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Feeling torn and fearing rue: Attitude ambivalence and anticipated regret as antecedents of biased information seeking☆

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ABSTRACT

Theoretical work on attitudinal ambivalence suggests that anticipated regret may play a role in causing awareness of contradictions that subsequently induce a feeling of an evaluative conflict. In the present paper we empirically examined how the anticipation of regret relates to the association between the simultaneous presence of contradictory cognitions and emotions (objective ambivalence), and the evaluative conflict associated with it (subjective ambivalence), in the context of decision-making. Across three studies (*N*s = 204,127,244), manipulating both objective ambivalence and regret, we consistently found that when a dichotomous ambivalent choice had to be made, (objectively) ambivalent attitude holders for whom feelings of anticipated regret were made salient reported higher levels of subjective-attitude ambivalence than participants in the other conditions. Moreover, in Studies 2 and 3 we found that the effect of anticipated regret on subjective ambivalence had consequences on information processing. Specifically, anticipating regret made ambivalent participants search for attitude-congruent information. This effect was mediated by the increase in subjective ambivalence. This work provides the first empirical evidence for the role of regret in the association between objective-and-subjective attitude ambivalence, and its consequences.

1. Introduction

Although people have a fundamental desire for consistency (Festinger, 1962), they often have inconsistent attitudes, such as liking the taste of chocolate cake while at the same time disliking its calories. Such evaluative discrepancies are known as attitudinal ambivalence. The notion that awareness of ambivalence can elicit negative affect (Newby-Clark, McGregor, & Zanna, 2002) is reflected in the distinction between *objective* and *subjective* ambivalence. Objective ambivalence refers to the co-existence of positive and negative attributes with regard to an attitude object (Kaplan, 1972); subjective ambivalence refers to the extent to which one *experiences* conflict about one's ambivalent attitude (Priester & Petty, 1996). When individuals with ambivalent attitudes are confronted with a dichotomous evaluative choice, their positive and negative components become simultaneously accessible, leading to subjective ambivalence (Van Harreveld, Van der Pligt, & De Liver, 2009). In this work it is argued that the anticipation of regret about potentially making the wrong decision amplifies the association between the objective and subjective attitude

ambivalence. This study is the first to empirically test the role of regret as regards the consequences of awareness of ambivalence.

1.1. Anticipated regret and ambivalence

The theoretical relationship between ambivalent decisions and regret has been described in different ways. Ambivalent attitude holders facing a dichotomous decision are forced to choose one side of the issue and let go of the other. As they intrinsically do not know which choice will lead to the best outcome, anticipation of regret is likely. Previous research has shown that the relationship between objective ambivalence and negative arousal is mediated by uncertainty (Van Harreveld, Rutjens, Rotteveel, Nordgren, & Van Der Pligt, 2009), which was positively associated with anticipated regret (Loomes & Sugden, 1982).

Research has also shown that anticipating regret about a risky decision leads decision-makers to avoid taking that risk (Li et al., 2010). Similarly, procrastination has been found to be related to thoughts about how things could have gone better (Sirois, 2004). In the context

of ambivalence it has been argued that when a decision is imminent, the first inclination of ambivalent attitude holders is also to procrastinate (Van Harreveld, Van der Pligt, et al., 2009). Since ambivalent decisions are almost intrinsically risky (one cannot be sure which alternative is likely to generate the most positive outcome), it could be argued that regret anticipation drives the effect of ambivalence on procrastination, thus further supporting the notion that the anticipation of regret can arise in ambivalent decision-making.

Thus, building on previous work, we hypothesized that regret is what causes objective ambivalence to become the more conflicted experience of subjective ambivalence; namely:

H1. When a decision has to be made regarding an ambivalent attitude, regret will amplify the association between objective and subjective attitude ambivalence.

1.2. Consequences of regret-induced subjective ambivalence

Subjective ambivalence is known to guide the processing of attitude-relevant information. Specifically, ambivalent attitude holders have a preference for information that is consistent with their initial attitude (Clark, Wegener, & Fabrigar, 2008; Sawicki et al., 2013). In other words, ambivalent attitude holders who are slightly positive (negative) arguably prefer positive (negative) information as this is the most direct route towards univalence (Van Harreveld, Nohlen, & Schneider, 2015). To date, however, research has not empirically addressed the emotions and mechanisms underlying such biased information search.

In terms of the process underlying this effect of ambivalence on consistency bias, we adopted a motivational account. Specifically, we argue that ambivalent attitude holders' consistency bias is driven by the motivation to reduce the unpleasant feeling of regret by trying to acquire a more univalent attitude (Van Harreveld, Van der Pligt, et al., 2009). We therefore examined whether regret-induced subjective ambivalence would have downstream consequences for information search. We hypothesized that when a decision has to be made, regret-induced evaluative conflict should make the ambivalent attitude holder search for attitude-congruent information (see Fig. 1).

