Regret-action effect: Action-inaction asymmetries in inferences drawn from perceived regret

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Abstract

Extending the literature on cognitive effects of action-inaction asymmetries regarding regret, we hypothesized asymmetries in inferences drawn from regret regarding action and inaction. We conducted four experiments with two undergraduate samples from Hong Kong and two American Amazon Mechanical Turk samples (overall N = 1186). We contrasted situations involving either regret or lack of and examined whether these were perceived to be a result of action or inaction. We found consistent evidence for a "regret-action effect", that regret was perceived as more likely a result of taking action than of not acting, compared to no-regret. This regret-action effect held for action-inaction inferences drawn from target's regret for both before and after the target learned of the outcome of the decision. Regret also affected perceived action-inaction norms, with the no-regret situation construed as having weaker action norms (compared to the regret and control conditions).

Keywords: action; inaction; regret; norms; action-effect

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Imagine that a friend was facing a dilemma of whether to change a previous decision or not and is now regretful. Without knowing what the friend decided or the outcome of the decision, what inferences would you make about the situation?

The distinction between action and inaction holds implications for understanding human psyche and behavior (Anderson, 2003). Recent decades have witnessed the emergence of research across multiple domains examining action-inaction related phenomena and demonstrating that the concepts are helpful in predicting individual and social factors (Albarracin, Hepler, & Tannenbaum, 2011; Albarracín, Sunderrajan, Dai, & White, 2019; Prentice & Koehler, 2003; Feldman, Kutscher, & Yay, 2019). Action and inaction received considerable attention in the judgment and decision-making literature (Gilovich & Medvec, 1995), in two main streams of research summarized in the top half of Figure 1. The first examines factors affecting decisions of whether or not to act, such as action-inaction norms. The second examines outcomes of and factors associated with action and inaction, such as perceptions, attributions, and affect.

The present investigation aims to complement these lines of research by looking at the reverse causal chain, suggesting that in ambiguous situations outcomes affect inferences made regarding action versus inaction and their antecedents. The model is summarized in the bottom part of Figure 1. We begin by briefly discussing the existing lines of research in the literature and then proceed to hypothesize regarding the suggested links.

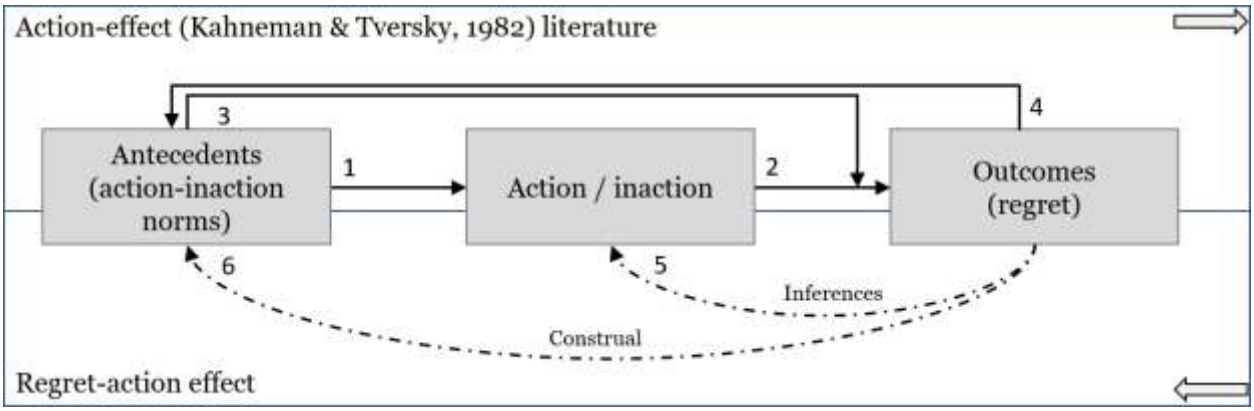

Figure 1. Action-inaction contrast asymmetries in the judgment and decision-making literature, comparing the current literature regarding the action-effect (Kahneman & Tversky, 1982) on the top part with the regret-action effect in the present investigation in the bottom part. Numbers next to arrows are used as references mentioned in the text.

Antecedences and outcomes of action and inaction

Research in judgment and decision-making literature has successfully demonstrated asymmetries in the processing, evaluation, and/or attributions of action versus inaction, resulting in a long list of action-inaction effects (Feldman et al., 2019). Below we highlight some examples of these effects regarding the links outlined in the top half of the model in Figure 1.

Decisions of whether or not to act are affected by antecedents such as perceived action-inaction norms (arrow 1 in the figure), both interpersonal norms (Koonce, Miller, & Winchel, 2015) and intrapersonal norms (McElroy & Dowd, 2007; Seta, McElroy, & Seta, 2001; Zeelenberg, Van den Bos, Van Dijk, & Pieters, 2002). For example, people who routinely refrain from action or live in societies refraining from action are more likely not to act.

Actions and inactions are also interpreted in different ways, leading to different attributions and associated outcomes (arrow 2 in the figure). For example, actions are easier to identify than inactions, as it may be hard to clearly distinguish whether an inaction was a decision not to act, an indecision, or simply neglecting to act (DeScioli, Bruening, & Kurzban, 2011). Therefore, compared to inactions, actions are often perceived as more intentional

(Hayashi, 2015; Yay & Feldman, 2019), causal (Henne, Niemi, Pinillos, De Brigard, & Knobe, 2019; Kordes-de Vaal, 1996), blameworthy (DeScioli, Christner, & Kurzban, 2011), and regrettable (Kahneman & Tversky, 1982).

