Decision speed and choice regret: When haste feels like waste ☆

Yoel Inbar [a,*], Simona Botti [b], Karlene Hanko [c]

[a] Tilburg University, The Netherlands
[b] London Business School, UK
[c] Richard Day Research, USA

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ABSTRACT

We test a metacognitive account of why larger choice sets often lead to greater regret, proposing that people apply the lay theory that "a quick choice is a bad choice" when evaluating how well they have chosen. Because people often operate under time pressure, larger sets are likely to entail a more cursory selection process than smaller sets, generating a feeling of having rushed the evaluation of the alternatives and heightened regret. Four studies show that choice-set size does not influence participants' regret when they believe that they had enough time to choose, that the subjective feeling of being rushed accounts for greater regret when choosing from larger sets, and that changing people's lay theories about choosing quickly eliminates regret.

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From the most trivial choices to the most consequential, people are faced with an ever-widening variety of options (Schwartz, 2004). While it has been held that adding more choices cannot make anyone worse off (Baumol & Ide, 1956), recent psychological research has documented the disadvantages of choosing from an extensive number of options, including reduced likelihood of choosing (Chernev, 2003; Iyengar, Jiang, & Huberman, 2004; Iyengar & Lepper, 2000), lower satisfaction with one's choice (Brenner, Rottenstreich, & Sood, 1999; Iyengar, Wells, & Schwartz, 2006), and greater regret (Carmon, Wertenbroch, & Zeelenberg, 2003; Sagi & Friedland, 2007). These effects have been grouped under the term *choice overload*.

Researchers have identified a number of moderators of choice overload, which fall into two categories: those related to characteristics of the *choice set* and those related to characteristics of the *chooser*. The first includes whether items are organized and categorized (Kahn & Wansink, 2004; Mogilner, Rudnick & Iyengar, 2008), whether the options are readily comparable (Gourville & Soman, 2005), and whether their attributes are easily combined into an imaginary "best option" (Chernev, 2005; Sagi & Friedland, 2007). The second category includes the degree to which choosers have clear preferences (Chernev, 2003) and expect to find the ideal option (Diehl & Poynor, 2010; Iyengar et al., 2006).

Thus, there is a steadily accumulating body of knowledge about *when* choice overload occurs. To what extent are these findings informative about *why* it occurs? Some moderators implicate insufficient cognitive resources given the demands of the choice task. If the choice task is made easier—for example, by organizing the choice set or by asking choosers to articulate their preferences and define their ideal choice beforehand—choice overload is lessened. Other moderators suggest a different type of insufficiency—that of the chosen option relative to the "best option." To the extent that one's chosen option compares poorly with this standard, one will be dissatisfied, and so choice sets that facilitate this sort of comparison will exacerbate choice overload. While these are separate accounts, they share a focus on people's evaluations of choice *outcomes*: limited cognitive capacity or the mental comparison of one's choice with a standard lead to less satisfaction when choosing from a large set.

We contribute to this prior work by proposing an explanation that, instead of focusing on evaluations of choice outcomes, is based on how people evaluate their *experience of choosing*. In making this type of metacognitive judgment, people apply lay "theories about thinking" to draw conclusions from their ongoing subjective experiences (Schwarz, 2004). For example, people (correctly) believe that more common events are easier to call to mind than rare events, and therefore view themselves as more assertive after listing a few of their assertive behaviors, which is easy, than after listing many, which is difficult (Schwarz et al., 1991). Metacognitive processes of this kind have been shown to influence judgments in a wide variety of domains (Sackett, Nelson, Meyvis, Converse, & Sackett, 2010; Stepper & Strack, 1993; Whittlesea, 1993), including choice (Liberman & Förster, 2006).

Of particular relevance for our investigation is the potential effect of metacognition on regret in decision making. It is important to note that we focus on regret stemming from people's negative evaluations of their choice *process*, rather than of their choice outcome. Although early accounts of regret (e.g., Kahneman & Tversky, 1982) assumed that people regretted only negative outcomes, more recently theorists have

recognized that one can regret one's choice process even when the choice does not turn out poorly (Connolly & Zeelenberg, 2002). This distinction has received substantial empirical support—for example, Pieters and Zeelenberg (2005) measured voters' regret before the outcome of the vote was experienced (i.e., before the new government took power) and showed that regret was predicted by people's perceptions of their voting process.

One important determinant of regret for the choice process may be the feeling of having rushed the choice. If people apply the lay theory that "a quick choice is a bad choice" (Ariely & Zakay, 2001; Sarason, 1984) when evaluating how well they have chosen, feeling that they have not dedicated enough time to the choice task should lead to regret. This feeling should be more common when choice sets are large not only because a careful examination requires more time when there are more options, but also because individuals tend to underestimate the amount of time they spend evaluating these options (Fasolo, Carmeci, & Misuraca, 2009), which may increase the perception of having rushed. Thus, we contend that larger sets are likely to entail a greater mismatch between the time people actually spend (or think they spend) choosing and the amount of time they feel they *should* spend, leading to feelings of rushing and thus to heightened regret. The provision of more time, or even just the perception of having more time, should therefore decrease feelings of rushing and reduce regret.

However, an alternative account based on decision heuristics would predict the opposite effect of increasing choice time on regret. Research has shown that people often opt to lessen decision complexity by using heuristics (Payne, Bettman, & Johnson, 1993). For example, Dhar and Nowlis (1999) have found that consumers under time pressure are less likely to defer high-conflict decisions because they adopt noncompensatory decision strategies that avoid difficult trade-offs and ease the decision task. The availability of more time may therefore encourage decision makers to confront the greater number of choice-induced conflicts involved in large sets, and consequently to experience greater regret. However, research on choice overload has shown that people's typical response when faced with an extensive number of options is to feel overwhelmed (Iyengar & Lepper, 2000), suggesting that they are not employing simplifying heuristics. As a result, we predict that alleviating time pressure should reduce, rather than increase, regret when choosing from large sets. As a preliminary test of this prediction, we performed a pilot study.

We adapted a paradigm used by Iyengar and Lepper (2000) in which participants chose and consumed one chocolate from a set of six or 30. Set size was crossed with whether the experimenter stayed in the room and waited for the choice to be made (without making any mention of time limits) or encouraged the participant to "take your time," then left the room. The manipulation effectively reduced time pressure: Participants took longer to choose ($M = 74$ s) when time was mentioned than when it was not ($M = 30$ s), $t(39) = -4.15$, $p = .002$, $d = 1.33$. Also as predicted, reducing time pressure reduced regret when choosing from the larger set: A 2 (choice-set size: small vs. large) × 2 (time pressure: default vs. reduced) ANOVA revealed the predicted interaction between set size and time pressure, $F(1, 38) = 7.51$ $p < .01$. In the default time-pressure condition, participants felt more regret when choosing from the large set ($M = 3.10$) than from the small set ($M = 1.56$), $F(1, 38) = 11.68$, $p < .002$. When time pressure was reduced, choosing from a large set no longer entailed greater regret, $M_{large} = 1.45$, $M_{small} = 1.58$, $F(1, 38) = .10$, ns.

This preliminary study supports our contention that choosing from large sets causes greater regret unless time pressure is actively lessened, rather than the opposing account that lessening time pressure when choosing from large sets increases regret. However, it does not speak to our claim that feelings of rushing—the feeling that one has spent less time than what a careful choice would have demanded—should mediate the relationship between large sets and greater regret. For instance, it could be that participants in the reduced time-pressure condition actually made better choices, and that this accounted for their reduced

regret. We therefore examined the proposed metacognitive account of choice regret in three further studies. In Studies 1 and 2, we measured and manipulated feelings of rushing. We first tested whether people naturally feel more rushed when confronted by large rather than small sets, and whether this statistically mediates their ensuing regret. We next tested whether creating subjective feelings of rushing while holding actual choice time constant similarly leads to heightened regret. Finally, in Study 3, we manipulated people's lay theories about choosing quickly. We predicted that when people did not hold the theory that quick choices lead to bad results, choosing from large sets would no longer lead to heightened regret.

Study 1

According to our metacognitive account of choice regret, choosing from a large set, as compared to a small set, should be more likely to lead to feelings of having inappropriately rushed a decision. In Study 1, we asked people to make a choice from a large or small set. We predicted that those choosing from a large set would feel more rushed and regretful than those choosing from a small set, and that the experience of regret would be mediated by their feelings of having rushed.

Method and materials

Participants were 27 Cornell University undergraduates, of whom 14 were randomly assigned to the *large set* condition and the remainder to the *small set* condition. All participants chose one of a group of popular DVDs arranged on a table in front of them (examples include "Crash," "Brokeback Mountain," "The Matrix," and "The Breakfast Club"). Participants in the large-set condition chose from 30 DVDs, whereas those in the small-set condition chose from one of six 5-disc subsets of the large set. All participants were told that they had about a 20% chance of winning the DVD they chose in a drawing to be conducted after the study had finished. After making their choice, participants filled out a questionnaire containing the dependent measures. We assessed regret by asking participants to indicate "How much did you regret choosing the DVD you did?" (1 = "Not at all"; 7 = "Very much"). Single-item measures of regret have commonly been used in prior research on regret and decision making (Arkes, Kung, & Hutzel, 2002; Crawford, McConnell, Lewis, & Sherman, 2002; Kumar, 2004; Ordóñez & Connolly, 2000; Sagi & Friedland, 2007; Van Dijk & Zeelenberg, 2005). The other two main dependent measures related to participants' perceptions of having rushed: "How rushed did you feel while you were making your choice?" (1 = "Not at all rushed"; 7 = "Very rushed"), and "Do you think you had enough time to make a good choice?" (1 = "Not at all"; 7 = "Very much").[1]

Participants next completed a measure of affect that asked them to report, on scales ranging from 1 ("Very slightly or not at all") to 5 ("Extremely"), how much they currently felt "Alert," "Cheerful," "Depressed," "Energetic," "Miserable," "Stressed," and "Weary." Finally, participants were thanked, debriefed, and dismissed.

Results

The *rushed* and *enough time* items were highly correlated, $r(27) = -.85$, $p < .001$, and were combined into a composite score after reverse-scoring the latter item. Examining composite scores showed that, as expected, participants in the large-set condition felt that they had rushed more ($M = 2.96$) than did participants in the small-set condition ($M = 1.7$), $t(25) = 2.25$, $p < .04$, $d = .90$.

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[1] In this study as well as in Study 2, these questions were embedded in a longer list of items concerning participants' evaluation of their choices. Because the other items are of less theoretical interest, they are not reported here. A full list of items is available from the first author.

Participants in the large-set condition also felt more regret ($M = 2.86$) than did those in the small-set condition ($M = 1.31$), $t(25) = 3.16$, $p < .01$, $d = 1.26$.

Scores on the rushing composite were significantly related to regret, $r(27) = .77$, $p < .0001$, meeting the requirements for mediation (Baron & Kenny, 1986). Simultaneously regressing regret on the rushing composite and set size (small or large) showed that rushing significantly predicted regret, $\beta = .67$, $t(24) = 5.06$, $p < .0001$, whereas the effect of set size was only marginally significant, $\beta = .26$, $t(24) = 1.98$, $p = .06$. The bootstrapping procedure for testing mediation outlined by Preacher and Hayes (2008) revealed that a 95% confidence interval around the indirect effect did not include zero (.04, 1.65), indicating significant mediation.

According to our account, rushing leads to regret due to a metacognitive evaluation of one's choice process. It could be argued, however, that feelings of rushing and regret might simply reflect a general negative emotional state produced by choosing from a large set. To rule out this alternative explanation, we subjected participants' ratings on the seven affect items to a principal components analysis, which revealed two components with eigenvalues above 1. A Varimax rotation showed that items reflecting global positivity or negativity ("cheerful," "depressed," and "miserable") loaded highly on the first component, and that items reflecting fatigue ("alert," "stressed" and "weary") loaded highly on the second (the item "energetic" loaded roughly equally on the two components). Feelings of having rushed were strongly related to regret even when controlling for both components, $\beta = .73$, $t(23) = 6.27$, $p < .0001$. Similarly, repeating the bootstrapping analysis reported above with both components included as covariates produced a 95% confidence interval for the indirect effect that did not include zero (.03, 1.62).

Participants were allowed to take as much time as they liked to make their choices, and those in the large-set condition did indeed spend more time choosing ($M_{small} = 15.8$ s, $M_{large} = 79.1$ s, $t(26) = -2.23$, $p = .03$).[2] Might some consequence of greater time spent choosing, rather than the experience of having rushed, be responsible for greater regret when choosing from a large set? To explore this possibility, we regressed regret simultaneously on time spent choosing and our rushing composite. The rushing composite significantly predicted regret, $\beta = .72$, $t(24) = 5.24$, $p < .0001$, but time spent choosing did not, $\beta = .06$, $t(24) = 1.33$, $p = .20$. Thus, it appears that it is participants' belief that they chose too quickly, rather than the actual time spent choosing, that produced regret.

Discussion

The results of Study 1 support the metacognitive account of choice regret. Participants choosing from a larger set were more likely to feel that they had rushed while choosing. The more they felt that they had rushed, the more they regretted their choices. Although the mediation analysis in this study supports our theoretical account, feelings of rushing were only measured, not manipulated. This approach maximizes ecological validity, but it leaves open the possibility that some unmeasured confounding variable might underlie the relationship between set size, rushing, and regret. Thus, in Study 2 we sought to support our account in a different way—by manipulating our proposed mediator.

Study 2

Study 1 showed that greater regret when choosing from a large set was statistically mediated by participants' feelings of having made their

decision more quickly than they should have. In the current study, we manipulated feelings of rushing and predicted that participants who felt rushed while choosing from a large set would feel greater regret. We also predicted that the subjective experience of having rushed would mediate heightened regret.

We introduced one other important change in the current study: We held time spent choosing constant across conditions. In the first two studies, participants determined how much time to spend making their choices, which leaves open the possibility that some other aspect of time spent choosing might have influenced regret. Although we attempted to rule out this possibility statistically in Study 1, a better approach is to hold choice time constant and to independently manipulate feelings of having rushed. This is what we did in the current study. All participants were given two minutes to choose from either a large or a small set. Orthogonal to choosing from a large or small set, participants heard a fast or slow metronome sound. Following a similar manipulation employed by Sackett and his colleagues (Sackett et al., 2010), who varied the speed of an on-screen timer, we expected that the fast metronome would create a subjective experience of "quickness," which would lead to feelings of rushing when choosing from a large set independent of the actual amount of time spent choosing.

Methods and materials

Participants were 166 students fluent in English recruited from London Business School and Harvard University. Because the place of recruitment did not significantly interact with condition, the two groups were collapsed. Participants were told that they would be choosing a DVD using a computer program, and that we would be selecting 10 participants at the end of the study to receive the DVD they had chosen. To decrease the likelihood that participants would find their ideal option, which would lessen choice overload (Chernev, 2003), we used 45 newly released DVDs available on Amazon.com rather than the well-known DVDs used in Study 1.

We manipulated feelings of rushing by varying participants' perceptions of how quickly time was passing while keeping the actual choice time constant. Participants were told that in order to make the decision task more realistic, we would add "a small amount of background noise," which was played through headphones. In the *slow metronome* condition, the "background noise" was a slowly ticking metronome (40 beats per minute); in the *fast metronome* condition, the metronome ticked twice as fast (80 beats per minute).

Participants had two minutes to choose from a *large set* of 45 DVDs or, in the *small set* condition, from one of three 15-disc subsets of the full set. The computer program displayed DVD covers in a grid; clicking on a DVD cover opened a pop-up window with a larger cover image and a brief plot synopsis (see Fig. 1). After two minutes had elapsed, the DVDs disappeared and participants were asked to enter the name of the film they had chosen. Immediately afterward, participants completed a questionnaire that included the same regret item and two rushing items used in Study 1. Participants then completed the same seven-item affect measure used in Study 1. They were then debriefed and dismissed.

Results

Ten participants (six in the small-set/fast-metronome condition and four in the large-set/slow-metronome condition) whose regret scores were identified as outliers by Tukey's method (Tukey, 1977) were eliminated from the analysis, leaving 156 participants.[3] Scores on the

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[2] Because one participant in the large-set condition took an extremely long time to choose (10 minutes and 40 seconds), we subjected the time measure to a square root transformation for this and the following analysis. For ease of interpretation, we report untransformed means.

[3] Tukey's method identifies data points as outliers if they are three interquartile ranges below the 25th percentile or above the 75th. This procedure has the advantage that extreme observations do not excessively influence the measure of spread (Carter, Schwertman, & Kiser, 2009). Including the 10 excluded participants yielded the same patterns of means, but nonsignificant interactions between set size and metronome speed when predicting rushing and regret. Rushing and regret, however, remained significantly correlated, $r(166) = .40$, $p < .001$.

rushed and *enough time* items were again highly correlated ($r = -0.52$, $p < .0001$), and were combined into the same composite measure of subjective rushing employed in Study 1. A 2 (choice-set size: small vs. large) × 2 (metronome speed: fast vs. slow) ANOVA conducted on this composite revealed a significant set-size × metronome-speed interaction, $F(1, 152) = 4.30$, $p < .05$. In the fast-metronome condition, participants who chose from a large set felt more rushed ($M = 4.92$) than did those who chose from a small set ($M = 3.56$), $F(1, 152) = 14.32$, $p < .005$; in the slow-metronome condition, set size did not affect feelings of rushing ($M_{large} = 3.98$; $M_{small} = 3.70$), $F(1, 152) < 1$, *ns* (see Fig. 2).

A parallel analysis of regret yielded a significant set-size × metronome-speed interaction, $F(1, 152) = 8.93$, $p < .005$. In the fast-metronome condition, regret was higher among those who chose from a large set than among those who chose from a small set ($M_{large} = 2.23$; $M_{small} = 1.52$), $F(1, 152) = 9.78$, $p < .005$; in the slow-metronome condition, participants were equally regretful regardless of set size ($M_{large} = 1.52$; $M_{small} = 1.79$), $F(1, 152) = 1.32$, *ns* (see Fig. 2).

Scores on the rushing composite and regret were significantly correlated, $r = 0.35$, $p < .0001$, meeting the requirements for mediation (Baron & Kenny, 1986). Simultaneously regressing regret on the rushing composite, set size, metronome speed, and the set-size × metronome-speed interaction showed that the rushing composite significantly predicted regret, $\beta = .31$, $t(151) = 3.98$, $p < .0001$, whereas the effect of the set-size × metronome-speed interaction was reduced, although still significant, $\beta = .19$, $t(151) = 2.43$, $p < .05$. Mediation was confirmed by the bootstrapping procedure outlined by Preacher and Hayes (2008), which revealed that a 95% confidence interval around the indirect effect did not include zero (.02, .48).

As in Study 1, we subjected the seven affect items to a principal components analysis, which again revealed two components with eigenvalues above 1. A Varimax rotation conducted on these two components revealed a somewhat different structure than was found in Study 1: "depressed," "miserable," "stressed," and "weary" loaded highly on the first component; "alert," "cheerful," and "energetic" loaded highly on the second. Neither component correlated significantly with regret, metronome speed, or the metronome-speed × set-size interaction, all $ps > .10$.

Discussion

The results of Study 2 again support the metacognitive account of choice regret. Although all participants had the same amount of time to choose, the manipulation of metronome speed changed participants' perception of how rushed their choice was. Participants who heard a fast metronome sound and chose from a large set were especially likely to feel that they had rushed, and were consequently prone to regret their choices more. Measures of affect were not significantly related to regret or to the interaction of metronome speed and choice-set size, ruling out a purely affective interpretation of the results. Additionally, the fact that large sets entailed more regret only when participants heard a quickly ticking metronome rules out the alternative explanation that large sets simply raise people's expectations of their choices (Diehl & Poynor, 2010), and that greater regret and greater feelings of having rushed are both consequences of the failure to meet these high expectations.

Is it possible that the metronome sound affected people's choices in some way that might have increased their regret? Might it, for example, have caused stress, leading people to make poorer choices? The null effects for self-reported affect call such an account into question; nonetheless, we investigated whether the speed of the metronome sound had any systematic effect on people's choices. Participants chose a wide variety of films—41 films were chosen at least once. In order to make the analysis of film choices tractable, we coded all films that were chosen by five or fewer people as "other." Eleven films were chosen by six or more people; therefore, there were 12 possible choices in the analysis (with "other" being one choice). A likelihood-ratio chi-square showed no effect of metronome condition on choices, $\chi^2(12) = 12.13$,
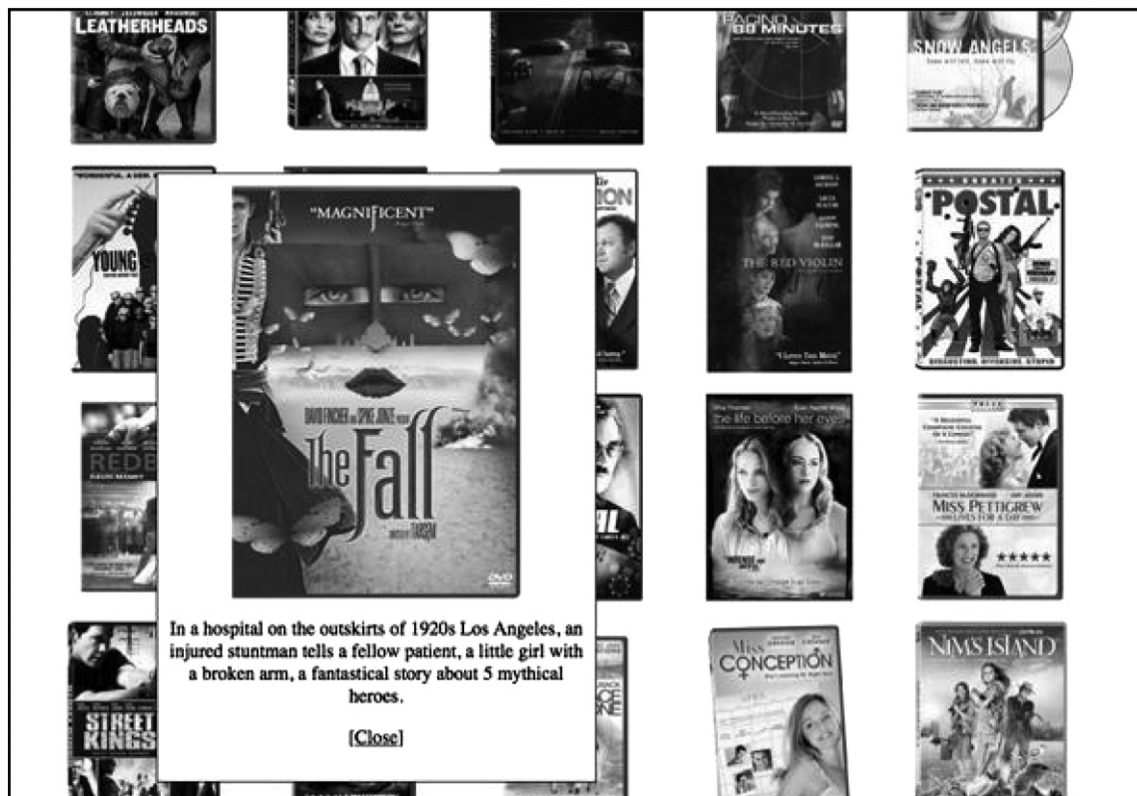

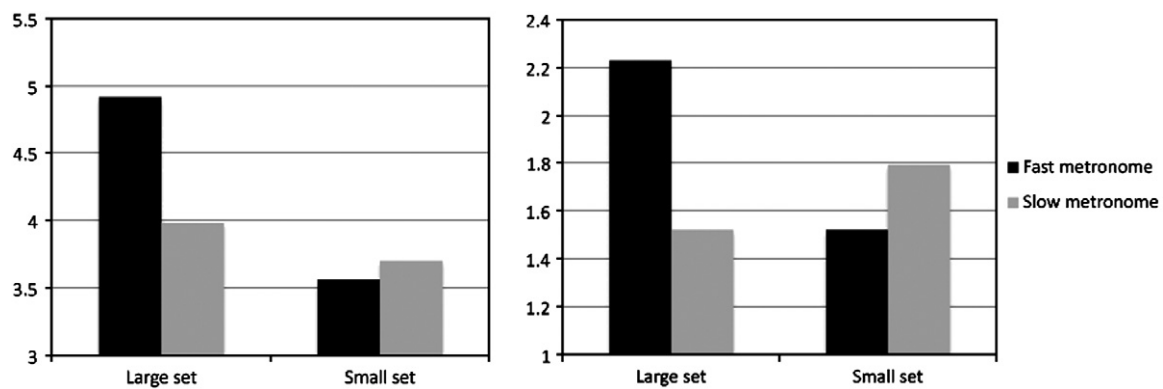**Fig. 1.** Screen shot of options display in Study 2.

Fig. 2. Feelings of having rushed (left panel) and of regret (right panel) by set size and metronome speed in Study 2.

$p = .44$. Thus, there is no evidence that metronome speed had a systematic effect on which DVDs were chosen.

One might ask why the fast metronome sound didn't cause heightened feelings of having rushed in participants who chose from a small set. This is most likely because we deliberately chose a small set size that we thought participants would easily be able to examine in two minutes, making the metronome manipulation less effective. Of course, the designation of choice sets as small and large is tightly bound to a very specific context, and we do not doubt that under some circumstances (e.g., Shah & Wolford, 2007), choosing from 15 alternatives might be quite stressful.

Study 3

In our final study, we sought to build on the results of Studies 1 and 2 in three ways. First, our metacognitive account of choice regret holds that people's lay theory that "a quick choice is a bad choice" leads to heightened regret when selecting an option from larger sets, because choosing from large sets under time pressure entails spending less time examining each possible choice option. This implies that changing people's theories about choosing quickly should change the effect of set size on regret: If people do not believe that choosing quickly leads to poorer choices, the effect of set size on regret should be attenuated or even eliminated. Conceptually, this notion is similar to research reported by Briñol, Petty and Tormala (2006), in which manipulating people's theories about the meaning of metacognitive ease reversed the classic finding that a feeling of ease when generating arguments in favor of a proposal leads to more favorable attitudes toward it (Schwarz et al., 1991). In the current study, therefore, we sought to manipulate participants' lay theories by convincing them that choosing quickly leads either to good or to bad choices. We expected to replicate the effect of choice-set size on regret when participants were told that choosing quickly leads to bad choices (consistent with their pre-existing lay theory) but to attenuate or even eliminate it when participants were told that choosing quickly leads to good choices (inconsistent with their pre-existing lay theory).

Second, participants in Studies 1 and 2 did not actually experience the item they chose before they were asked to report their regret. We do not believe that this threatens the validity of our results, because our account focuses on regret stemming from people's negative evaluations of their choice *process*, rather than of their choice outcome (Connolly & Zeelenberg, 2002). Nevertheless, we wanted to determine whether our theory would hold even when participants reported their regret after having experienced the outcome of their choices. In the current study we therefore asked participants to choose a chocolate, consume it, then report their regret. Based on the results of the pilot study described in the Introduction, which showed that reducing time pressure mitigated post-consumption regret for a chocolate chosen from a large set, we expected that our theory would hold even when regret was assessed post experience.

Finally, we wished to test something of an alternative explanation for the results of Studies 1 and 2. We have argued that because people believe that choosing quickly is a poor decision strategy, people experience heightened regret as a direct consequence of feeling that they rushed while choosing—in other words, that people feel that they have chosen "the wrong way" and that this negative evaluation of their choice process leads to greater regret. However, one might argue that participants in our studies were simply less confident in their choices when they felt that they had made them quickly. In the same way that one might be less confident in a conclusion arrived at quickly than in one arrived at after careful thought (cf. Barden & Petty, 2008), our participants might have been less confident that they had chosen the best option when they felt that they had chosen it too quickly. This lack of confidence in their choices might then lead to heightened regret. In order to explore this possibility, we modified the dependent measures in the current study with the intent to differentiate regret from decision confidence. Whereas confidence refers more broadly to the degree of certainty with which individuals believe that their judgments are correct (Barden & Petty, 2008; Koriat, Lichtenstein, & Fischhoff, 1980; Shafir, Simonson, & Tversky, 1993), regret entails a specific process by which the decision maker engages in unfavorable comparisons between the chosen and the forgone options either during or after the decision process (Bell, 1982; Kahneman & Tversky, 1982; Loomes & Sugden, 1982). Therefore, in addition to the single-item measure of regret used in the previous studies, we followed prior research (Iyengar & Lepper, 2000) and asked participants two additional questions: one directly assessed how confident they were that they had made the best possible choice, and the other assessed how their choice compared with the other options in the set. We expected the latter item, but not the former, to show the same pattern as our single-item regret measure. We also expected that controlling for confidence would not eliminate the effects of choice-set size and lay theories on regret.

In this study we used the same experimental paradigm employed in the pilot. Participants chose a chocolate from either a large or a small set and ate the chocolate before answering a questionnaire about their experience. Orthogonal to the set-size manipulation, we also gave people information indicating either that choosing quickly leads to better choices (*quick choices good*), or that it leads to worse choices (*quick choices bad*). We expected to replicate the results of Studies 1 and 2 in the *quick choices bad* condition but not in the *quick choices good* condition.

Methods and materials

Participants were seventy students from different UK academic institutions recruited to participate in a study at London Business School. To put all participants under time pressure, the experimenter told them

that they would be presented with a chocolate assortment and that they would have only ten seconds to select a chocolate to eat, noting that "ten seconds may not seem like a lot of time to make your choice." After this introduction, participants received the lay-theory manipulation, which was presented as a short summary of research on the effects of time pressure on decision making. In the *quick choices bad* condition, participants read that psychological research showed that "making better choices often takes more time and effort." The summary concluded with "When making a choice, take your time to make the best choice possible." In the *quick choices good* condition, participants instead read that psychological research showed that "people often make better choices when they don't think carefully about what to choose." The summary concluded with "More thought isn't always better, so a quick choice can often be a better choice."

Next, participants were shown the chocolate assortment, which had been concealed under a cloth. In the large-set condition the assortment consisted of 24 different chocolates arranged in four rows of six chocolates each, whereas in the small-set condition it consisted of six pieces. (The small sets were created by rotating each of the rows included in the large set.) Each chocolate was described by a short label placed in front of the chocolate piece. As soon as the chocolates were uncovered, the experimenter started a stopwatch; after the ten seconds were over, participants ate their selected chocolate before completing a questionnaire. The questionnaire included the same regret item and two manipulation-check items for perception of rushing that were used in the previous studies. In addition, participants were asked two questions adapted from prior choice-overload research (Iyengar & Lepper, 2000). The first question tapped unfavorable comparisons between the selected outcome and the forgone outcomes ("Do you think that there were chocolates on the table that tasted much better than the chocolate that you chose?"), whereas the second assessed a more general sense of confidence about the correctness of the decision ("How confident are you that you chose the best chocolate?"). Finally, participants answered a question to check that the lay-belief manipulation was successful ("How much do you agree with the statement 'Choosing quickly leads to worse choices'?") and completed the same seven-item affect measure used in the prior two studies. They were then debriefed and dismissed.

Results

Because the experiment hinged on participants feeling pressed for time when making their choice, we eliminated from the analysis one participant in the large-set/rush-bad condition whose score for the manipulation-check question "How rushed did you feel while you were making your choice?" was so low as to be identified as an outlier by Tukey's method (Tukey, 1977). This left us with 69 participants.

Scores on the *rushed* and *enough time* items were again highly correlated ($r = 0.70$, p<.0001) and were combined into the same composite measure of subjective rushing employed in the previous studies. As expected, scores on this composite were higher in the large-set condition ($M = 4.46$) than in the small-set condition ($M = 3.43$), $t(67) = 2.46$, $p = .009$, indicating that participants felt more rushed when choosing from a larger set. We next verified that the lay-theory manipulation worked as intended. As expected, participants agreed more with the statement that "Choosing quickly leads to worse choices" when they had read the *quick choices bad* paragraph ($M = 4.72$) than when they had read the *quick choices good* paragraph ($M = 3.83$), $t(66) = 2.64$, $p = .01$.[4] Thus, it appears that our manipulation successfully influenced participants' lay theories.

As expected, subjecting the *confident* item to a 2 (choice-set size) × 2 (lay theory) ANOVA revealed only a marginally significant main effect of

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[4] Reduced degrees of freedom are due to one participant not answering this question.

set size: participants who chose from a larger set were marginally less confident that they had chosen the best chocolate ($M_{large} = 4.93$, $M_{small} = 5.50$), $F(1, 65) = 3.16$, $p = .08$. No other effects were significant, both ps>.12. In contrast, subjecting the *regret* and *others better* items to the same 2 (choice-set size) × 2 (lay-theory) ANOVA revealed significant choice-set size × lay-theory interactions for both items, *regret* $F(1, 65) = 4.00$, p<.05, *others better* $F(1, 65) = 16.20$, p<.001. As the two items were also highly correlated, $r(69) = .56$, $p<.001$, we combined them into a composite measure of regret. A 2 (choice-set size) × 2 (lay theory) ANOVA on this composite measure yielded the predicted set-size × lay-theory interaction, $F(1, 65) = 12.60$, p<.001. In the *quick choices bad* condition, participants who chose from the large set felt more regret than those who chose from the small set ($M_{large} = 3.72$, $M_{small} = 1.82$), $F(1, 65) = 19.45$, $p<.001$; in the *quick choices good* condition, participants felt the same amount of regret regardless of the size of the choice set ($M_{large} = 2.84$; $M_{small} = 3.06$), $F(1, 65)<1$, *ns* (see Fig. 3). We then repeated this analysis including confidence in the choice as a covariate and found that the interaction between set size and lay theory remained significant, $F(1, 64) = 9.78$, $p = .003$.

We also tested whether changes in beliefs about choosing quickly mediated changes in regret. A stronger belief that "Choosing quickly leads to worse choices" was significantly correlated with the composite regret score, $r(68) = 0.32$, p = .008, meeting the requirements for mediation (Baron & Kenny, 1986). Simultaneously regressing regret on beliefs, set size, lay-theory condition, and the set-size × lay-theory condition interaction showed that beliefs significantly predicted regret, $\beta = .25$, $t(63) = 2.17$, $p = .03$, whereas the effect of the set-size × lay-theory condition interaction was reduced, though still significant, $\beta = .32$, $t(63) = 2.89$, $p = .005$. Significant mediation was confirmed by the bootstrapping procedure for testing mediation outlined by Preacher and Hayes (2008), which revealed that a 95% confidence interval around the indirect effect did not include zero ($-.98$, $-.02$).

Finally, as in Studies 1 and 2, we conducted a principal components analysis on the seven affect items, which again revealed two components with eigenvalues above 1. Subjecting these two components to a Varimax rotation revealed the same structure found in Study 2: "depressed," "miserable," "stressed," and "weary" loaded highly on the first component; "alert," "cheerful," and "energetic" loaded highly on the second. Neither component varied significantly by set size, rush theory, or their interaction, all ps>.10.

Discussion

The results of Study 3 again support our metacognitive account of choice regret. Participants who had been told that choosing quickly leads to bad choices (consistent, we hypothesized, with their pre-existing lay theory) showed heightened regret when choosing from a large set under time pressure. In contrast, when participants were told that choosing quickly leads to good choices (inconsistent, we hypothesized, with their pre-existing lay theory), the effect of set size on regret was eliminated—participants were no more regretful when they chose from a large set than when they chose from a small one. These results demonstrate that it is not the feeling of rushing *per se* that is crucial in producing regret, but rather the subjective experience of choosing quickly combined with the lay theory that choosing quickly is bad. Further supporting this account, differences in endorsement of the belief that choosing quickly leads to worse choices mediated the relationship between our lay-theory manipulation, set size, and regret.

There are two other noteworthy features of the current results. First, there was no significant interaction between choice-set size and lay theory on confidence, whereas the same interaction was significant on self-reported regret even when controlling for confidence. These results speaks against the alternative explanation that participants' elevated regret is the result of a more general lack of confidence when choosing from large sets.
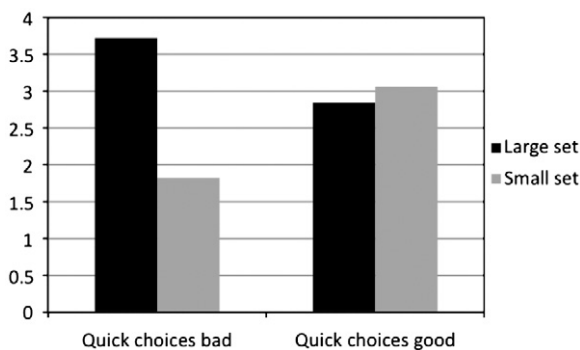
Fig. 3. Regret (composite) by set size and lay theory in Study 3.

Second, participants in the current study experienced the results of their choice (i.e., they ate the chocolate they had chosen) before they reported their regret. Although one can of course regret "unresolved" choices (cf. Connolly & Zeelenberg, 2002), the current study (together with the pilot study reported in the Introduction) shows that our metacognitive account of choice regret applies to resolved as well as unresolved choices.

General discussion

Choices from large assortments are, in many cases, advantageous—for example, when individuals value freedom, are variety-seekers, or have a very clear idea of their preferences and ideal attribute combinations. In other cases, however, too much choice has been shown to overload decision makers and to lead to undesirable consequences (Broniarczyk, 2008). The four studies reported in this paper support a metacognitive account of heightened regret when choosing from many options: People are more likely to feel that they have inappropriately rushed when choosing from large sets than from small ones, which in turn leads them to regret their choices from large sets more. Our pilot study suggests that people choosing from large sets normally experience time pressure and heightened regret. However, subtly encouraging participants to take more time eliminated the relationship between larger choice sets and greater regret. Study 1 confirmed that people's heightened regret when choosing from a large set was mediated by their feelings of having rushed while choosing. Study 2 showed that manipulating feelings of rushing by changing the perception of how quickly time had passed while holding choice time constant led to heightened regret when choosing from a large set. Again, this heightened regret was mediated by participants' metacognitive experience of having rushed. Finally, Study 3 showed that changing the lay theory that "a quick choice is a bad choice" eliminated the effects of choice-set size on regret.

Early accounts of regret (e.g., Kahneman & Tversky, 1982) assumed that it required a negative outcome. More recently, however, theorists have recognized that one can regret one's choice process even when the choice does not turn out poorly (Connolly & Zeelenberg, 2002). In the current studies, regret was mediated by feelings of having rushed—that is, by an evaluation of the choice process. In contrast, accounts of regret and choice-set size have emphasized people's evaluations of outcomes (e.g., Iyengar et al., 2006; Sagi & Friedland, 2007). The current results suggest that in addition to evaluations of outcomes, people's evaluations of choice processes are an important cause of the heightened regret often entailed by larger choice sets.

Limitations and future directions

One limitation of the current studies is that the mean levels of regret reported by participants on the 1-item regret scale were not high—they fell below the midpoint of the scale. This is similar to those from other research using similar paradigms (see, for example, Haynes, 2009). Most

likely, these relatively low levels of regret are due to the fact that in the studies reported here, and in other experimental studies of regret, participants are choosing a modest "bonus prize" in addition to their other compensation for participation. (It is also worth noting that the composite measure of regret used in Study 3, which incorporated people's unfavorable comparisons between the chosen and the forgone options, showed higher average scores.) We suspect that, if anything, the relatively low stakes of the choices in the current studies worked against our hypotheses, and that higher-stakes choices might be even more likely to show the effects we found. After all, the higher the stakes, the easier it is to kick oneself for choosing poorly, and other studies of choice have found that effects demonstrated with relatively low-stakes choices (e.g., jams or chocolates) seem to hold for high-stakes choices as well (e.g., jobs or 401(k) contributions; Iyengar et al., 2004, 2006).

The metacognitive account proposed in this paper is of course only one way that larger choice sets can cause greater regret. Even when people don't feel rushed, they might still feel more regretful because, for instance, they have rejected a greater number of alternatives to which they had grown attached during the evaluation phase (Carmon et al., 2003). At the same time, however, these results may account for the underlying mechanism explaining the effect of moderators such as set organization or clearly defined preferences. In general, any moderator that eases a chooser's cognitive burden and also increases choice satisfaction might do so because it leads to a more favorable metacognitive evaluation of the choice process.

Our results may also explain some puzzling failures to replicate choice overload effects (e.g., Scheibehenne, Greifeneder, & Todd, 2009). If a feeling of having rushed underlies diminished satisfaction when choosing from larger sets, subtle changes to the experimental setting that enhance or reduce this feeling might have a strong influence on whether choice overload is observed. While our results are suggestive in this regard, they are far from definitive—in particular, we focus on regret, rather than satisfaction more broadly—and this is a promising avenue for future research.

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