H2. Regret-induced subjective ambivalence will result in biased information search in the direction of the initial attitude.

Our work is also related to existing research in the context of decision-making and information processing, and specifically to the concept of the psychological immune system. The psychological immune system is thought to be comprised of people's tendency to restructure their beliefs, such that outcomes are experienced more positively in the context of cognitive dissonance (Gilbert & Ebert, 2002), as illustrated

Fig. 1. Moderated mediated model for the effect of regret on consistency bias via subjective-attitude ambivalence.

by the post-decisional spreading of the attractiveness of alternatives (Brehm, 1956). The motivational aspect of cognitive consistency effects is driven by the desirability of the outcome (Kruglanski et al., in press). Our study examined whether ambivalent decisions can also trigger the psychological immune system, by leading decision-makers to focus on one side of the issue and thus increase confidence in their decision.

Three studies were conducted to test the research hypotheses. Study 1 established the role of regret on the objective-subjective attitude relationship (H1). Study 2 tested the subsequent effect of regret and ambivalence on biased information search (H2). Finally, Study 3 aimed at increasing ecological validity by testing the hypotheses in an (ostensibly) naturalistic setting.

2. Study 1

2.1. Methods

2.1.1. Participants and design

Undergraduates ($N = 203$, 64% female) from a local university participated in the study in exchange for course credit ($M_{age} = 22.62$, $SD = 2.11$). This sample size has a power of 0.90 to detect a medium effect sized-interaction, *Cohen's f* = 0.25, in a 2*2 between-participant design.

2.1.2. Procedure

After filling out the consent form, participants were asked to read a paragraph about an ostensible university decision that requires undergraduate students to do an annual 40 h of community service in jobs that benefit society (Baker & Petty, 1994). Participants were randomly assigned to a high or low objective ambivalence condition. Participants in the low ambivalence condition read the following passage:

> "A recent decision of the University states that starting next year, undergraduate students will be required to do 40 hours of volunteer work in projects that benefit society. Some examples of these projects include helping underprivileged elementary and high-school students with their homework, volunteering in organizations that help the elderly and projects with people with special needs (the blind and otherwise disabled, etc.). Students will be able to choose their own project, which will then have to be approved by the University, or take part in a project organized by the University. Completing the 40 hours is mandatory to graduate. The student council argues it will place an undue burden on students' already busy schedules and will thus interfere with their ability to study. It also argues that the decision will also hurt the students who need to work in their free time to pay their tuition."

Participants in the high ambivalence condition read the following passage:

> "A recent decision of the University states that starting next year, undergraduate students will be required to do 40 hours volunteer work in projects that benefit society. Some examples include helping underprivileged elementary and high-school students with their homework, volunteering in organizations that help the elderly and projects with people with special needs (the blind and otherwise disabled etc.). Students will be able to choose their own project, which will then have to be approved by the University, or take part a project organized by the University. Completing the 40 hours is mandatory to graduate. The student council argues that the decision will place an undue burden on students' already busy schedules and will thus interfere with their ability to study. On the other hand it is argued that this proposal will help the university attract donors, which will result in better facilities for the students."

Subsequently, to associate ambivalence with a dichotomous choice, which is known to facilitate simultaneous accessibility and a more subjective experience of ambivalence (Van Harreveld et al., 2009), we asked participants to state whether they were either in favor or opposed the
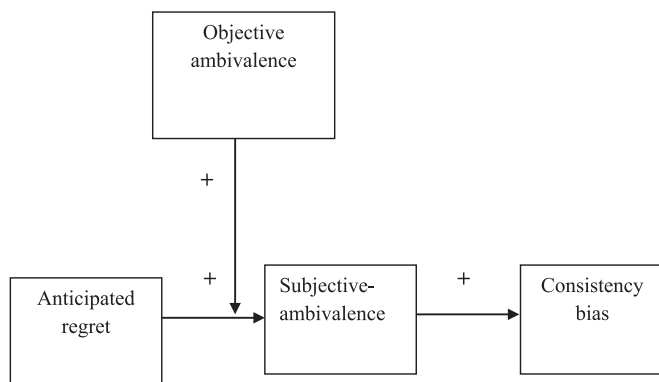
proposal and write a short essay justifying their stance.[1] Before writing the essay, we randomly assigned participants to a high or low anticipated regret condition. Participants in the regret condition read the following:

"Imagine you chose to write the essay supporting one stance and it is published in the student newspaper with your picture alongside it for everyone to see. Then however you anticipate that people will associate you with a position that you don't fully identify with and you wish you could go back and change your position." No message was presented in the low regret condition. Finally, participants completed questionnaires on the research variables and were debriefed.

2.2. Measures

All measures were assessed on 11-point Likert-type scale (0-*not at all*, 10-*completely*).

2.2.1. Objective-attitude ambivalence

We used the split semantic differential scale (Kaplan, 1972) which includes two items: "ignoring your negative (positive) thoughts and feelings about the decision and considering only your positive (negative) thoughts and feelings, how positive (negative) is your attitude towards the decision"? Objective ambivalence was calculated by subtracting the absolute value of the difference between the positive (P) and negative (N) attributes: $(P + N)/2 - |P - N|$; Thompson, Zanna, & Griffin, 1995). This index is maximized when people are equally and highly positive and negative about the attitude object. Results ranged from −5 to 10.

2.2.2. Regret

We measured regret with five items (e.g., *I am sorry about my decision*), (α = 0.83).[2]

2.2.3. Subjective-attitude ambivalence

We used the subjective-attitude ambivalence scale (Priester & Petty, 1996;e.g., "I feel conflicted regarding my attitude towards the proposal"; α = 0.87).

2.2.4. Negative affect

To assess whether any effects of the regret manipulation on subjective ambivalence were driven by the experience of anticipated regret and not by more general negative affect, we also assessed negative affect (Watson, Clark, & Tellegen, 1988; α = 0.88).

2.3. Results and discussion

2.3.1. Manipulation checks

Participants in the high objective ambivalence condition reported more objective ambivalence (M = 4.28, SD = 3.74) than participants in the low objective ambivalence condition (M = 3.27, SD = 3.44), t (201) = 2.00, p = .046, d = 0.28. Participants in the high regret condition reported more regret (M = 3.31, SD = 1.83) than participants in the low regret condition (M = 2.03, SD = 1.81), t(201) = 6.00, p < .001, d = 0.85 (see Table 1).

An analysis of Covariance *(ANCOVA)* indicated that the objective ambivalence, $F(1198) = 11.87$, $p < .001$, $\eta_p^2 = 0.06$, and regret manipulations, $F(1198) = 12.22$, $p < .001$, $\eta_p^2 = 0.06$ had main effects on subjective ambivalence when controlling for negative affect.[3] Participants in the high objective ambivalence condition reported more subjective ambivalence ($M_{adjusted} = 3.45$, $SE = 0.18$) than participants in the low objective ambivalence condition ($M_{adjusted} = 2.52$,

Table 1
Descriptive statistics for Study 1.

	M	SD	1	2	3
Objective ambivalence	3.80	3.62			
Regret	2.70	1.71	**0.18**		
Subjective ambivalence	3.00	2.11	**0.29**	**0.54**	
Negative affect	3.15	1.68	0.02	**0.18**	**0.28**

Note: Values in **bold** differ from 0 at *p* < .05.

$SE = 0.20$). Participants in the high regret condition reported more subjective ambivalence ($M_{adjusted} = 3.47$, $SE = 0.19$) than participants in the low regret condition ($M_{adjusted} = 2.51$, $SE = 0.19$).

The interaction between the experimental conditions on subjective ambivalence, when controlling for negative affect, was significant, $F(1198) = 4.52$, $p = .035$, $\eta_p^2 = 0.02$. Simple effects analysis indicated that this interaction was driven by the low regret and high regret conditions differing *within* the high objective ambivalence condition. Specifically, under high objective ambivalence, participants in the high regret condition ($M_{adjusted} = 4.22$, $SE = 0.27$), reported more subjective ambivalence than participants in the low regret condition ($M_{adjusted} = 2.68$, $SE = 0.26$), $p < .001$, 95% CI[0.78,2.29]. Under low objective ambivalence, there was no difference between participants in the high and low regret conditions.

In sum, anticipation of regret made the presence of contradictory beliefs within participants' attitude (objective-attitude ambivalence) to be experienced as more conflicted (subjective-attitude ambivalence). The increase in subjective ambivalence could not be attributed to general negative affect, but rather to a more specific feeling of regret. However, Study 1 did not examine the more downstream consequences of regret-induced subjective ambivalence. Hence, in Study 2 we investigated whether anticipated regret also plays a role in the context of biased information search.

3. Study 2

In Study 2 we aim to replicate the findings of Study 1 using a different attitude object and examined whether anticipated regret increases biased information search by increasing subjective ambivalence.

3.1. Participants and design

Undergraduates from a local university participated in the study in exchange for course credit (N = 127, 53% female, $M_{age} = 22.70$, SD = 2.52). This sample size has a power of 0.80 to detect a medium effect sized interaction, *Cohen's f* = 0.25, in a 2*2 between-participant design.

3.2. Procedure

The procedure mirrored that of Study 1 but with a different attitude object. Participants read a message about a university decision to help disadvantaged students by ensuring them that 10% of the total enrollment would be reserved for them in undergraduate programs in all departments, even if they did not meet the enrollment requirements. Participants in the low objective ambivalence condition read one argument in favor of the decision and three arguments against it. Participants in the high ambivalence condition read two arguments in favor of the decision and two arguments against it (see supplementary material). Afterwards, participants chose a position[4] and wrote a short

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[1] 44% chose a position in favor of the decision, which suggests the decision was difficult.

[2] All items loaded on one factor.

[3] We controlled for negative affect in every analysis where subjective ambivalence was the dependent variable. We report the results without controlling for negative affect in the supplementary material.

[4] 39% in favor.

essay about it, followed by the same regret manipulation as in Study 1. Finally, participants filled in questionnaires on the research variables and were debriefed.

3.3. Measures

3.3.1. Objective ambivalence, regret, subjective ambivalence, negative affect
All measures were identical to Study 1, all αs > 0.83.

3.3.2. Attitude valence
Attitude valence was calculated by subtracting the negative split-semantic differential scale item from the positive item: *positive-negative*.

3.3.3. Consistency bias
We presented a list of eight article titles (see supplementary material). Half of the titles supported the decision and half opposed it. For each title, participants indicated the extent to which they wanted to read the entire article on an 11-point Likert-type scale (0- not at all, 10-very much), ($\alpha_{positive}$ = 0.75, $\alpha_{negative}$ = 0.71). Participants were divided into two groups based on their attitude valence scores. Group 1 was composed of participants whose score on the positive semantic-differential scale (Kaplan, 1972) was equal to[5] or higher than the score on the negative split-semantic differential scale. Group 2 was composed of the opposite. For example, a participant who assigned a rating of 5 on the positive attributes of the decision, and 3 on the negative attributes, was placed in group 1. Consistency bias was calculated based on participants' rating of their desire to read the headlines as follows:

Group 1: (*sum positive headlines*) − (*sum negative headlines*).

Group 2: (*sum negative headlines*) − (*sum positive headlines*).

This measure captures both the *direction* and the *extent* of bias. A score above 0 indicates that individuals focused on headlines that fit their initial attitude, whereas a score below 0 indicates individuals focused on headlines that countered the initial attitude. The higher the score, the higher the consistency information seeking was considered to be.

3.4. Results and discussion

3.4.1. Manipulation checks
Participants in the high objective ambivalence condition reported more objective ambivalence (*M* = 4.56, *SD* = 2.72) than participants in the low objective ambivalence condition, (*M* = 3.13, *SD* = 3.77), *t* (125) = 2.40, *p* = .018, *d* = 0.43. Participants in the high regret condition reported more regret (*M* = 3.15, *SD* = 1.98) than participants in the low regret condition (*M* = 2.01, *SD* = 1.43), *t*(125) = 3.47, *p* < .001, *d* = 0.62 (see Table 2).

Participants in the high objective ambivalence condition reported more subjective ambivalence ($M_{adjusted}$ = 4.61, *SE* = 0.24) than participants in the low objective ambivalence condition ($M_{adjusted}$ = 3.13, *SE* = 0.25), *F* (1123) = 18.29, *p* < .001, η_p^2 = 0.15. Moreover, participants in the high regret condition reported more subjective ambivalence ($M_{adjusted}$ = 4.81, *SE* = 0.25) than participants in the low regret condition ($M_{adjusted}$ = 2.92, *SE* = 0.24), *F*(1123) = 28.91, *p* < .001, η_p^2 = 0.21.

The interaction between the experimental manipulations on subjective ambivalence was significant, *F*(1123) = 4.12, *p* = .044, η_p^2 = 0.03. As in Study 1, this interaction was driven by differences between participants in the regret conditions. Under high objective ambivalence, participants in the high regret condition ($M_{adjusted}$ = 4.88, *SE* = 0.34) reported more subjective ambivalence than participants in the low regret condition ($M_{adjusted}$ = 2.66, *SE* = 0.36), *p* < 0.001, 95% CI[1.15,3.29]. Under low objective ambivalence there was no difference between participants in the

Table 2
Descriptive statistics and correlations for Study 2.

	M	SD	1	2	3	4	5	6
Objective ambivalence	3.82	3.37						
Attitude valence	1.60	3.78	− **0.52**					
Regret	2.57	1.81	*0.17*	− **0.30**				
Subjective ambivalence	3.85	2.28	*0.16*	− *0.18*	**0.27**			
Negative affect	3.30	1.85	**0.19**	− *0.18*	**0.39**	**0.25**		
Bias consistency	0.31	2.49	**0.25**	**0.20-**	0.12	**0.40**	**0.21**	

Note: Values in **bold** differ from 0 at *p* < .05; values in *italics* differ from 0 at *p* < .10.

regret conditions.

An *ANOVA* indicated a significant interaction between the experimental manipulations on consistency bias, *F*(1123) = 5.23, *p* = .024, η_p^2 = 0.05. Specifically, under high objective ambivalence, participants in the high regret condition were more biased in their information search (*M* = 1.50, *SE* = 0.45) than participants in the low regret condition (*M* = 0.12, *SE* = 0.47), *t*(65), *p* = .038, 95% CI[0.08,2.68]. Under low objective ambivalence there was no difference between participants in the high and low regret conditions.

3.5. Mediation analysis

To test the entire model (see Fig. 1) we used a moderated mediation approach (PROCESS Model 7; Hayes, 2013), with 5000 bootstrapping samples. We estimated the objective attitude ambivalence conditions (0 = low, 1 = high) as the moderator for the effect of the regret manipulation on subjective ambivalence. Specifically, our model tested whether the regret manipulation elicited more regret (as measured by the manipulation check), which in turn would induce higher subjective ambivalence and, as a consequence, greater consistency bias. Furthermore, it was hypothesized that the mediating role of subjective ambivalence would only apply under high objective ambivalence. In other words, when objective ambivalence was high (but not low), the regret manipulation would induce higher consistency bias by increasing subjective ambivalence.

As can be seen in Fig. 2, regret increased subjective ambivalence only when objective ambivalence was high, *b* = 1.74, *SE* = 0.76, *t* (123) = 2.29, *p* = .024, 95% CI[0.23,3.24]. Moreover, subjective ambivalence mediated the effect of regret on consistency bias only under high ambivalence, as indicated by a significant conditional indirect effect, *b* = 1.14, *SE* = 0.42, 95% CI[0.45,2.20], in the high ambivalence condition, and a non-significant indirect effect, *b* = 0.28, *SE* = 0.30, 95% CI[− 0.22,0.98], in the low ambivalence condition. The direct effect of the regret manipulation on the consistency bias was not significant, *b* = − 0.39, *SE* = 0.48, 95% CI[− 1.34,0.56]. These results are consistent with mediation, but only for participants in the high objective ambivalence condition.

In sum, Study 2 replicated the results of Study 1 and showed that anticipation of regret renders ambivalent attitude holders to process information in a more biased manner because they experienced subjective ambivalence. However, one caveat is that both studies tested the research hypotheses under hypothetical scenarios. Hence, Study 3 was conducted to better assess the role of regret in inducing subjective ambivalence when people believe the decisions made are real.

4. Study 3

Study 3 was designed to test the research hypotheses in the context of an (ostensible) actual decision where we assessed the consistency bias with a behavioral measure. Whereas studies 1 and 2 examined post-decisional regret, Study 3 tested the hypotheses in the context of
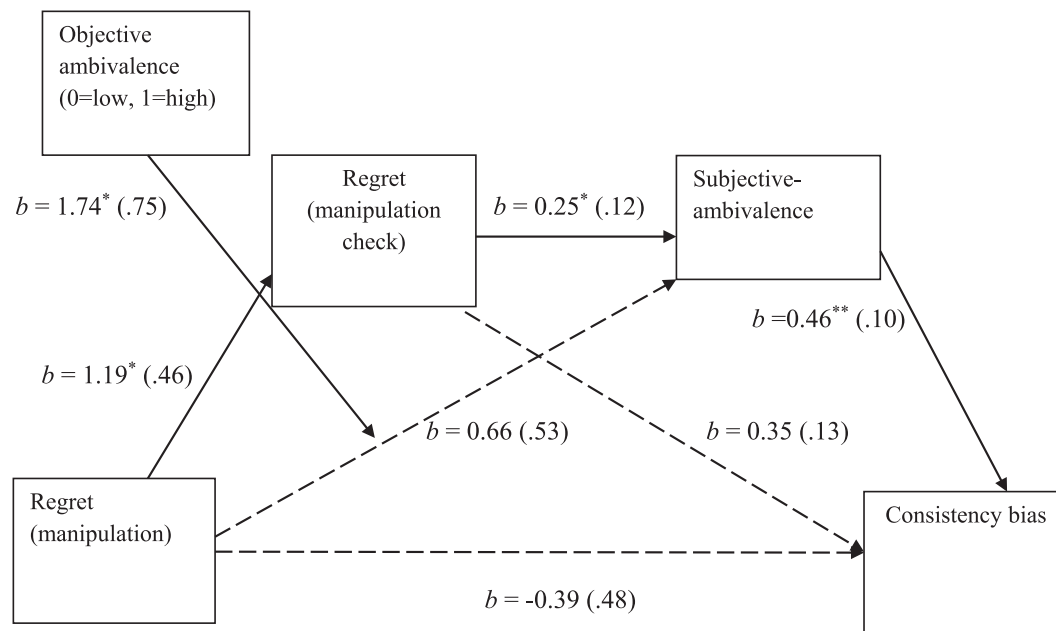
Fig. 2. Moderated-mediation model of Study 2. Standard errors in parenthesis. $^{**}p < .01$, $^*p < .05$.

pre-decisional regret, since previous research has suggested that regret can also arise in the pre-decisional phase (Van Harreveld et al., 2009).

4.1. Participants and design

We recruited 248 participants through Prolific Academic,[6] an online labor market where researchers can recruit participants.[7] Each participant was paid £0.85 for participation. We excluded four participants from the experimental condition (high ambivalence, high regret) who spent an extremely long time on the measure of biased-information search[8] (> 2 SD above average on the log-transformed response times). This left a total sample size of 244 ($M_{age} = 33.86$, $SD = 11.81$, 60.1% female). This sample size has a power of 0.97 to detect a medium effect sized interaction, *Cohen's f* = 0.25, in a 2*2 between-participant design.

4.2. Procedure

After filling out the consent form, participants were told the study was related to an effort to clean up the participant pool at Prolific Academic and they were informed that participants from that pool would be involved in this effort. Therefore they would be presented with information about the behavior of a person who fills in surveys at Prolific Academic, and would be asked to judge whether that person should or should not be excluded from future surveys. Importantly, to make the anticipated decision meaningful we told participants that if they decided to exclude the participant, it is very likely that he or she would indeed be excluded not only from our surveys, but from other surveys as well (see supplementary material).

Next, participants read six pieces of information about the

behavior of a participant who ostensibly participated in three surveys for our lab. We randomly assigned participants to either a positive univalent condition (e.g., "In all surveys the participant answered the awareness question correctly, indicating attention", and, "In each survey this participant answered all questions, never leaving a question without an answer, whether it was a closed or open-ended question"), or an ambivalent condition (e.g., "At the end of every questionnaire we ask for feedback about the survey. This participant provided helpful feedback in all 3 surveys", and, "In every survey, the participant had a strange pattern of answers, for example marking the answer "4" six times in a row, even when one of the questions had content in the opposite direction). Participants in the ambivalence condition were given 3 positive and 3 negative pieces of information, whereas participants in the univalent condition were given 6 positive pieces of information.

Next, participants were randomly assigned to the anticipated regret conditions. Participants in the low anticipated regret condition did not receive any additional information whereas participants in the anticipated regret condition read the following passage:

"Soon you are going to make your judgment regarding the exclusion of participant # 58dd232385b4740301733566.[9] You will also be asked to write a few short sentences about the reasons that led you to this decision. **Your answers will be analyzed** and you will receive feedback on the quality of your decision. You will receive the feedback about two weeks from now. Your answers will be analyzed by 'Prolific' staff. The 20 most reliable judges will take part in a lottery in which they can win $100."

Afterwards, participants answered questionnaires on the research variables, made their decision, were debriefed and compensated.

4.3. Measures

4.3.1. Anticipated regret
We used the same items as in Studies 1 and 2 and adapted them to

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[6] Participants from Prolific Academic were found to be more diverse, naïve, and less dishonest than MTurk participants (Peer, Brandimarte, Samat, & Acquisti, 2017).

[7] Samples obtained from such platforms tend to be more representative than student samples (Buhrmester, Kwang, & Gosling, 2011).

[8] The extremely high scores of these participants on the consistency bias measure could be due to artifacts such as taking a break when they were reading a review that was in the direction of their initial attitude. Hence, although their inclusion would amplify the results in the predicted direction, we chose a conservative approach by omitting them from the analysis.

[9] Participant # 58dd232385b4740301733566 is the participant about whom the participants received the information. Each participant was told that he/she was the only one judging this participant.

the current setting (e.g., "I anticipate feeling regret about my decision"), α = 0.88.

4.3.2. Objective ambivalence, attitude valence, negative affect, subjective ambivalence

The measures mirrored those used in Studies 1 and 2, $\alpha_{\text{negative affect}}$ = 0.91, $\alpha_{\text{subjective ambivalence}}$ = 0.92.

4.3.3. Positive affect

We measured positive affect (Watson et al., 1988) as an additional covariate. Items were rated on 11-point Likert-type scales (0-*not at all*, 10-*completely*), α = 0.90.

4.3.4. Consistency bias

To investigate the influence of ambivalence and regret on consistency we presented participants with more information about the target participant they were evaluating. We presented a list of six review titles. Half of the titles reflected positive reviews (e.g., "Provides good feedback"), and half reflected negative reviews (e.g., "This type of participant is useless to my research"). Participants could choose to read as many titles as they wanted. We calculated consistency bias using the same formula as in Study 2 with response latencies. Response latencies were log-transformed because of their skewness.

Results and discussion

4.3.5. Manipulation checks

Participants in the high objective ambivalence condition reported more objective ambivalence (M = 3.80, SD = 2.38) than participants in the low objective ambivalence condition (M = −1.89, SD = 3.44), $t(242)$ = 15.01, p < .001, d = 1.92. Participants in the high anticipated regret condition reported anticipating more regret (M = 3.50, SD = 2.74) than participants in the low regret condition (M = 2.69, SD = 2.19), $t(242)$ = 2.57, p = .011, d = 0.33. (see Table 3)

An *ANCOVA* indicated significant main effects of the objective ambivalence, F (1239) = 104.17, η_p^2 = 0.30, p < .001, and regret manipulations, $F(1239)$ = 12.03 η_p^2 = 0.05, p < .001, on subjective ambivalence, when controlling for negative affect, respectively. Importantly, the interaction between the experimental manipulations on subjective ambivalence was significant, $F(1239)$ = 4.83, p = .029, η_p^2 = 0.02. Simple effects analysis indicated that this interaction was driven by differences between participants in the regret conditions. Specifically, in the high objective ambivalence condition, participants in the high regret condition (M_{adjusted} = 5.81, SE = 0.31) reported significantly more subjective ambivalence than participants in the low regret condition (M_{adjusted} = 4.22, SE = 0.27), p < 0.001, 95% CI [0.80, 2.38]. In the low objective ambivalence condition there was no

difference in subjective ambivalence between participants in the high and low regret conditions. The same interaction and pattern of simple effects were obtained when controlling for positive affect, $F(1239)$ = 7.08, p = 0.008, η_p^2 = 0.03.

Furthermore, there was a significant interaction of the experimental conditions on consistency bias, $F(1240)$ = 5.15, p = .024, η_p^2 = 0.02. Under high objective ambivalence, participants in the high regret condition were more biased in their information search (M = 0.85, SE = 0.15) than participants in the low regret condition (M = 0.20, SE = 0.14), p = .002, 95% CI[0.25, 1.04]. In the low objective ambivalence condition there was no difference between participants in the high and low regret conditions.

4.4. Mediation analysis

As in Study 2, we conducted a moderated-mediation analysis (Fig. 3). The Regret X Objective ambivalence condition interaction on subjective-attitude ambivalence was significant in the hypothesized direction, b = 1.45, SE = 0.57, $t(240)$ = 2.54, p = .012, 95% CI[0.33, 2.57]. That is, higher levels of regret increased subjective ambivalence more in the high objective ambivalence condition. Moreover, subjective attitude ambivalence mediated the effect of anticipated regret on consistency bias for participants in the high objective attitude ambivalence condition, as indicated by a significant indirect effect, b = 0.40, SE = 0.13, 95% CI[0.18, 0.70], but not for participants in the low objective attitude ambivalence condition, as indicated by a non-significant indirect effect, b = 0.08, SE = 0.07, 95% CI[− 0.06, 0.23]. The direct effect of the regret manipulation on biased information search was not significant, b = 0.13, SE = 0.14, 95% CI[− 0.15, 0.40]. These results replicate the results of Study 2.

In sum, the results provided support for the predictions that anticipating regret amplifies the association between objective and subjective ambivalence, which subsequently leads to biased processing of information. One could argue that the regret manipulation may have impacted other attitude relevant constructs such as accountability and issue involvement, but we feel this alternative explanation is not very likely given that the same pattern of results was obtained in Study 1 and Study 2 using a different regret manipulation.

Thus, Study 3 replicated the results of Studies 1 and 2 by manipulating pre-decisional regret and using a decision-making paradigm investigating the consequences of ambivalence and regret on information processing and behavioral decision-making. Moreover, the pattern of biased information search replicated the pattern found in Study 2. That is, when participants experienced high objective ambivalence and high regret they searched for information congruent with their initial attitude.

Table 3
Descriptive statistics for Study 3.

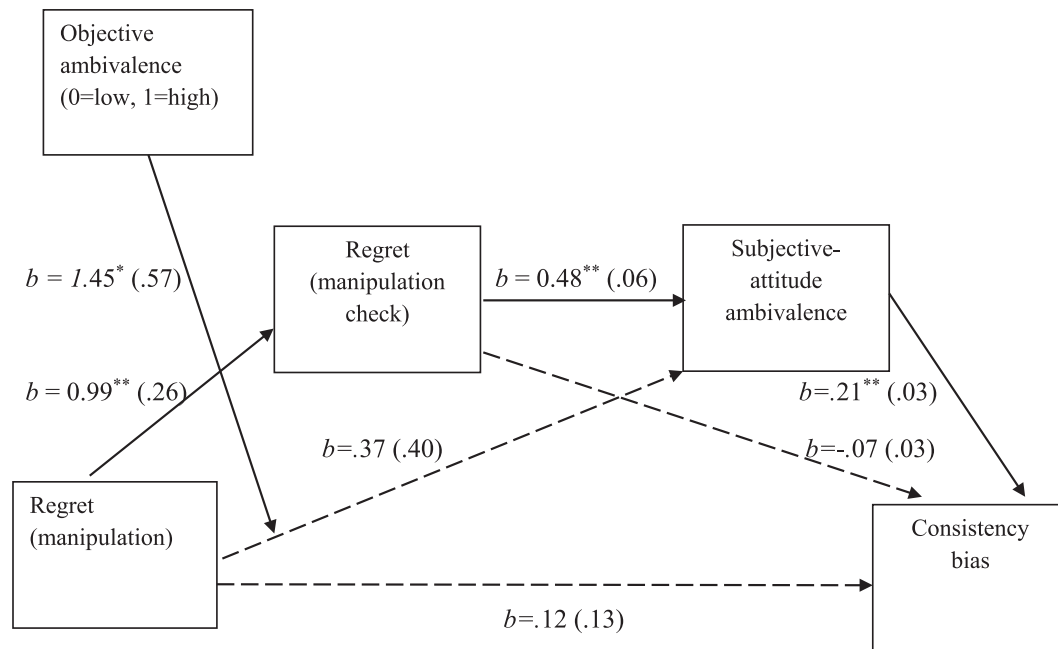|	M	SD	1	2	3	4	5	6	7
Objective ambivalence	0.91	4.11							
Attitude valence	4.61	4.79	**− 0.85**						
Anticipated regret	3.08	2.50	**0.38**	**− 0.33**					
Subjective ambivalence	3.51	2.76	**0.54**	**− 0.50**	**0.53**				
Negative affect	3.13	1.51	**0.26**	**− 0.16**	**0.24**	**0.33**			
Positive affect	5.03	1.88	**− 0.16**	**0.20**	**− 0.16**	**− 0.06**	**0.27-**		
Bias consistency (log)	0.08	0.19	**0.19**	**− 0.25**	**0.13**	**0.43**	0.11	0.03	

Note: Values in **bold** differ from 0 at p < .05.

Fig. 3. Moderated-mediation model of Study 3. Standard errors in parenthesis. $**p < 0.01$, $*p < 0.05$.

5. General discussion

Across three studies, we obtained consistent support for the role of regret in amplifying the association between objective and subjective ambivalence in the context of a dichotomous decision.[10] Moreover, in Studies 2 and 3, subjective ambivalence mediated the effect of anticipated regret on biased information search. The direction of bias was correlated with initial attitude valence.

When objective ambivalence is high, the uncertainty associated with it induces fear that the wrong decision will be made (Van Harreveld et al., 2009). The current study extends these findings by focusing on regret as a specific uncertainty-induced feeling. The more regret is associated with the uncertainty of the choice, the more evaluative conflict the ambivalent attitude holder will experience. This role of regret in the association between objective and subjective ambivalence has been proposed by the MAID model (Van Harreveld, Van der Pligt, et al., 2009) but this study is the first to empirically test and validate it. Moreover, in Studies 2 and 3 we found that the combination of high ambivalence and high regret leads to more biased information search.

Furthermore, our results suggest that the role of regret in the association between objective and subjective ambivalence does not depend on whether it is pre-decisional (Study 3), or post-decisional (Studies 1 and 2). We speculate that the key component governing this effect is the expected *feedback* about the quality of the decision. When feedback about the quality of the decision has not been received, anticipated regret will amplify the association between objective and subjective ambivalence. Thus regret can also be anticipated even after the decision has been made.

One limitation of the current study is that it tested the role of regret within a relatively short time frame. Our study did not examine the duration of the effect of regret on subjective ambivalence. One possibility is that biased information search, as is the case for other dissonance reduction strategies, reduces subsequent anticipated regret and subjective ambivalence, and makes subjective ambivalence more

tolerable in the long term. Future research should test subjective ambivalence after people have had the opportunity to seek additional information, but before any feedback is provided.

It could be claimed that the effect on regret is an artifact because participants had to think about regret. However, there are empirical and theoretical indications that regret can occur naturally in the context of ambivalent decisions. For example, previous work found ambivalent decisions to be associated with arousal and various negative emotions including regret (Van Harreveld et al., 2009). The current study is the first, however, to shed light on the dynamic interplay between ambivalence, regret and the subsequent effects on information processing.

An interesting avenue for future work would be to test the current hypotheses in the context of decision reversibility. Previous theoretical (Gilbert & Ebert, 2002) and empirical (Frey & Rosch, 1984) work has argued that the psychological immune system is only activated after an irreversible decision. Moreover, decision-makers were found to focus solely on satisfaction-inducing aspects of the decision when the decision was irreversible (Bullens, van Harreveld, Förster, & van der Pligt, 2013). Future research could investigate whether ambivalent decision-makers are also more biased in their information search when the decision is irreversible than when it is reversible.

Overall, our study relates research on attitudinal ambivalence to work on decision-making and shows that regret can plays a crucial role in amplifying the association between objective and subjective attitude ambivalence. We found that ambivalence induced regret has downstream consequences for the preference for attitude relevant information. These results highlight the importance of regret in research on attitude ambivalence and decision-making and shed further light on its consequences.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jesp.2017.11.003.

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[10] A Mini Meta-Analysis of the results across the studies is available in the supplementary material.

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