Antecedents to action and inaction may affect the cognitive processing of action and inaction and the associations between action and inaction and outcomes (arrow 3 in the figure). Exceptions to set norms are cognitively more salient and accessible (Kahneman & Miller, 1986), and deviations from social norms are perceived as more accountable (Kordes-de Vaal, 1996). Therefore, if there are set norms to refrain from action, that would make actions much more salient than inactions. In such a case, actions resulting in negative outcomes would be perceived as more accountable and will likely result in experiencing stronger regret (Feldman, 2019; Feldman & Albarracín, 2017). Norms to prefer action over inaction may result in a weaker and even reserved association between action and regret (Feldman, 2019; Feldman & Albarracín, 2017)

Finally, action-inaction attributions and outcomes may affect antecedents to action-inaction (arrow 4 in the figure). For example, to minimize accountability and regret, people facing risky situations with the possibility of negative outcomes tend to prefer inaction over action (DeScioli, Asao, & Kurzban, 2012; DeScioli, Christner, & Kurzban, 2011; Ritov & Baron, 1990). These, in turn, if sufficiently repeated or observed, would then strengthen perceived inaction norms.

The causal chain from antecedents, to action-inaction, then to outcomes, and finally back to antecedents is fairly well-documented, as well as the action-inaction asymmetries in each of these links.

Given this causal chain, we set out to examine whether people also make asymmetrical inferences about outcomes regarding action-inaction (arrow 5) and antecedents to action-inaction, such as action-inaction norms (arrow 6).

We focused on the well-established causal link from action to regret, and the action-effect (Kahneman & Tversky, 1982) which revealed asymmetries in regret following negative outcomes resulting from action versus inaction. We examined the possibility that given situations involving regret or no regret, people would make asymmetrical inferences regarding whether action or inaction took place. We first introduce the action-effect and then proceed to present the suggested causal link from regret to action, which we termed the "regret-action effect".

Action-effect: Regret over action versus inaction

Regret is one of the most studied emotions in the context of judgment and decision making and the “action-effect” is one of the first classic biases related to emotions. It was first introduced by Kahneman and Tversky (1982) using the following scenario (p. 173):

> Mr. Paul owns shares in company A. During the past year he considered switching to stock in company B, but he decided against it. He now finds out that he would have been better off by $1,200 if he had switched to the stock of company B.
>
> Mr. George owned shares in company B. During the past year he switched to stock in company A. He now finds that he would have been better off by $1,200 if he had kept his stock in company B.
>
> Who feels greater regret?

In response to this scenario, 92% of the 138 participants rated action-George as more likely to experience regret than inaction-Paul, meaning that actions leading to negative outcomes

are regretted more than inactions leading to the same outcomes. Action-effect is considered one of the most widely cited and replicated effects in the regret literature (Gilovich & Medvec, 1995).

Action-effect has mostly been explained using norm theory (Kahneman & Miller, 1986) and decision justification theory (Connolly & Zeelenberg, 2002; Inman & Zeelenberg, 2002): people experience higher regret over abnormal or less justifiable behavior (Kutscher & Feldman, 2019). In risky situations that may result in negative outcomes, inaction is considered more normal and justifiable, which results in action being more regretful when things turn out badly.

Regret-action effect: Inferring action-inaction and norms from regret

Based on the causal chain linking action to regret we sought to examine the reverse causal link and hypothesized a “regret-action effect”, that regret is more likely to be interpreted as resulting from action rather than from inaction. If we follow the norm and justifiability theoretical logic for the action-effect, then regret would signal that something went wrong, and since action is considered more accountable it is therefore more likely that regret would be inferred as being about action. There is some initial work about asymmetries in moral judgments supportive of the reverse causal chain and outlining its importance for the field. For example, compared to good behaviors and outcomes, bad behaviors and outcomes are perceived as more actively "doing" than passively "allowing" (Cushman, Knobe, & Sinnott-Armstrong, 2008) and as freer and more deliberate (Feldman, Wong, & Baumeister, 2016; Phillips & Knobe, 2009). These inferences of the opposite causal chain go beyond the original effects to highlight important features about the distinction between action and inaction and associated cognitive processes and sense-making regarding counterfactual thinking and regret (Byrne, 2016).

Going further back in the causal chain, regret may also affect perceived action-inaction norms. Norm theory (Kahneman & Miller, 1986) theorized that norms are inferred, changeable, and context-specific, rather than the prior common view of norms as being fixed and clear, arguing that norms are often calculated posthoc based on limited available information. For example, the mere possibility of negative outcomes may shift perceptions of norms toward inaction (Feldman & Albarracín, 2017), since taking action is associated with more responsibility and higher accountability (omission bias; Ritov & Baron, 1990).

How may regret affect general perceptions of norms? Research by Zeelenberg et al. (2002) argued that social expectations for taking action reverse the action-effect. To demonstrate that, their experimental designs manipulated loss prior to the decision under the assumption that a prior loss sets expectations for taking action meant to motivate correcting whatever the cause leading to the loss. Recent research on escalation of commitment dilemmas (Feldman & Wong, 2018) provided further support, showing that in decisions regarding whether or not to continue investing receiving negative feedback led to stronger action-orientation. Since regret signals negative outcomes or that something went wrong, we expected that regret would trigger perceiving stronger action norms.

The present investigation

We set out to examine inferences drawn regarding action and inaction from situations involving regret or lack of. In four experiments we tested the impact of a target's regret on inferences regarding action-inaction and perceived norms. We pre-registered hypotheses that in situations where decisions or outcomes are ambiguous or unknown (to both the target and the observer), regret is more likely be interpreted to be a result of action, compared to no-regret.

To supplement the theoretical model provided in Figure 1 regarding the positioning of the regret-action effect in regards to existing literature, we also summarize a comparison of the key differences between the regret-action effect and the action-effect in Table 1.

Table 1

Comparison of the action-effect and the regret-action effect

	Action-effect (Kahneman & Tversky, 1982)	Regret-action effect
Independent variable	A decision between action and inaction	Experiences of regret
Dependent variable	Feelings of regret	1 - Inferred action versus inaction 2 - Inferred action-inaction norms
Behavior	Clear and defined	Ambiguous or unknown to observers
Emotion / regret	Experienced	Expressed
Are outcomes known to the target?	Yes	Not necessarily, the effect occurs even when the target has yet to learn of the outcome
Outcomes	Effect mainly for negative outcomes. Weak to no effects for positive outcomes (e.g., Bostyn & Roets, 2016; Feldman, 2019)	Outcomes are unknown or ambiguous and therefore less relevant. Both before and after outcomes, regardless of outcome valence.
Norms	Perceived norms for negative outcomes are for inaction (Kahneman & Miller, 1986; Feldman & Albarracín, 2017)	Perceived norms are inferred. Negative outcomes (regret) seem to trigger action orientation (Feldman & Wong, 2018; Zeelenberg et al., 2002)
Temporal direction	Prospective - future If one acts/does not act, then...	Reflective - past Given this situation, inferring what took place.
Context	Both intrapersonal and interpersonal	Interpersonal, inferences not relevant for self

Note. "Outcomes known" refers to whether outcomes resulting from the decision were known to the target decision-makers, not observers/raters. Outcomes here refer to whether the decision led to a positive or negative outcome, and not to regret. Observers/raters do not need to know what actual outcomes were for regret-action effect to occur, as inferences depend solely on regret.

The supplementary includes pre-registrations, power analyses, disclosures, and full materials, and these with data and code were made available on the Open Science Framework (OSF; review link: https://osf.io/du9ws/?view_only=8d59f402aa45437c87cc3f264d87156e).

Experiment 1

Pre-registration and plan

We pre-registered the experiment on the Open Science Framework and data collection was launched the following day. Based on Feldman and Albarracín (2017) $d \sim .56$ for the action-regret relationship, we estimated a required sample of 70 per condition (power = 0.95; $\alpha = .05$; one-tail).

Method

A total of 231 undergraduates from Hong Kong participated in return for course credit (M_{age} = 18.71, SD_{age} = .87; 139 females). Of the sample, 31 participants failed the manipulation-check question, leaving a sample of 200 participants following a pre-registered exclusion (M_{age} = 18.71, SD_{age} = .88; 125 females). The exclusions had little effect on the results (full sample results reported in the supplementary).

Participants were presented with the following scenario with two between-subject conditions manipulating whether the student regretted his decision or not:

> "John […] was taking an important multiple-choice exam. At the end of the exam John checked his answers and […] was considering changing his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

> John finally made a decision between switching or not-switching, but we do not know what decision he made.
>
> All we know is that after submitting the exam and before knowing the results John is now feeling [regretful/no regrets] about his decision."

The scenario was followed by a manipulation-check comprehension question. Participants were then asked to rate **action-inaction inferences** for the student's decision ("Which of the two options did John finally choose?"; "John decided [1 – *Not change* / 2 – *Change*] his answer") and the **perceived behavioral norms** ("Which of the two options do you think most people would choose in this situation?"; 1 – *Not change*, 2 – *Change*).

Results

Counts, percentages, and chi-square test results for action versus inaction options across conditions are detailed in Table 2.

Table 2

Experiment 1: Counts, percentages, and chi-square test results for action versus inaction options across conditions

Decision	**Action Decision**	**Inaction Decision**	**N**	**Action Decision**	**Inaction Decision**	**χ2**	***d***
Regret	78	19	97	80%	20%	18.54	0.64
No regret	53	50	103	51%	49%	$p < .001$	
Behavioral norms	**Action norms**	**Inaction norms**	**N**	**Action norms**	**Inaction norms**	**χ2**	***d***
Regret	79	18	97	81%	19%	4.78	0.31
No regret	70	33	103	68%	32%	$p = .029$	

Note: The left two action-inaction columns are counts; the right two action-inaction columns are percentages. *d* indicates a converted Cohen's *d* from the chi-square score.

We found support for differences in action-inaction inferences (d = .64). In the regret condition, 80% of the participants rated that John changed his answer, compared to 52% of the participants in the no-regret condition. Meaning, that whether John expressed regret or not affected behavior attributed to John, such that regretted decisions were associated with more action compared to decisions with no regret.

We also found support for differences in perceptions of behavioral norms in this situation (d = .31). In the regret condition, 81% rated the behavioral norms as action, compared to 68% in the no-regret condition. Meaning, that observing John's regret or lack of also affected perceived norms of what people likely do in that situation in general. The situation was associated with stronger action-oriented norms when observing regret person, compared to a situation where the person showed no regret.

The findings supported our pre-registered hypotheses.

Experiment 2

We extended the experimental design from Experiment 1 in several ways. First, we added a control condition to determine the effect for both regret and no-regret over not referring to regret. Second, we explored both regret over decisions (prior to the target learning of the outcomes; as in Experiment 1) and regret over outcomes (after the target learned of the result, although outcomes are not known to the observer/rater). Finally, we adjusted the dichotomous choice in Experiment 1 to a scale to try and gain a more accurate assessment of the effect size. We expected the same outcome as the pre-registered hypotheses and findings in Experiment 1 and made no predictions for the decision-outcome manipulation. There was therefore no separate pre-registration for Experiment 2, and the extensions from Experiment 1 were exploratory.

Procedure and power analysis

Based on d = .64 found in Experiment 1, we estimated a required sample of 31 per condition (G*Power; power = 0.80; α = .05; one-tail).

Method

A total of 312 participants were recruited online using Amazon Mechanical Turk (M_{age} = 37.36, SD_{age} = 13.30; 183 females). As in Experiment 1, participants were presented with the student scenario. Extending Experiment 1, in this experiment there were six conditions in a 3 x 2 between-subject design manipulating two factors: (1) whether the student expressed regret (regret, no-regret, control), and (2) whether the student knew the results or not (before versus after results). The control condition offered no information regarding the student's emotions.

The scenario was followed by two manipulation-check comprehension questions. Consistent with our pre-registration, we reported results using the full sample here. Results with the sample that excluded the 45 participants who failed the manipulation check are reported in the supplementary. Participants were then asked to rate **action-inaction inferences** and the **perceived behavioral norms** using the items in Experiment 1 on a six-item scale (0 = *Definitely not change;* 5 = *Definitely change*).

Results

Means and standard deviations are detailed in Table 3. Contrasts between regret conditions are detailed in Table 4, and contrasts between the after and before conditions are detailed in Table 5, reporting mean differences, confidence intervals, and Cohen *d* effect sizes.

Replicating the findings from Experiment 1, we found significant differences in action-inaction inferences and perceived action norms between the regret and no-regret conditions

(decision: d = .98; norms: d = .44). Compared to no-regret, regret was perceived as more likely resulting from action, and with stronger perceived norms for action.

Table 3

Experiment 2: Means, standard deviation, of all conditions

		Action-inaction attributions		Norm perceptions	
	N	*M*	*SD*	*M*	*SD*
Before-Regret	53	2.79	1.26	2.62	1.10
Before-No regret	54	1.57	1.25	2.11	1.22
Before-Control	51	2.27	1.00	2.57	1.27
After-Regret	55	3.35	1.24	2.65	1.24
After-No regret	49	1.94	1.14	2.00	1.15
After-Control	50	2.48	1.20	2.38	1.14

Note. Action inaction attributions: 0 = Inaction; 5 = Action. Action-inaction norm perceptions: 0 = Inaction; 5 = Action. Before = prior to the target learning of the outcomes, After = after the target learned of the result, but outcomes not known to the observer.

Table 4

Experiment 2: Contrasts between the regret conditions

		Regret-No regret		Regret-Control		No regret-Control	
		Diff	*d*	*Diff*	*d*	*Diff*	*d*
Before	Action-inaction	1.22*** [.77, 1.67]	0.97	.52* [.06, .98]	0.46	-.70** [-.16, -.24]	-0.62
	Norms	.51* [.06, .96]	0.44	.05 [-.40, .51]	0.05	-.46* [-.91, .00]	-0.37
After	Action-inaction	1.41*** [.95, 1.87]	1.18	.87*** [.41, 1.32]	0.71	-.54* [-1.01, -.07]	-0.46
	Norms	.65** [.19, 1.11]	0.55	.27 [-.18, .73]	0.23	-.38 [-.85, .09]	-0.33

Note. ŧ p < .10, * p < .05, ** p <.01, *** p < .001. Brackets detail 95% confident intervals. Before = prior to the target learning of the outcomes, After = after the target learned of the outcome, but outcomes not known to the observer.

Table 5

Experiment 2: Contrasts between the before and after (outcome is known) conditions

	Regret		No regret		Control	
	Diff	*d*	*Diff*	*d*	*Diff*	*d*
Action-inaction	.55* [.10, 1.00]	0.44	.36 [-.10, .83]	0.31	.21 [-.26, .67]	0.19
Norms	.03 [-.42, .48]	0.03	-.11 [-.57, .35]	-0.09	-.19 [-.65, .28]	-0.16

Note. Numbers in the cells are comparisons between the before conditions (prior to the target learning of the outcomes) and after conditions (after the target learned of the outcome). * $p < .05$. Brackets detail 95% confidence intervals.

Extending Experiment 1, we included a control condition that made no reference to regret. For action-inaction inferences, we found support for differences between the regret and the control conditions ($d = 0.46$) and between the no-regret and the control conditions ($d = -0.62$). Meaning, that compared to a neutral situation, regret was interpreted as more likely to be a result of action, whereas no-regret was interpreted as less likely to be a result of action. There were also differences in perceived norms with weaker effects (no regret vs. control: $d = -0.37$; regret vs. control: $d = 0.05$).

A second extension to Experiment 1 was adding conditions assessing action-inaction inferences for regret or no-regret after the outcome was revealed ("after"), rather than the assessment of inferences for before the outcome is revealed ("before") in Experiment 1. In the after conditions we also found support for differences between the regret and the control conditions ($d = 0.71$) and between the no-regret and the control conditions ($d = -0.46$). The differences between the before and after conditions were weak to medium effects ($0.19 < |d| < 0.44$). Comparing the before and after conditions regarding differences in perceived norms, we found weak non-significant differences ($|d| < 0.16$). In summary, results for the after-conditions

replicated the effects found in the before conditions detailed above, and regret over an outcome (after) was even more strongly associated with action than regret over a decision (before outcomes are revealed).

Experiment 3

Pre-registration and plan

We aimed to replicate the findings from Experiments 1 and 2 by contrasting between regret and no-regret in a second scenario to more closely mirror the experimental designs in classic action-effect discussed in the introduction. We pre-registered the experiment on the Open Science Framework and data collection was launched later that day.

We note that we also collected two conditions in which the outcome was known and was either positive or negative, rather than ambiguous. These conditions did not significantly differ from the ambiguous condition. In order to keep reporting concise and focused on the main effect, descriptives and statistics reporting for these two conditions were moved to the supplementary.

Method

A total of 205 participants were recruited online using Amazon Mechanical Turk (M_{age} = 37.24, SD_{age} = 12.06; 214 females).

We adapted the classic action-effect scenario by Kahneman and Tversky (1982) described in the introduction. To meet our hypotheses, we changed the scenario to contrast regret and no-regret and asked participants about action and inaction inferences.

Participants read the following scenario in two between-subject conditions manipulating whether the regret was experienced before or after learning of the outcome:

> "Paul and George are stock traders. They work for different trading companies and they do not know each other.

> Paul and George initially made the decision to invest in stock portfolio A. During the past year Paul and George were considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.
>
> Paul and George finally made a decision between switching and not-switching, one of them decided to switch and the other decided not to switch, but we don't know who decided which.
>
> [Before condition: Paul and George do not know the outcome of their investment decision, but their decisions can no longer be changed.
>
> After condition: They have now both reviewed the stock performance reports and know the outcome of their decisions.]
>
> Compared to Paul, George is now feeling much stronger regret about his decision regarding whether to switch or not."

The scenario was followed by forced comprehension questions which participants had to answer correctly to proceed. Finally, participants were asked to rate **action-inaction inferences** ("Who probably made the decision to switch investments?"; 1 – *Paul (the less regretful)*, 2 – *George (the more regretful)*) and the **perceived behavioral norms** ("which is generally more common for stock traders facing this dilemma?"; 1 – *Not switch*, 2 – *Switch*).

Results

Counts, percentages, and chi-square test results for the outcome conditions are detailed in Table 6.

In typical action-effect scenarios with a dichotomous choice contrasting two options, the bias is measured using deviation from a random 50%-50% choice. We conducted chi-square analyses and found that across conditions, participants rated the regretful decision-maker as more likely to have been the one to have taken action (before condition: 75%; after condition: 77%). Participants generally perceived stronger action norms (before: 56%; after: 67%), with a similar effect across the before-after outcome conditions (before: $\chi2 = 1.41$, $p = .235$; after: $\chi2 = 11.89$, $p = .001$; comparison: $\chi2 = 2.67$, $p = .102$, $d = .23$).

Table 6

Experiment 3: Counts, percentages, and chi-square test results for action versus inaction options across conditions

Decision	**Regret is action**	**Regret is inaction**	**N**	**Regret is action**	**Regret is inaction**	**50-50 χ2**	***p***	***d***
Before learning the outcome	77	25	102	75%	25%	26.51	<.001	
After learning the outcome	79	24	103	77%	23%	29.37	<.001	
Difference						.04	.839	.03
Behavioral norms	**Action norms**	**Inaction norms**	**N**	**Action norms**	**Inaction norms**	**50-50 χ2**	***p***	***d***
Before learning the outcome	57	45	102	56%	44%	1.41	.235	
After learning the outcome	69	34	103	67%	33%	11.89	.001	
Difference						2.67	.102	.23

Note. 50-50 $\chi2$ = chi-square test comparing the action-inaction attributions to a 50-50 random choice. *d* indicates a converted Cohen's *d* from the chi-square score.

Experiment 4

Pre-registration and plan

The design aimed to replicate the findings from Experiment 3 using a similar action-effect (Kahneman & Tversky, 1982) type scenario. Instead of contrasting regret and no-regret felt by two decision makers in a single scenario, we separated regret versus no-regret to two different

conditions in a between-subject design. We also aimed to replicate Experiment 3 using a different sample.

We pre-registered the experiment on the Open Science Framework and data collection was launched later that week.

Method

A total of 274 undergraduates from Hong Kong participated in return for course credit (M_{age} = 18.93, SD_{age} = 1.22; 163 females). We adapted the classic action-effect scenario by Kahneman and Tversky (1982) in Experiment 3 to a 2 x 2 between-subject design, manipulating regret (versus no-regret) and whether the observed decision-maker knew the outcome:

> John is a stock trader. John initially made the decision to invest in stock portfolio A.
>
> During the past year John was considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.
>
> John finally made a decision between switching and not-switching, but we don't know what he decided.
>
> [Before-outcome conditions: John still does not know the outcome of his investment decision, but his decision can no longer be changed.
>
> After-outcome conditions: John has now reviewed the stock performance reports and knows the outcome of his decision.]
>
> [No-regret conditions: All we know about John's decision is that John is now feeling no regret about his decision regarding whether to switch or not.

Regret conditions: All we know about John's decision is that John is now feeling regret about his decision regarding whether to switch or not.]

The scenario was followed by two forced comprehension questions which participants had to answer correctly before proceeding. Finally, participants were asked to rate **action-inaction inferences** ("In your opinion, based only on the information provided, what did John decide to do?"; 1 – *Not switch*, 2 – *Switch*) and the **perceived behavioral norms** ("which is generally more common for stock traders facing this dilemma?"; 1 – *Not switch*, 2 – *Switch*).

Results

Counts, percentages, and chi-square test results are detailed in Table 7.

We conducted chi-square analyses and found support for a main-effect for action-inaction inferences from regret. Replicating findings in Experiments 1 to 3, participants evaluating a regretful person were more likely to infer action (64%) than those evaluating a person who showed no-regret (51%) ($\chi 2 = 4.31$, $p = .038$, $d = .25$). There was no support for a main-effect for the difference between the before-outcome condition and the after-outcome condition for action-inaction attributions ($\chi 2 = .37$, $p = .541$, $d = .07$).

Table 7

Experiment 4: Counts, percentages, and chi-square test results for action versus inaction options across conditions

Decision	**Action Decision**	**Inaction Decision**	**N**	**Action Decision**	**Inaction Decision**	**χ2**	***d***
Regret	87	50	137	64%	36%	4.31	.25
No regret	70	67	137	51%	49%	$p = .038$	
Before	76	61	137	55%	45%	.37	.07
After	81	56	137	59%	41%	$p = .541$	
Behavioral norms	**Action norms**	**Inaction norms**	**N**	**Action norms**	**Inaction norms**	**χ2**	***d***
Regret	84	53	137	61%	39%	3.33	.22
No regret	69	68	137	50%	50%	$p = .068$	
Before	73	64	137	53%	47%	.73	.10
After	80	57	137	58%	42%	$p = .394$	

Note: The left two action-inaction columns are counts; the right two action-inaction columns are percentages. *d* indicates a converted Cohen's *d* from the chi-square score.

Regarding perceived norms, similar to previous experiments, we found support for a main-effect of regret. Participants evaluating a person expressing regret rated higher action norms (61%) than those evaluating a person who showed no-regret (50%) ($\chi2 = 3.33$, $p = .068$, $d = .22$). Again, there was no support for a main-effect contrasting before-outcome and after-outcome conditions ($\chi2 = .73$, $p = .394$, $d = .10$).

General discussion

Four experiments demonstrated a regret-action effect, that in ambiguous situations regret (versus no regret) is more likely to be interpreted as being a result of action rather than inaction. Moreover, situations involving no regret were associated with weaker perceived social norms for taking action than situations with regret. A summary of the experiments and findings is provided in Table 8.

Table 8

Summary of experiments and main findings

#	N	Sample	Scenario	IVs	DV measures	Effect action	Effect norms	Effect outcome	Contribution
1	200	Hong Kong undergraduates	Student-exam	Regret (2)	Dichotomous	.64	.31	N/A	Baseline effect
2	312	American MTurk workers	Student-exam	1) Regret (3) 2) Before vs. after (2)	Scale	Before: .98 After: 1.19	Before: .44 After: .55	.45	1) Replication w/ different sample 2) Added a control condition 3) Before-after outcomes 4) Scale (0=inaction; 5=action)
3	400	American MTurk workers	Investment action-effect	1) Regret contrast (1) 2) Before vs. after (2)	Dichotomous	Before: 1.18 After: 1.26	Before: .23 After: .72	.02	1) Adjusted classic action-effect scenario 2) Contrasting regret vs. no-regret
4	274	Hong Kong undergraduates	Investment action-effect	1) Regret (2) 2) Before vs. after (2)	Dichotomous	.25	.22	.07	Between-subject design

Note: [a] value indicates the percentage of people who perceived higher regret for action than for inaction; *** $p < .001$; ** $p < 0.01$; * $p < 0.05$. In Experiment 1, 3, and 4 effect size *d* is calculated as contrasts, and converted from chi-square values in experiments with dichotomous DV. Before = before learning of the results, After = after learning of the results.

In Experiment 1, we found that a higher percentage of participants rated regret as action (rather than inaction) compared to participants rating no-regret. In Experiment 2, we replicated and extended these findings and showed that regret was rated as higher likelihood for action and no-regret are rated as lower likelihood for action compared to the control condition. In Experiment 3, we again replicated the regret-action effect using a different scenario, closer in content and structure to Kahneman and Tversky (1982) action-effect design, that contrasted regret and no-regret in a single scenario. Experiment 4 provided a second replication of the second scenario with a between-subject manipulation of regret and no-regret.

The findings are robust. We varied the scenarios (student-exam, investment), action measurement (dichotomous, scale), regret measurement (manipulation, contrast, within versus between designs), and sample population (American MTurk, and Hong Kong undergraduates) (see Table 8 for a summary). Although the small number of studies prevents us from drawing any definite conclusions, the differences in effect-size in the experiments' findings may suggest possible moderators. For example, Experiments 1 and 4 were conducted with undergraduate samples from Hong Kong and Experiments 2 and 3 were conducted with American samples on MTurk of a wider age range. The effects were consistent across the experiments yet were much stronger in Experiments 2 and 3, which could possibly point out to some cultural or demographic moderators of the effect. Also, the use of continuous scale measures may have contributed to stronger observed effects in Experiment 2 compared to simple dichotomous choice used in the other experiments.

Implications and future directions

Regret-action effect builds upon and extends judgment and decision-making literature on action and inaction. We focused our demonstration on regret, with previous literature on the

action-effect (Kahneman & Tversky, 1982) and norm-theory (Kahneman & Miller, 1986) demonstrating the causal link from norms to action to regret. Our findings show that not only is regret affected by whether they originated from action or inaction but also that regret affects inferences made regarding whether the situation originated from action and inaction (see Figure 1 for the model, and Table 1 for comparison of action-effect and regret-action effect). Action-effect has been shown to hold for both feelings of self and others, yet regret-action effect is mainly about inferences regarding action-inaction given regret or lack of in others.

Feelings aid sense-making, and serve an important role in the interpretation of ambiguous situations and in deciding how to respond. Regret serves as a signal that outcomes deviated from expectations or were negative (Zeelenberg, Van Dijk, Manstead, & vanr de Pligt, 2000), and the regret-action effect extends that further to suggest regret cues affect inferences regarding the sort of behavior, in terms of action and inaction, that led to the unfortunate outcome..

Regret and counterfactual thinking are functional sense-making mechanisms that allow for change and learning for the self (Epstude & Roese, 2008; Roese, 1994, 1997), but expressions of regret also signal meaning to others, and there are heuristics in the way regret is understood and interpreted (van Doorn, van Kleef, & van der Pligt, 2015). People observe others' emotional cues and use that information to make sense of a situation and then choose how to react (Keltner & Haidt, 1999). Some regrets elicit more sympathy than others or trigger different reactions (van Kleef, De Dreu, & Manstead, 2006), and these may rely upon the interpretation of the perceived behavior leading to the resulting regret (Martinez, Zeelenberg, & Rijsman, 2011). Therefore, current emotion theories can be extended to a social context to also refer to the role regret and other expressions of negative emotions play in interactions between persons, as suggested by the emotions-as-social-information theory (van Kleef, 2009).

In this investigation we focused on regret, a generally negative emotion, and an interesting related question is regarding possible asymmetries over positive emotions of joy. So far, studies on action-inaction effects comparing regret and joy had mixed results (e.g, Landman, 1987; van Dijk & van der Pligt, 1997). Our interpretation of recent findings is that the effects of action-inaction asymmetries for positive emotions are much weaker (e.g., Bostyn & Roets, 2016; Feldman, 2019), yet it is possible that inferences from positive emotions would show stronger effects since they convey important social information (Fredrickson, 1998).

Quite possibly, similar action-inaction asymmetry effects may be found regarding other outcomes. Given the typical dependent variables in the action-inaction judgment and decision-making literature, the likely suspects for similar effects for asymmetrical action-inaction inferences are outcome factors such as valence, responsibility, blame, intent, morality, and freedom of choice.

Are actions or inactions the common norm? The judgment and decision-making literature generally follows the assumptions stated in norm theory (Kahneman & Miller, 1986) that inaction is the norm, whereas the literature on action-inaction attitudes and values and the action-inaction cross-cultural research seems to suggest that the world is very action-orientated (Ireland, Hepler, Li, & Albarracín, 2015; Levine & Norenzayan, 1999; Zell et al., 2013). Several possible explanations have been offered to explain the contradictory findings, related to term use (Feldman et al., 2019) and as reflecting a cognitive bias towards inaction due to the possibility of negative outcomes (Feldman, 2019; Feldman & Albarracín, 2017). Previous findings regarding negative outcomes triggering action-orientation (e.g., Feldman & Wong, 2018) led to our pre-registered hypotheses and findings that the perceived norms in this scenario would be to take

action and switch. Still, action-inaction norms and possible biases resulting from the presentation of outcomes should be explored, to address and resolve the mixed findings.

Our references to the terms action and inaction were according to the use and conceptualization in the action-effect literature following Kahneman and Tversky (1982). We note, however, that the experimental designs confound action and inaction with switching or not switching, since there is a stated status quo. In Experiments 1 and 2, the student made an initial decision on a certain answer and so taking action means switching to a different answer whereas inaction means sticking to the previously chosen answer. In Experiments 3 and 4, mirroring the original design in Kahneman and Tversky (1982) the investment has already been made, and the decision to take action involves switching to a different investment. This confound may affect interpretation. For example, it is possible that people infer that the stated status quo or decision made was not randomly assigned but was made for a good reason, and that the previous status or decision was due to some prior assessment of those having higher chances for success. Therefore, taking action and switching away from that decision may be perceived as decreasing chances for success, thereby resulting in higher regret if outcome was negative. Future research should aim to address these and other confounds in action-inaction literature (see, for example, an attempt by Feldman et al., 2019).

Our experiments are a first step in examining asymmetries in action-inaction inferences, and we therefore aimed for the most abstract demonstration of the effect using simplified vignettes. This draws on the tradition in the judgment and decision-making literature in which the base-line effects are first demonstrated using simple scenarios and then later tested and replicated in more complex and real-life settings. There is ample evidence to suggest that findings in judgment and decision-making vignettes are generalizable to more complex and real-

life decisions (see discussion regarding regret findings in Zeelenberg et al., 2002). We consider this a first step in establishing the effects so that future research could build on these findings and test the generalizability of the effect to real-life situations.

Finally, we outline suggestive practical implications for these findings. Emotions of others also serve as important cues, and expressed emotions provide observers with information (van Kleef, 2009; van Kleef, De Dreu, & Manstead, 2010) and impact subsequent reactions (e.g., Martinez et al., 2011; van Kleef et al., 2006). We so far know relatively little about the way people infer information about others' regret in ambiguous situations and the possible associated asymmetries in interpreting such information. Such asymmetries could prove important in situations where observers need to evaluate or judge how someone acted and use that information to make a decision. For example, members of a jury may rely on regret cues by a defendant to form their opinion on what the defendant did or did not do to assess blame and punishment, and decision-makers in negotiation or business situations may use emotional cues to determine counterparts' behavior and the context, to then form strategies on whether to cooperate or compete.

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Regret-action effect: Supplementary materials

Contents

Opening statement – data and code sharing + replications

We fully support the open-science movement. Therefore, pre-registrations, experimental materials, power analyses, open-science disclosures are reported in a comprehensive supplementary, with data and code made available for reviewers and readers on the Open Science Framework (OSF; https://osf.io/du9ws/?view_only=8d59f402aa45437c87cc3f264d87156e).

We believe (pre-registered) replications are important and therefore conducted three such replications of the baseline effect in Experiment 1, with minor extensions and contributions offered with each new experiment. This was meant to address recent developments in psychological science following the so-called "replication crisis" (Open Science Collaboration, 2015) and recent editorials (e.g., Lindsay, 2015; Vazire, 2016) calling for emphasizing replicability. The effect was robust across two different scenarios, two different samples from different parts of the world (Hong Kong and USA), and different designs (contrasts versus between-subject comparisons and dichotomous versus scale).

Power analyses

Experiment 1

In our related research projects with four experiments about the action-effect (action-inaction affecting regret, the reverse causal chain) we consistently found an effect of 1.14 > *d* > .56, which we used as proxy. To establish the base-line effect we aimed for 0.95 power. Using G*Power 3.1.9.2 and settings of 0.95 power, alpha = .05 and d = .56 we calculated a required sample of N = 70 per cell for one-tail (preregistered directional hypothesis, N=84 for two-tail). We aimed at 100 participants per cell.

We found an effect size of *d* = .64.

Experiment 2

The effect found in Experiment 1 was a converted Cohen's *d* of .64. Using G*Power 3.1.9.2 and settings of 0.8 power and alpha of .05 we calculated a required sample of N = 31 per cell for one-tail (preregistered directional hypothesis, N=40 for two-tail). We aimed at 50 participants per cell.

We found an effect size of *d* = 1.02 – 1.22.

Experiments 3-4

The regret-action effect was medium to very strong in Experiments 1 and 2, and we therefore aimed to try and detect the weaker before-after outcome manipulation differences.

The outcome manipulation in Experiment #2 resulted in an average effect of Cohen's d = .37. Using GPower 3.1.9.2 (one tail, alpha .05 power .80), we calculated sample of 92 participants per condition.

Figures

We summarized the effects reported in the manuscript in figures to aid readers in interpreting the results.

Experiment 1

Figure 1. Experiment 1 action-inaction attributions (first plot), perceived action-inaction norms (second plot), and the regret-norm interaction (third plot). Scores indicate the percent of participants who chose that answer on dichotomous choice between action and inaction. Error bars indicate standard error.

Experiment 2

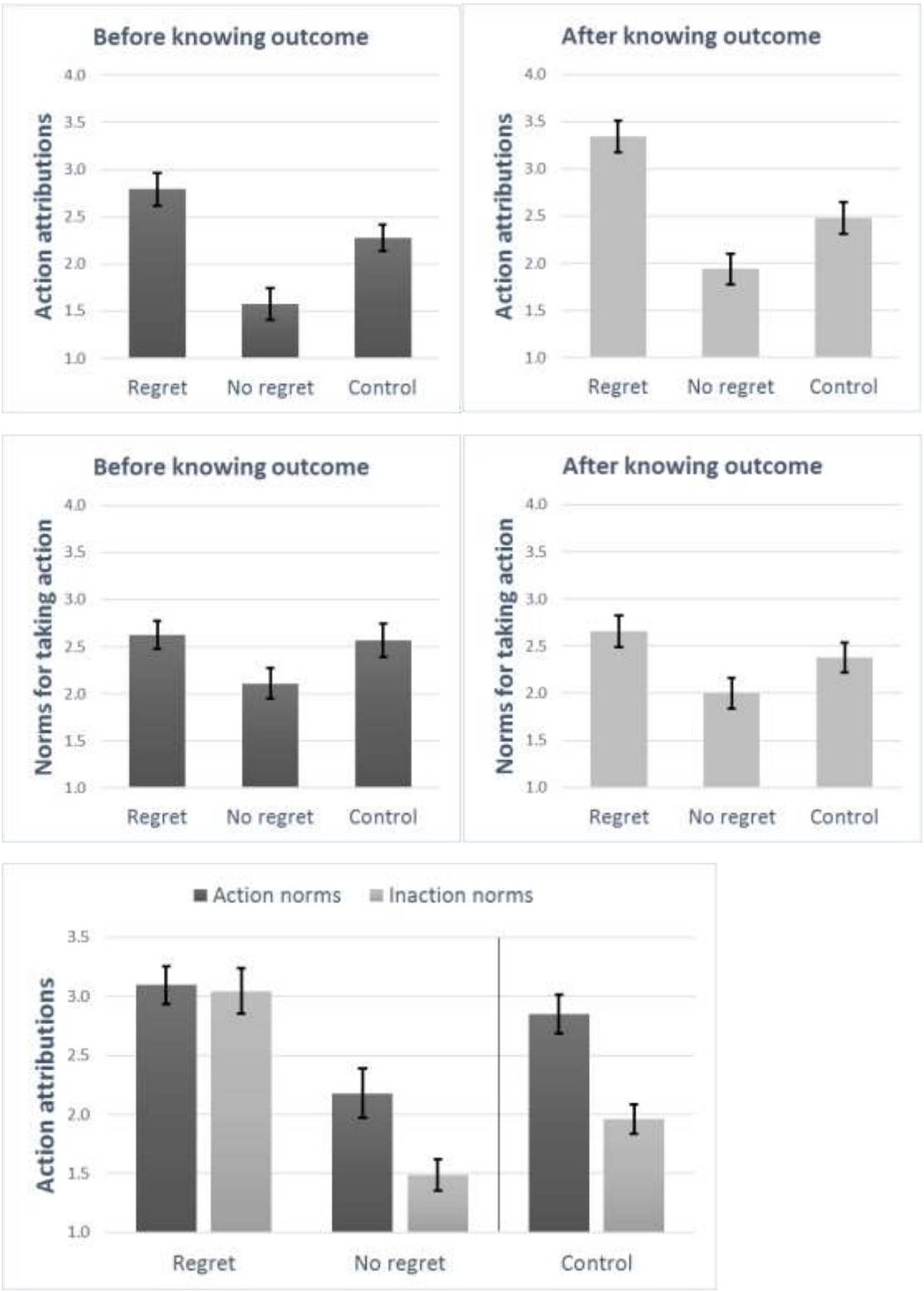

Figure 2. Experiment 2 action-inaction attributions (first row), perceived action-inaction norms (second row), and the regret-norm interaction (third row). Higher scores indicate higher attributions of action over inaction. The interaction plot combines data of the before-after conditions with norms split using median (2.00) on a 0-5 norms scale, to mirror the reporting contrasts in Experiment 1 and Figure 1. Error bars indicate standard error.

Experiment 3

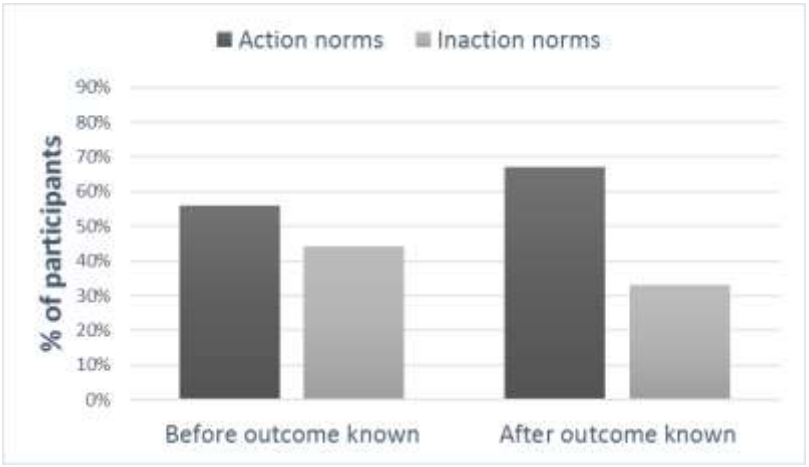

Figure 3. Experiment 3 plots of the action-inaction attributions (first plot), perceived action-inaction norms (second plot), and the regret-norm interaction (third plot). On all plots, scores indicate the percent of participants who chose that answer on dichotomous choice between action and inaction. Error bars indicate standard error.

Experiment 4

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Figure 4. Experiment 4 plots of the action-inaction attributions (first plot), perceived action-inaction norms (second plot), and the regret-norm interaction for the whole sample (third plot). On all plots, scores indicate the percent of participants who chose that answer on dichotomous choice between action and inaction. Error bars indicate standard error.

Materials used in the experiments

Experiment 1

Regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made. All we know is that after submitting the exam and before knowing the results John is now feeling regretful about his decision.

No regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made. All we know is that after submitting the exam and before knowing the results John is now feeling no regrets about his decision.

Manipulation check

Regret: After submitting the exam, how does John feel about his decision whether to change his first answer or not

1. Regret (1)
2. No regret (2)
3. We don't know (3)

Attributions

Action attributions

In your opinion, based only on the information provided, which of the two options did John finally choose?

1. John decided not to change his answer (1)
2. John decided to change his answer (2)

Norm attributions

In your opinion, based only on the information provided, which of the two options do you think most people would choose in this situation?

1. Not change the answer (1)
2. Change the answer (2)

Experiment 2

Conditions

Before-Regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that after submitting the exam and before knowing the results John is now feeling regretful.

Before-No-regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that after submitting the exam and before knowing the results John is now feeling no regrets about his decision.

Before-Control condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that John still does not know the results of the exam.

After-Regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that after seeing the test results John is now feeling regretful.

After-No-regret condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that after seeing the test results John is now feeling no-regrets about his decision.

After-Control condition

John is a student, and not too long ago he was taking an important multiple-choice exam. At the end of the exam John checked his answers and on one question that was worth many points he was considering whether to change his choice to a different answer. John needed to make a decision whether to keep his first choice and not change his answer, or to change his choice and switch to a different option.

John finally made a decision between switching or not-switching, but we don't know what decision he made.

All we know is that John received and reviewed the results of his exam.

Manipulation checks

Regret: After submitting the exam, how does John feel about his decision whether to change his first answer or not

1. Regret
2. No regret
3. We don't know

Before-after: Based on what you read in the scenario - