006). Note that the results for the maximizing variable were similar in Experiments 2 and 3, and we based our analyses on a median split in those experiments as well.

Following Fasolo et al. (2009), we computed the ratio of time perceived (P) to actual time spent (A) to obtain a comparable measure of the perceived duration of 1 s (P/A).

Comparisons of independent samples (t-tests) showed a significant difference between maximizers and satisficers only in the choice task. In particular, maximizers tended to underestimate the time spent choosing, compared to satisficers, who tended to overestimate it, $t(37) = 2.35$, $p < .02$. Maximizers perceived 1 s as .89 s (SD = .68), whereas satisficers perceived 1 s as 1.44 s (SD = .77). We did not find any significant difference between maximizers' and satisficers' perception of time in the non-choice conditions. In the picture condition, both maximizers and satisficers perceived 1 s on average as 1.10 s (maximizers: M = 1.10 s, SD = .67; satisficers: M = 1.10 s, SD = .60), $t(37) = -.003$, $p = .99$). In the syllogism condition, maximizers perceived 1 s on average as 1 s (SD = .59), and satisficers perceived 1 s as 1.13 (SD = .43), $t(37) = -.73$, $p = .47$.

In conclusion, as hypothesized, maximizers and satisficers differed in their perception of time only when they engaged in a decision task. In particular, it seems that maximizers, in line with the assumptions of the existing literature, in order to select the best option, process a higher amount of information, which in turn leads to a tendency to underestimate time spent choosing, compared to satisficers. These differences in time perception suggest that the two decisional types process different amounts of information while choosing. However, our results do not suggest such a difference in non-decisional tasks, even for syllogisms, which require high reasoning abilities. This supports Iyengar et al.'s (2006) thought that maximizing strategies are a kind of learned behaviors, or search strategies, designed specifically for decision making tasks, rather than global individual differences.

The finding of our first experiment, suggesting that the two decisional types differ in the amount of cognitive resources recruited for decision-making, gave the base for our further experiments. Our second experiment investigates how the number of options from which to choose further affects the perception of time in maximizers and satisficers.

3. Experiment 2: does the number of alternatives have a stronger effect on time perception in maximizers than in satisficers?

Results on *choice overload* suggest that the provision of an extensive array of options has detrimental effects on intrinsic motivation to choose and on post-choice satisfaction (e.g., Haynes, 2009; Iyengar, Huberman,

& Jiang, 2004; Iyengar & Lepper, 2000; Jacoby, Speller, & Berning, 1975; Jacoby, Speller, & Kohn, 1974; Keller & Staelin, 1987; Mogilner, Rudnick, & Iyengar, 2008; Reutskaja & Hogarth, 2009; Shah & Wolford, 2007; but see Inbar, Botti, & Hanko, 2011). Iyengar and Lepper (2000), for example, found that 24 jars of jams, compared to only 6, can at first seem highly appealing to consumers, yet can reduce their subsequent motivation to purchase the product and their satisfaction with the chosen option.

Schwartz assumes that the detrimental consequences of having "too much" choice would be even stronger for maximizers than for satisficers (Schwartz, 2004a, 2004b; see also Iyengar et al., 2006; Jain et al., 2011; Polman, 2010). When satisficers judge an option as good enough, they do not look any further. Thus, adding options does not necessarily add much work. Maximizers instead feel the need to explore all the possibilities before deciding which one is the best. As a consequence, the proliferation of options has a stronger impact on their decision-making process, and can induce higher levels of anxiety, regret, and second-guessing (Schwartz, 2004a, 2004b). To the extent of our knowledge, no studies have been conducted to assess whether the overload of choice indeed affects maximizers' cognitive workload more than satisficers'.

In Experiment 2, we focused on the effect of the number of alternatives on the perception of time of maximizers and satisficers. The goal was to examine how maximizers differ from satisficers in their perception of time across decisions involving small and large choice sets.

3.1. Method

Fifty-nine undergraduate students (78% female, mean age = 25) from Washington State University in Vancouver participated in the second experiment, in exchange for course credit. None of them had participated in the previous experiment. The participants were randomized into two experimental conditions: 29 participants chose 1 out of 6 hypothetical cell phones (small choice set), and 30 chose 1 out of 24 phones (large choice set). The size of the choice set (6 vs 24) was determined on the basis of previous research demonstrating that choosing among fewer than 7–8 options poses little cognitive load, while choosing among 20 or more options poses more cognitive load (e.g., Iyengar & Lepper, 2000; Lenton, Fasolo, & Todd, 2008; Reutskaja & Hogarth, 2009; Shah & Wolford, 2007). The task was adapted from Fasolo et al. (2009). In both conditions, the cell phones were described along 5 attributes: price; weight; battery life; number of functions; and memory. There were no dominant options (for details of the materials and inter-attribute correlations see Fasolo et al. (2009)). The cell phones were presented in a comparison table without pictures to avoid the choices being driven by visual aspects. Participants were tested individually, and were free to take as much time as they needed to make the choice. The time they spent choosing was recorded by the experimenter (actual time). After the participants had made a choice, they were asked to estimate the time that they felt they had spent evaluating the phones and choosing one of them (perceived time). They then completed Schwartz et al.'s (2002) 13-item Maximizing Scale.

3.2. Results and discussion

To distinguish between maximizers and satisficers, we performed a median split on the measure, as in Experiment 1 (small choice condition: median = 37; large choice condition: median = 43). Again we computed the ratio of time perceived (P) to actual time spent (A) to obtain a comparable measure of the perceived duration of the time unit of a second (P/A). Comparisons of independent samples (t-tests) showed that in the small choice set condition, maximizers and satisficers differed in their perception of time $t(27) = -2.495$, $p < .01$. While maximizers underestimated the time spent choosing, satisficers overestimated it. In particular, maximizers perceived 1 s as 0.78 s (SD = .53), whereas satisficers perceived 1 s as 1.35 s (SD = .70). In the large set condition on the other hand, both maximizers and satisficers underestimated the time spent choosing, $t(28) = .523$, $p = .605$. Maximizers perceived 1 s as .95 s (SD = .58), whereas satisficers perceived 1 s as .85 s (SD = .54). Fig. 1 illustrates these findings.

A comparison within the two groups showed that maximizers underestimated the time spent choosing in both conditions (6 options: M = .78 s, SD = .53; 24 options: M = .95 s, SD = .58), $t(29) = -.88$, $p = .39$; whereas satisficers only underestimated the time in the extended set condition, but overestimated the time in the reduced set condition (6 options: M = 1.35 s, SD = .70; 24 options: M = .85 s, SD = .54), $t(26) = 2.13$, $p = .04$.

Our results add nicely to Fasolo et al. (2009), who had shown – without distinguishing between decisional styles – that the amount of information processed in a choice task affects the perception of time spent making a choice. Our results more specifically suggest that, in choice tasks, maximizers always perceive time to pass more quickly than satisficers, which could be used as evidence of their processing a higher amount of information in comparing the available options, even if the decision task involves few options, posing little cognitive load. Satisficers instead process a high amount of information only for decision tasks that involve an extensive array of options. When the decision task involved fewer options, satisficers were presumably able to make a decision by engaging fewer cognitive resources and therefore estimated that more time had passed than did maximizers. This result does not support the assumptions in previous literature, according to which maximizers are more than satisficers overloaded with the increase of the number of options. On the contrary, our data suggest that many options have a stronger effect on satisficers, leading them to behave more like maximizers, engaging more cognitive resources, presumably to make more comparisons.

In conclusion, it seems that the satisficers' decision type compared to the maximizers' may be more flexible, adjusting the amount of cognitive effort to the complexity of the decision task, thus avoiding to overinvest cognitive resources.

4. Experiment 3: does the instruction format affect the tendency to maximize and, as a consequence, the perception of time?

The goal of the third experiment was to verify whether the decision making type (maximizing vs. satisficing) can be affected by specific instructions. Schwartz et al. (2002) and Schwartz (2004a, 2004b) assumed that differences in maximizing versus satisficing can be conceptualized as

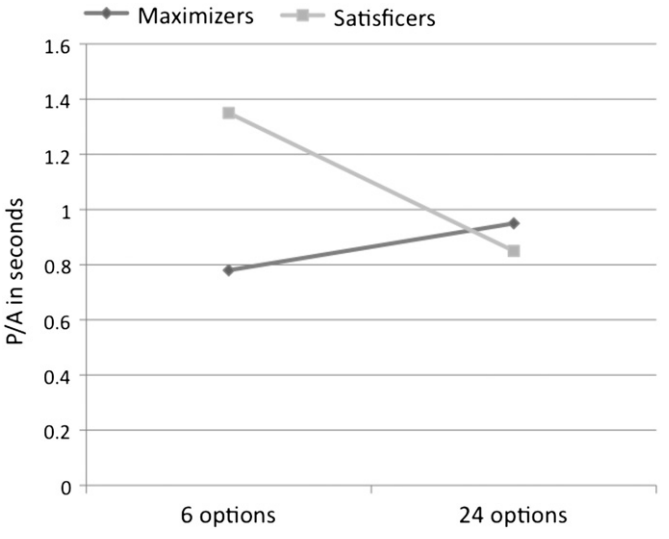

Fig. 1. Perceived duration of 1 s (P/A) for maximizers and satisficers when choosing among small (6) and large (24) choice sets.

a stable personality trait. Some decision makers habitually adopt a maximizing strategy whereas others habitually adopt a satisficing strategy across a wide range of decision tasks. Despite that assumption, Schwartz (2004a, 2004b) also speculates that the number of choices may affect the decision type — in fact, an abundance of choice may actually turn people who are satisficers into maximizers.

The results of our second experiment seem to support this idea. However, besides our own data, to the extent of our knowledge the literature so far lacks any empirical tests on the extent to which people's propensity to maximize or satisfice is malleable at all. Our third experiment attempts to fill this gap. In particular, we hypothesized that by directly instructing people to search for the "best" vs. "good enough" option, we would be able to induce the maximizing vs. satisficing decision strategy, respectively. As in our second experiment, we again use the perception of time as an indirect evidence of the amount of load associated with maximizing or satisficing types.

On the basis of our results in Experiment 2, we expected that when instructed to maximize, that is, to find the "best" option, participants would process a higher amount of information, and as a consequence, would tend to underestimate the time spent choosing. On the other hand, when instructed to satisfice, that is, to find a "good enough" option, participants would process a lower amount of information, thereby tending to overestimate the time.

4.1. Method

Fifty-nine undergraduate students (58% female, mean age = 27) of Washington State University in Vancouver participated in the third experiment in exchange for course credit. None of them had participated in the previous experiments. The participants were randomly assigned to 1 out of 2 experimental conditions: 29 participants received the instruction to find the "best" out of 6 cell phones, and 30 participants were instructed to find the "good enough" out of the same 6 cell phones. The decision task and methods for measuring their time estimation were otherwise identical to Experiments 1 and 2. Participants then also completed the same maximizing scale used in Experiments 1 and 2.

4.2. Results and discussion

To distinguish between maximizers and satisficers we adopted the same median split as in Experiments 1 and 2 ("good enough" condition: median = 40; "best" condition: median = 41). Analyses were again conducted on the ratio of time perceived to actual time spent: (P/A) and on maximizing scale responses. Comparisons of independent samples (t-tests) showed that in the "good enough" condition, maximizers underestimated the time spent choosing, whereas satisficers overestimated it, $t(28) = 2.01$, $p = .05$ (see Fig. 2). In particular, maximizers perceived 1 s as .84 s ($SD = .53$), whereas satisficers perceived 1 s as 1.26 s ($SD = .59$). In the "best" condition on the other hand, both maximizers and satisficers underestimated the time spent choosing, $t(27) = -.80$, $p = .43$. Maximizers perceived 1 s as .89 s ($SD = .57$), whereas satisficers perceived 1 s as .75 s ($SD = .37$).

A comparison within the two groups showed that while maximizers underestimated the time independently of the specific instructions ("good enough": $M = .84$ s, $SD = .53$; "best": $M = .89$ s, $SD = .57$), $t(28) = -.22$, $p = .82$; satisficers underestimated the time only when instructed to find the "best" option ("good enough": $M = 1.26$ s, $SD = .59$; "best": $M = .75$ s, $SD = .37$), $t(27) = 2.76$, $p = .01$.

These results suggest that while maximizers always processed a high amount of information, independently of the specific instructions, satisficers appeared to process a limited amount of information when they were asked to select the "good enough" option, but they processed the same – higher – amount of information as maximizers when they were asked to select the "best" option.

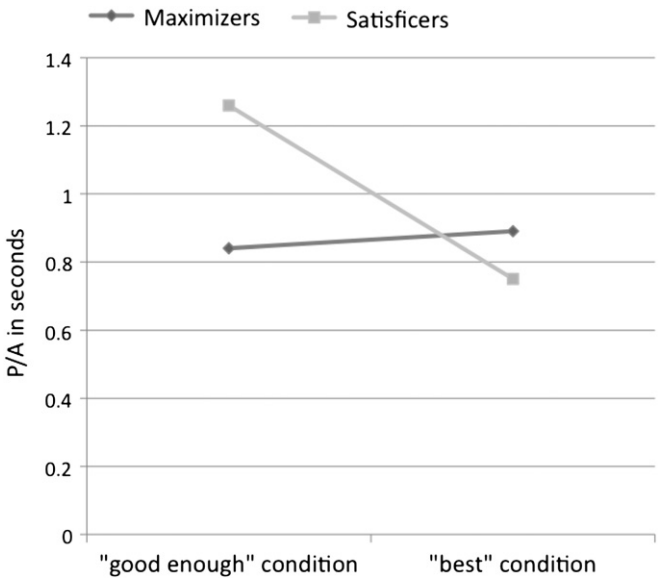

Fig. 2. Perceived duration of 1 s (P/A) for maximizers and satisficers when instructed to select the "good enough" vs the "best" option.

Again, as in Experiment 2, it seems that while maximizers tend to always engage a high amount of cognitive resources, regardless of the difficulty of the decision task, satisficers adjust the amount of cognitive effort according to the difficulty of the decision task: when the task is easier, requiring to select merely a "good enough" option, they do not invest a lot of cognitive resources; when the task is more demanding, requiring to select the "best" option, they involve more resources. In other words, satisficers show again more malleability than maximizers. Our results are in line with Fasolo et al. (2009) showing that the amount of information processed to choose among alternatives affects the perception of time spent making the choice.

5. General discussion

A series of three experiments explored whether the maximizing and satisficing decision-making types are associated with differences in perception of time, as a consequence of their different cognitive workloads. Findings from Experiment 1 suggest that maximizers and satisficers differ in their perception of time only when they face a decision task, but not when they perform other tasks like looking at pictures or solving syllogisms. In decision-making tasks, maximizers indeed tended to underestimate the time spent choosing, while satisficers tended to overestimate it. This leads us to think, consistently with untested assumptions in the previous literature, that maximizers and satisficers, when making a decision, consider different amounts of information: maximizers tend to process a higher amount of information with the aim of finding the best option, while satisficers tend to process less information, aiming only for an option that is good enough.

Our findings from Experiment 2 suggest that the proliferation of options affects satisficers more than maximizers. Our results showed that maximizers tended to underestimate time regardless of the number of options among to choose (6 vs 24), suggesting that they always put the highest cognitive effort into their decisions. Satisficers instead tended to overestimate time only when they faced a small array of 6 options but tended to underestimate time when they faced an extensive array of 24 options, suggesting that they adjusted their cognitive effort to the complexity of the decisional task. This is not consistent with assumptions in the literature that the higher amount of options poses a more cognitive load on maximizers than satisficers (Iyengar et al., 2006; Schwartz, 2004a, 2004b), since it is only in the smaller choice sets that we find differences between maximizers and satisficers. A possible interpretation is that there may be a difference in need for

cognition between the two groups, in the sense that maximizers will simply do more processing of individual items even when the choice set is small. It looks as though for the maximizers, even a small decision demanded a certain minimal amount of thought, thereby making even relatively simple decisions effortful.

Experiment 3 further confirms that satisficing is a more flexible type than maximizing. Our results demonstrated that maximizers always tended to underestimate time, even when specifically instructed to find the "good enough" option, while satisficers adjusted their cognitive effort to the specific instructions, resulting in a tendency to underestimate time when asked to find the best option and a tendency to overestimate time when asked to find the good enough option.

The present findings add to the growing knowledge concerning individual differences in decision-making. It may have valuable implications for understanding different decision making types and strategies, and the extent to which these are rigid and predetermined, or flexible and controllable, adjusted according to the specific requirements of the decision situation. Furthermore, they suggest that the perception of time may serve as an indirect measure of the different cognitive workloads in these two decisional types, as a useful addition to the existing self-report measures. Indeed, in all our experiments the perception of time appeared to be strongly associated with the amount of information that we would expect to be processed while maximizing or satisficing under different decision conditions. However, this measure has here only been tested in a very limited range of contexts and requires further investigation. An expanded assessment of the reliability of the measure, in particular with regard to different levels of processing, would be a beneficial aim for future research.

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