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ABSTRACT

This research examines the moderating role of regret aversion in reason-based choice. Earlier research has shown that regret aversion and reason-based choice effects are linked through a common emphasis on decision justification, and that a simple manipulation of regret salience can eliminate the decoy effect, a well-known reason-based choice effect. We show here that the effect of regret salience varies in theory-relevant ways from one reason-based choice effect to another. For effects such as the select/reject and decoy effect, both of which were independently judged to be unreasonable bases for deciding, regret salience eliminated the effect. For the most-important attribute effect that is judged to be normatively acceptable, however, regret salience amplified the effect. Anticipated self-blame regret and perceived decision justifiability consistently predicted preferences and thus offer a parsimonious account of both attenuation and amplification of these reason-based choice effects.

KEYWORDS: Decision Justification; Reason-Based Choice; Regret; Regret Aversion; Decoy effect; Accept/Reject Effect; Most Important Attribute Effect.

The Moderating Role of Regret Aversion in Reason-Based Choice

Research on decision-related regret, disappointment and related emotions stems from two distinct research traditions. Economic choice theorists (e.g. Bell, 1982, 1985; Loomes & Sugden, 1982, 1986; Irons & Hepburn, 2007; Ozerol & Karasakal, 2008; Bleichrodt, Cillo & Diecidue, 2010) aim to improve the descriptive validity of standard Expected Utility models of choice under uncertainty by introducing variables representing expected emotions. The existence and intensity of these emotions is inferred from actual choice behavior (for example, between monetary gambles), supplemented by the researchers' intuitions of their own emotional responses, rather than from direct measurement. Psychological research on regret, in contrast, relies heavily on self-report measures of expected emotional reactions to hypothetical events (e.g. Kahneman & Tversky, 1982; Connolly, Ordóñez & Coughlan, 1997; Gilovich & Medvec, 1994; Inman & Zeelenberg, 2002). The advantages and drawbacks of these two approaches have been widely debated, especially the tension between psychological realism and formal tractability (see Rabin, 2002, and Ortmann & Hertwig, 2002, for extended and insightful discussions). A study using a hybrid of self-report and actual choice measures (Connolly & Butler, 2006) showed some convergence between the two methodologies (for example, inclusion of self-report expected-emotion measures improved prediction of actual choices between significant real-money gambles), but only modest convergence between self-report measures of regret and the patterns predicted by an economic regret-theory model.

The research reported in the present paper is firmly in the psychological tradition. We are concerned with the characteristics of choice situations in which people expect to experience regret and the effects of such expectations on the choices they make and the decision processes they use. A convenient starting point is a much-cited study by Kahneman and Tversky (1982) in

which subjects read a brief scenario featuring two investors who each loses \$1,200 as a result of owning a certain stock, Stock A. One investor initially owned a different stock, Stock B, but switched to Stock A. The other considered Stock B but decided to hold onto his Stock A. Subjects were asked to predict which of the two would experience more regret at his loss. An astonishing 95% felt that the investor who switched would experience more regret. This was interpreted as evidence that unfortunate outcomes resulting from action are more regrettable than identical outcomes resulting from inaction. This so-called “action effect” was thought to lead to an “omission bias” in which, for example, non-vaccination (inaction) would be preferred to vaccination (action) when disease effects and vaccination side-effects were equivalent (Ritov & Baron, 1990, 1992; Baron & Ritov, 1994. See Connolly & Reb, 2002, for a detailed critique of these studies).

Subsequent research painted a more complex pattern. Gilovich and Medvec (1994) showed that action-regret linkages could reverse over time. Seta, McElroy and Seta (2001) found the two-investors effect reversed if the protagonists were described as entrepreneurial businessmen rather than ordinary risk-averse savers: entrepreneurs were expected to regret loss from inaction more. Zeelenberg et al (2002) asked participants how much regret a soccer coach would feel if his team lost after he either changed or did not change the team. As with the two investors, the active coach was seen as more regretful than the inactive coach, but only if the team had previously enjoyed a winning record. If they had a losing record, loss after inaction was regretted more. Inman and Zeelenberg (2002) compared consumers who bought an unsatisfactory product either switching brands or staying with a previously-purchased brand. The predicted regret depended on the consumer’s prior experience with the brand. If prior experience

with the initial brand had been poor, switching was seen as less regrettable than if prior experience with the initial brand had been good.

Drawing on these and other studies, Connolly and Zeelenberg (2002) proposed Decision Justification Theory (DJT). The theory has two central propositions. First, it proposes that decision-related regret has two components, one associated with an assessment of the outcome (“outcome regret”), the other with the decision process that led to the alternative chosen (“process” or “self-blame” regret). Second it argues that the two components are driven by rather different mechanisms. Outcome regret is driven by comparison of the actual outcome with some reference point (sometimes the outcome of an unchosen alternative, sometimes other reference points such as the status quo, the expected outcome, or the outcome received by another person. See, for example, Connolly, Ordóñez & Coughlan, 1997; Ordóñez & Connolly, 2000). Process regret, in contrast, is driven by the individual’s assessment of whether or not the decision was justified. For example, Zeelenberg et al’s (2002) soccer coaches’ decision to change their team is seen as justified (and therefore not blame-worthy or regrettable) if the team had recently been losing but not if they had been winning. Seta et al’s (2001) entrepreneurial investors were justified in taking action (switching their investments) because that is what entrepreneurs do. Inman and Zeelenberg’s (2002) brand-changers were justified in deciding to switch brands by their poor prior experience with the old brand. Reb and Connolly (2010) found that mothers whose vaccination decisions for their babies led to poor outcomes were expected to feel less regret when they were based on careful thought, consultation with several doctors and active gathering of relevant information than when they were made casually or carelessly. Indeed, although some justifications are specific to particular actions and settings (such as what soccer coaches or entrepreneurs are expected to do), the use of a careful, thoughtful, well-informed

decision process – what Janis and Mann (1977) termed a “vigilant” decision process – seems to be a general-purpose regret-reducing justification across many contexts.

If careless decisions are expected to lead to more regret than careful decisions when each yields a poor outcome, does the converse also hold? Does sensitizing people to possible regret motivate more careful decision processes? Recent evidence suggests that it does. Reb (2008) found that subjects primed to think about regret invested more effort, acquired more information, thought longer about their decisions, and made better final decisions than did those not so primed. Kugler, Connolly and Kausel (2009) showed that regret priming can motivate more rational play in experimental games. Even quite subtle, unconscious priming of one or other type of regret can influence choice behavior. In a repeated decision task Reb and Connolly (2009) showed that unconscious priming of outcome regret led subjects to reject potentially painful feedback on the outcomes of unchosen alternatives. This feedback rejection impeded their task learning and reduced their final earnings (a trap we refer to as “myopic regret avoidance”). In contrast subjects unconsciously primed for process regret accepted the short-term pain of seeing that their outcomes could have been better, learned more about the task, and ended up performing better.

In short, just as poor decision processes lead to increased regret, making possible regret salient can lead to improved decision processes. We now turn to a class of decision biases in which decision justification seems to be central, and which should therefore be responsive to the enhanced demand for a justifiable decision process which, we have argued, comes with increased salience of decision process regret.

Reason-Based Choice Effects

Several authors (Montgomery, 1983; Pettibone & Wedell, 2000; Simonson, 1989; Slovic, 1975; Tversky, 1972) have written about how the reasons and justifications the decision maker sees for and against the available alternatives influence decision making. Interestingly, the desire to make justifiable decisions can sometimes lead to choices that violate the norms of rational decision making (Barber, Heath, & Odean, 2003; Huber, Payne, & Puto, 1982; Simonson, 1989). Choices based on “shallow but nice-sounding rationales” (Simonson, 1989, p. 170) may be seen as more justifiable than decisions based on more thorough, rational processes (Slovic, Fischhoff, & Lichtenstein, 1976). Research has documented a number of these “reason-based choice effects” (RBCEs), and in many of them the desire for easy justification leads to violations of various basic principles of rational choice (Shafir, Tversky, & Simonson, 1993; Mercier & Sperber, in press).

A well-known example is the asymmetric dominance or “decoy” (or attraction) effect (Huber, Payne, & Puto 1982). Imagine a choice between two options that do not dominate each other (i.e., each option is better than the other on at least one attribute). Huber et al found that introducing a third, “decoy” option that is dominated by only one of the original options significantly increases the frequency with which the dominating option is chosen. This effect violates the fundamental normative principle of regularity (Luce, 1977). Apparently, however, the normatively irrelevant decoy option, though very rarely chosen, provides at least some subjects with a plausible reason for choosing the dominating option.

RBCEs such as the decoy effect have been found for a variety of choice domains including consumer choice (Huber et al, 1982; Simonson, 1989) and workplace decisions (Highhouse, 1996; Slaughter, Sinar, & Highhouse, 1999). They have been replicated using a variety of methods, including studies using hypothetical scenarios (e.g., Shafir, 1993) and video-

vignettes (Slaughter et al, 1999), in choices with real monetary or other material incentives (Simonson & Tversky, 1992), and using both between- and within-subjects designs (Huber et al, 1982).

There is evidence that justifiability perceptions mediate experimentally induced RBCEs (Pettibone & Wedell, 2000). Simonson (1989) found stronger RBCEs when decision makers expected to be asked to justify their decisions to others (cf. Lerner & Tetlock, 1999). In a recent study (Connolly, Reb & Kausel, 2010) we explored the contrasting effects of justification to others and justification to oneself in the decoy effect. In one experiment a control condition replicated the usual decoy effect for a choice between two job offers. In a second condition, subjects were asked to think about the regret they would feel if they made a poor choice and ended up in an unsatisfying job. This manipulation entirely eliminated the decoy effect. In a second experiment we replicated this result for two different choice tasks, and also added a third condition in which subjects were told they might have to explain their choice to an external audience. As before, making regret salient (which the subjects experienced as a demand to justify their choices to themselves) eliminated the decoy effect, but the accountability manipulation (which was seen as requiring justification to others) had no impact on the decoy effect in one task, and significantly exacerbated it in the other.

The present paper extends the research to two other RBCEs, the select/reject effect (Shafir, 1993) and the most important attribute effect (Slovic, 1975). The first is, like the decoy effect, generally agreed to be normatively violative, while the second is not. The select/reject effect is a choice anomaly in which a decision maker's preference ordering reverses depending on whether the choice task is *selecting* the option she likes more or *rejecting* the option she likes less. For example Shafir (1993) presented subjects with an imaginary choice between an

enriched option (which had some very positive and some very negative attributes) and an *impoverished* option (which had moderate values on all attributes). He found that the enriched option was selected more often when the task was to choose a winner, but was also rejected more often when the task was to choose a loser (thus making the impoverished option the winner). Shafir argued that this shift in choice frequencies resulted from the fact that the enriched option offers more explanatory features than the impoverished option. The extreme positive attribute scores can be used to justify selecting this option if selection is called for; the extreme negative scores can be used to justify rejecting it if rejection is required. However, the effect violates the fundamental normative principle of procedural invariance (Shafir, 1993; Shafir et al, 1993).

The other RBCE we consider here is the most-important attribute (MIA) effect (Slovic, 1975). Slovic asked participants to choose between pairs of two-attribute options that they had previously equated in value. They also judged which of the two attributes they considered more important. For example, participants read a description of two auto tires in terms of tread life and cost. Both attribute scores were given for one tire, only one score for the other, and the participants were asked to fill in the score on the missing attribute that would make the two options equally attractive to them. Later, they judged which attribute, tread life or cost, they considered more important. Finally, they chose between the two tires. Results across several such choices showed that participants tended to choose the option scoring higher on the attribute they previously had rated as more important. Slovic argued that the effect was the result of people making a choice they found easy to justify. Since the option pairs were equated for overall attractiveness, a second criterion is needed to choose between them. Choosing the option that is better on the dimension one cares about more appears to serve as a tie-breaking rationale that

allows one to move beyond decision paralysis. The most-important attribute effect thus violates no normative principle and offers some practical advantage.

Our purpose in these studies is to further probe the somewhat subtle interplay of regret aversion, decision justification, and RBCEs within the Decision Justification Theory framework. Our examination of this interplay in the decoy effect (Connolly et al, 2010) showed that requiring justification to others (via the accountability manipulation) can exacerbate a RBCE, while requiring justification to oneself (via regret priming) can reduce or eliminate it. If our theorizing is correct, we would expect regret priming to similarly reduce or eliminate the select/reject effect, since the assumed justification driving the effect does not survive careful scrutiny. However in the MIA effect, the assumed justification seems normatively neutral and offers some practical advantage in the form of tie-breaking. In this case we would expect the assumed justification to survive, or even be strengthened by, the enhanced scrutiny stimulated by regret priming. In short, just as Connolly et al (2010) found contrasting effects for requiring justification to others and justification to oneself, we predict here contrasting effects of regret priming when the assumed justification is non-normative (as in the select/reject effect) and when it is normatively acceptable (as in the MIA effect).

These predictions presuppose that our subject pool shares our intuitions as to when an RBCE is normatively acceptable and when it is not – that is, that the decoy and select/reject effects both represent decision errors, while the MIA effect does not. We examine this supposition in the Pretest reported in the following section. Subsequent sections report experiments testing the effects of regret priming on the select/reject effect (Study 1) and the MIA effect (Study 2). The final section integrates these results within the framework of Decision Justification Theory.

EXPERIMENTAL STUDIES

Pretest

We wanted to test whether our subject population agreed with the conceptual argument made above. Do they consider the MIA effect as more normatively acceptable than the decoy and select/reject effects? Thirty-two undergraduate students from the same population as that used in the main studies completed a short questionnaire in return for class credit. The questionnaire presented, in counterbalanced orders, three short scenarios each describing the behavior of an individual who demonstrates one reason-based choice effect: the decoy effect, the select/reject effect, and the MIA effect (full versions of the scenarios are available from the authors).

Respondents were asked to rate the choice behavior described as to whether or not it is reasonable, makes sense, is rational, is justifiable, and is something the respondent would do. Responses were made on five-point (1-5) scales on which higher values indicated less reasonable etc. decisions. Scores on the five items were strongly intercorrelated within scenarios and were averaged into simple justifiability indices for each scenario (minimum coefficient alpha = .85).

ANOVA showed a significant main effect for scenario, $F(2, 56) = 16.77, p < .001$, and no significant interaction with, or main effect for, order, $F_s < 1$. As expected, further analyses (all $p < .001$) showed that the select/reject effect ($M = 3.26, SD = 1.14$) and the decoy effect ($M = 3.07, SD = 1.13$) were considered significantly less justifiable than the MIA effect ($M = 1.86, SD = .77$) but not significantly different from each other. Thus, the present subject population agrees with the conceptual argument that the MIA effect is distinctly more reasonable than the select/reject and the asymmetric dominance effects.

EXPERIMENT 1: THE SELECT/REJECT EFFECT

We examined the effect of regret salience on the select/reject effect. Following Connolly et al (2010), we predicted that the effect will be reduced or eliminated when regret is made salient. In other words, we expected an interaction effect such that the select/reject effect will be weaker in the regret condition (i.e., when regret salience is high) than in the control condition (i.e., when regret salience is low).

*Method**Design, Procedure, and Participants*

We presented decision makers with a hypothetical decision between two jobs. The “enriched” job had several very attractive and several very unattractive attributes; the “impoverished” job was moderately attractive on all attributes. Depending on the choice task condition, participants were asked either to select or to reject one of the two jobs. They were then asked, for each job, to rate how justifiable they would judge having chosen the job if it later turned out to be unsatisfactory. We also manipulated regret salience. In the regret condition, but not in the control condition, the possibility of experiencing regret as a consequence of their choice was made salient to respondents. In sum, the experiment had a 2 (choice task: select versus reject) x 2 (regret salience: control versus regret) between-subjects factorial design.

Seventy undergraduate business students at a large Southwestern public university participated for course credit as part of a larger experiment session. They took about 10 minutes to complete the questionnaire.

Materials, Manipulation, and Measures

Participants were asked to imagine themselves faced with a choice between two job offers. In the select condition they read:

Imagine that you applied for a new job and you received two offers. You have had several days to think about which of the two jobs to select. However, the time has come now to make a decision and keep one of the two offers.

Participants in the reject condition read:

Imagine that you applied for a new job and you received two offers. Because you have indicated interest in both offers the companies have kept their offers open for you for several days. However, the time has come now to make a decision and reject one of the two offers.

Next, the options were described with presentation order counterbalanced. Six attributes were specified for each: vacation time, amount of training, stress, location quality, chance of promotion, and benefits. For the “impoverished” job, all attributes were described as average, medium, okay or moderate. For the “enriched” job three attributes were very attractive (outstanding training, excellent location, and great benefits) and three were very unattractive (very short vacations, high stress, and low chance of promotion).

In the high regret salience condition only, the job descriptions were followed by this paragraph:

Because the job market is relatively tight these days you know that your decision won't be easy to reverse and you will most likely have to stick with your job for a considerable time. Thus, should you end up not liking your job you will have a lot of time to regret your decision.

We assessed preference in two ways. First, we assessed the job choice as indicated by the select or reject decision. Second, we measured relative strength of preference on a scale anchored at -100 (“I strongly prefer Job A”) and 100 (“I strongly prefer Job B”). The results for these two

dependent variables mirrored each other. We present here only the analyses for relative strength of preference as this continuous dependent variable allows for more powerful parametric statistical tests. Strength of preference was coded such that higher values indicate preference for the impoverished option. This means that a select/reject effect would show itself in higher scores in the reject condition, because the enriched option is less preferred in this condition than in the select condition.

On the next page participants were asked to imagine the following for both the enriched and impoverished job: “After a while on your new job, you find out that you do not like it much at all. In fact, you find the job situation you are in now to be **very dissatisfying**.” For both jobs they then rated the perceived justifiability of the decision on four items (“I made a justifiable decision”; “I regret my decision”; “I feel self-blame”; and “I made a bad decision”) on 7-point Likert-scales anchored at “completely agree” (1) and “completely disagree” (7). The responses were reverse-coded as necessary such that higher values indicate higher perceived justifiability, and summed for each job. A perceived justifiability scale was computed by subtracting the score for the impoverished option from the score for the enriched option.

Results

Moderating Effect of Regret Salience on the Select/Reject Effect

A 2 (choice task) x 2 (regret salience) between-subjects ANOVA showed a significant interaction between choice task and regret salience on relative strength of preference, $F(1, 66) = 9.12, p < .01$ (see Figure 1 for means). As expected, regret salience attenuated the select/reject effect. Further analyses revealed that in the control condition, the select/reject effect was replicated. As expected, the enriched option was less preferred in the reject condition than in the

select condition, $F(1, 33) = 6.97, p < .05$. In the regret-salient condition, however, the choice task (select or reject) did not significantly affect preferences, $F(1, 33) = 2.44, ns$.

 Figure 1 about here

The Role of Perceived Justifiability

To examine the role of perceived justifiability we conducted several analyses. First, a regression analysis showed perceived justifiability as a significant predictor of relative strength of preference, $B = 15.16, SE(B) = 3.34, \beta = .48, t(68) = 4.54, p < .001$. Second, an ANOVA with choice task and regret salience as independent variables showed the expected interaction on perceived justifiability, $F(1, 66) = 6.14, p < .05$. Further analyses showed that, as with preferences, choice task significantly affected justifiability perceptions in the control condition such that the enriched option was considered a less justifiable choice when rejecting ($M = -1.04, SD = 1.20$) than when selecting an option ($M = .17, SD = 1.37$), $F(1, 33) = 7.74, p < .01$. In the regret condition, the effect of choice task was not significant ($M = -.78, SD = 1.46$, select, $M = -.46, SD = 1.10$, reject), $F(1, 33) = .54, ns$. Thus, the effect of regret salience on perceived justifiability mirrored its effect on decision makers' preferences.

Discussion

This experiment examined the potential attenuating influence of heightened regret salience on the select/reject effect (Shafir, 1993). Respondents either selected or rejected one of two job offers, one of which was “enriched” (attribute scores widely varied), the other “impoverished” (attribute scores all mediocre). The possibility of experiencing regret as a result

of their decision was made salient to participants in the regret condition, but not in the control condition.

The results were consistent with the predicted moderating role of regret aversion. We found a significant interaction effect of choice task (select vs. reject) and regret salience on preferences. The original select/reject effect was replicated in the control condition: preference for the enriched option was weaker in the “reject” task than in the “select” task. When regret was made salient, however, preferences were not significantly affected by whether the task was to select or to reject an option. The results are consistent with the idea that making regret salient can lead to more vigilant decision processing, by weakening or eliminating the influence of the normatively irrelevant select/reject task feature. Perceived justifiability played a key role in these results. As in the earlier decoy effect study (Connolly et al, 2010), making regret salient led to a more critical appraisal of the justification driving the RBCE, eliminating the effect.

As discussed earlier RBCE mechanisms have also been identified in choice situations in which the evoked justifications are substantively appropriate (or, at least, not clearly inappropriate) rather than merely superficially convincing. In such situations the reasons/justifications for choosing different options may be retained even after careful deliberation. If, as we have argued, heightened regret salience generally leads to more vigilant, careful decision processing (Connolly & Reb, 2005; Janis & Mann, 1977; Reb, 2008), heightened regret should generate an *increased* preference for the reason-based option in such cases. Experiment 2 tested this reasoning, using the *most important attribute* effect first demonstrated by Slovic (1975).

EXPERIMENT 2: THE MOST IMPORTANT ATTRIBUTE EFFECT

*Method**Design, Procedure, and Participants*

Participants matched descriptions of two bicycles on two attributes (price and ride quality) so that they were indifferent between them. They then indicated which attribute they considered more important. After that, they chose between the two matched options. For about half the respondents we made regret salient by reminding them that their choice might turn out badly and that they might regret it. After the choice respondents indicated their anticipated regret for each bicycle assuming they had chosen it and it turned out to be unsatisfactory.

Seventy-eight undergraduate business students at a large Southwestern public university participated in exchange for course credit. They took about 5-10 minutes to complete the study on a computer. Two individuals were excluded for giving a match value indicating that they would prefer a more expensive bicycle with a worse ride quality. Eight participants rated both attributes equally important and, therefore, could not be used in the analyses. Two additional participants were excluded for missing data.

Materials, Manipulation, and Measures

After going through an example of the matching procedure, participants were asked to match two bicycles such that they were equally preferable to them. Bicycle A had a price of \$299 and a ride quality of 30 (on a 0-100 scale with higher values being better). Bicycle B had a price of \$599. Participants were asked to enter the ride quality that made the two bicycles equally attractive to them. The average ride quality matching value was 63.56 and was independent of the regret salience condition. Only one person gave the maximum value of 100.

Participants then rated the relative importance of the two attributes (price and ride quality) by splitting up 100 points between them. Mean importance of the two attributes was almost equal ($M = 48.27$ for price, $M = 52.48$ for ride quality, not affected by regret salience). Participants then continued to the choice task. Here, we also implemented the regret salience manipulation (shown in parentheses below):

Imagine you had to choose between the two bicycles you just evaluated. [You know that your choice might turn out to be wrong and that you might regret it.] Which option do you choose?

Participants saw the two options with all four attribute values including the one they had earlier generated themselves. They made their choice between the two bicycles. Because regret salience did not affect which bicycle was chosen, $\chi^2(1) = .22, ns$, we collapsed across this variable in the results section.

Participants were then asked to imagine for each bicycle (both the one chosen and the one not chosen) that the bicycle had turned out to be unsatisfactory. They then rated the perceived justifiability of their decision as before on four items (“I made a justifiable decision”; “I regret my decision”; “I feel self-blame”; and “I made a bad decision”) on 7-point Likert scales anchored at “completely agree” (1) and “completely disagree” (7). The responses were reverse-coded as necessary such that higher values indicate higher perceived justifiability; difference scores were formed by subtracting the value of the “lower MIA” option from the value of the “higher MIA” option; and these scores combined into a perceived justifiability scale ($\alpha = .82$) on which values above zero indicate higher perceived justifiability for the “higher MIA” option.

Results

Moderating Effect of Anticipatory Regret on Most Important Attribute Effect

As expected, anticipatory regret significantly moderated the MIA effect, $\chi^2(1) = 5.87, p < .05$. The original MIA effect was replicated in the control condition: About 72% of participants chose the “higher MIA” option, $\chi^2(1) = 6.12, p < .05$ (see Figure 2). As expected, when regret was made salient preference for the higher MIA option was even stronger and increased to about 94% of respondents, $\chi^2(1) = 26.47, p < .05$. Thus, the MIA effect was significant in the control condition and even amplified in the regret condition, consistent with our prediction.

 Figure 2 about here

The Role of Perceived Justifiability

We again examined the role of perceived justifiability, as in the previous experiment. First, a binary logistic regression with perceived justifiability as the predictor of choice was significant in the expected direction (choice of higher MIA option coded as 0, other as 1), $B = -.87, SE(B) = .35, \text{Exp}(B) = .42, \text{Wald}(df=1) = 6.16, p < .05$. Thus, justifiability perceptions predicted choice: the more justifiable an option was perceived to be, the more likely it was chosen. Second, ANCOVA showed that, controlling for participants’ age, perceived justifiability was affected by regret salience just as preferences were: the “higher MIA” option was perceived as a more justifiable choice in the regret condition ($M = .87, SD = 1.56$) than in the control condition ($M = .26, SD = 1.53$), $F(1, 63) = 4.23, p < .05$.

Discussion

In this experiment, participants first matched two two-attribute options for desirability and then chose between them. Replicating the most important attribute (MIA) effect (Slovic, 1975), most participants chose the option that had the higher value on the attribute they considered more important. As expected, the effect was even stronger in the regret salient condition than in the control condition. Justifiability perceptions predicted participants' choices and were higher for the "higher MIA" option, as expected. Also, the justifiability of the "higher MIA" option was increased when regret was made salient. This confirmed our prediction that when the RBCE is driven by a normatively acceptable justification, regret salience increases preference for the reason-based option (in this case, the "higher MIA" option).

GENERAL DISCUSSION

Research suggests that individuals are highly concerned with the justifiability of their decisions (Montgomery, 1983; Pettibone & Wedell, 2000; Simonson, 1989; Slovic, 1975; Tversky, 1972). This desire for decision justifiability can lead to violations of fundamental principles of rational decision making, such as procedural invariance and regularity, and, thus, to biased choices, as illustrated by the reason-based choice effects literature (Shafir et al, 1993; Simonson, 1989). In the prototypical RBCE experiment, the "reason" favoring one option over another is "shallow but nice-sounding" (Simonson, 1989, p. 170). Decision makers' desire to make justifiable choices leads them to rely on these irrelevant "reasons", resulting in choices that violate normative principles.

While these findings are well-established in the literature, relatively little research has examined moderating variables that could attenuate RBCEs and reduce choice bias. In the present paper, we proposed that heightened regret salience might be such a moderator. As Janis

and Mann (1977) argued, heightened anticipatory regret can lead decision makers to engage in more vigilant, careful decision processing (cf. Connolly & Reb, 2005; Reb, 2008). Such increased vigilance should reduce or eliminate RBCEs when closer examination reveals them to be flawed, but not when they can withstand such scrutiny.

An earlier study (Connolly et al, 2010) showed that regret salience eliminated the asymmetric dominance or “decoy” effect (Huber et al, 1982). Experiment 1 replicated this finding for the select/reject effect (Shafir, 1993) and found that justifiability perceptions tracked preferences. Both effects are caused by decision makers’ reliance on normatively irrelevant task factors: the presence of a dominated decoy alternative in one, whether the choice task is to select or to reject one of two options in the other. Both effects were replicated in the control condition, but were significantly attenuated when the possibility of experiencing regret as a consequence of their choices was made salient to decision makers. In both cases the impact of the regret manipulation appears to have been to prompt a closer examination of, and thus to discredit, the shallow justification underlying the RBCE.

In Experiment 2 we predicted, and found, the reverse effect of regret salience in the most important attribute (MIA) effect (Slovic, 1975) when the justification underpinning the RBCE survives the closer examination triggered by the regret priming. In contrast to the decoy and select/reject effects, the justification for choice in the MIA effect was seen by pretest participants as normatively defensible (a view we broadly share). In Experiment 2, the MIA effect was replicated in the control condition and was even stronger in the regret-salient condition. As in Experiment 1, participants’ justifiability perceptions closely tracked their preferences.

To the best of our knowledge the present research is the first to integrate two important streams of research in behavioral decision theory – decision regret and reason-based choice. Our

results suggest that anticipatory regret plays a significant moderating role in reason-based choice. Interestingly, Shafir (1993, p. 550), in his original paper on the select/reject effect, argued that regret aversion could not explain this effect. However, his argument was based on the then-current model of regret, which held that regret was purely a function of the outcome of the chosen option relative to the outcome of the non-chosen option (Bell, 1982; Loomes & Sugden, 1982) – what Decision Justification Theory refers to as “outcome regret”. Such a model of regret aversion has difficulty in parsimoniously explaining the reason-based choice effect. However Decision Justification Theory proposes a second self-blame component of regret resulting from a feeling that the decision was unjustified (Connolly & Reb, 2005; Connolly & Zeelenberg, 2002; Inman & Zeelenberg, 2002). It is the avoidance of this second component of regret that amplifies or attenuates the RBCEs in our three experiments.

The results thus add further support to Connolly and Zeelenberg’s (2002) proposal that outcome regret should be distinguished from self-blame regret associated with either the option chosen or the decision process used. The demonstration is especially compelling in the contrast between Experiment 1, where increased regret salience eliminated the RBCE, and Experiment 2, where it amplified it. In each case making regret salient appears to have produced more careful scrutiny of justification issues. In Experiment 1, as in Connolly et al (2010), this scrutiny revealed the unreasonableness of the RBCE justification, and the RBCE disappeared. In Experiment 2, the rationale appears to have survived the scrutiny and the justification was relied on more heavily when regret was salient, amplifying the RBCE.

Taken together these findings add some empirical support to Janis and Mann’s (1977) suggestion that the anticipation of regret can lead to improved, more “vigilant”, decision making. The weakening of the select/reject effect in Experiment 1 and of the asymmetric dominance

effect in the earlier study at least reduced the influence of one normatively-irrelevant consideration from the decision process, and may have led to more thoughtful evaluation of the attribute tradeoffs involved. The strengthening of the most important attribute effect in Experiment 2 is normatively blameless, at least if it was used as a tie-breaking device between two equally-valued options. Enhanced regret salience thus seems to have improved decision making in all three experiments. These results extend Reb's (2008) recent findings that increased regret salience leads to more careful information search and deliberation during the decision process.

Our findings are, of course, subject to the usual cautions concerning the use of student participants in brief laboratory studies using hypothetical scenarios. It is worth noting, however, that the scenario methodology in which participants are asked to imagine how they *would* feel under certain circumstances is not used here as a cheap alternative to assessing actual emotions in real versions of these same circumstances. Whether or not the participants' emotional expectations are accurate (and there is good reason to be suspicious: Gilbert et al, 2004), *ex ante* they are all the decision maker has for guidance. If a simple laboratory manipulation such as making regret salient does, in fact, lead a participant to think differently about a particular decision and to make a different choice, the accuracy of the expectations involved is not the focal issue. On the other hand the findings leave open for further research the question of whether or not this manipulation will have a similar effect on thoughts and choices in real decisions outside the laboratory.

A limitation of concern to experimental economists is our use of self-reports of subjective beliefs (typically dismissed as "cheap talk") and other failure to ensure incentive-compatible responses. We share this general concern, and are currently trying to devise real-money choice

tasks that show RBC effects paralleling those reliably found in the hypothetical choices used in the studies reported here. More broadly we see real potential in hybrid methodologies combining the rigor of experimental economics procedures with the soft, subjective variables of interest to psychological regret theory. For example, Reb (2008) and Reb and Connolly (2009) showed experimentally the effect of (soft) regret priming on real-money choices, though the monetary stakes were small. Kugler et al (2009) found substantial effects of such regret priming inductions on first-player contributions in a Trust Game with real-money payoffs ranging up to \$60. Connolly and Butler (2006) used choices between real-money experimental gambles with substantial payoffs (up to \$30) modeled on those used by Loomes, Starmer and Sugden (1991) but also including subjective self-report measures of the emotions subjects expected to experience for each possible outcome in the payoff matrix. These self-report measures added significantly to the prediction of actual gamble choices, and correlated well with ex post self-reports of emotional reactions to the payoffs actually received (though not, as noted earlier, with the emotional experiences predicted by Regret Theory). These examples suggest that there may be real potential in hybrids of economic and psychological experimentation in building theory that is both psychologically rich and economically rigorous. (There are hints that hybrids involving brain imaging may also contribute to such progress. See, for example, Coricelli, Dolan & Sirigu, 2007).

The findings provide an interesting footnote to the continuing debate about the functionality of emotions in decision making (e.g. Elster, 1996; Zeelenberg, 1999). Much of this debate (e.g. Loewenstein, 1996; Loewenstein, Weber, Hsee & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2002) has emphasized the ability of the emotions to bypass or undermine rational decision processes. Other voices have emphasized the positive role emotions can play in

decision making (e.g., Damasio, 1994; Isen, 1993). The present experiments support the latter position: the anticipation of an emotion (self-blame regret) seems to lead to a cognitive reappraisal of an element of the decision process (the “reasons” underlying RBCEs) and, in turn, to an improvement in that process.

A major recent theoretical paper by Mercier and Sperber (in press) provocatively argues that human reasoning abilities have their primary evolutionary roots in communication rather than in decision making, and are better suited to argument and persuasion than to analysis and consequential thought. The present analysis is entirely sympathetic to and compatible with Mercier and Sperber’s argument – indeed, the research on RBCEs is one of their main threads of empirical evidence. Our analysis, however, extends that of Mercier and Sperber in suggesting that humans may have also developed emotion-based mechanisms, such as regret and its anticipation, that can extend our argument-making skills into the balance and synthesis required for consequential thinking.

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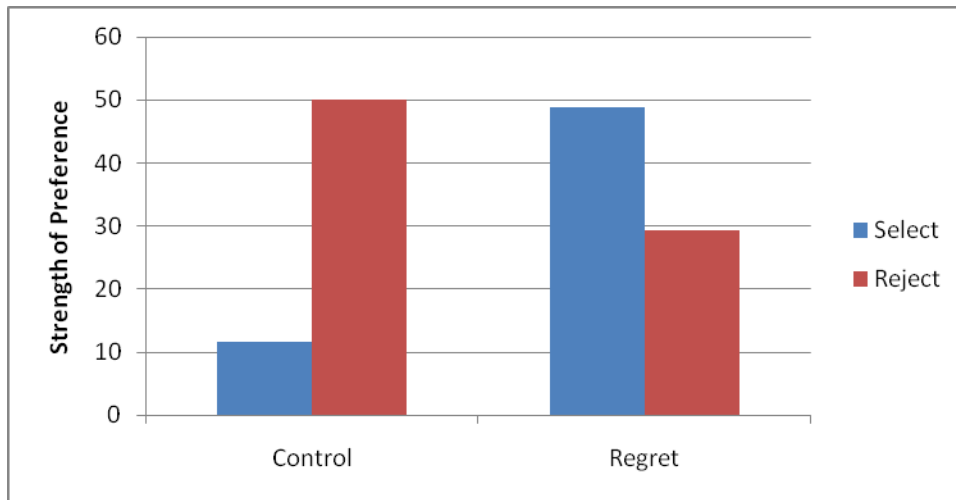
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Figure 1: Relative Strength of Preference for Enriched and Impoverished Options as a Function of Choice Task and Regret Saliency, Experiment 1



(Relative Strength of Preference measured on a -100 to +100 scale with higher values indicating stronger preference for the impoverished option.)

Figure 2: Choice Frequencies of Options Higher and Lower on MIA as a Function of Regret Salience, Experiment 2

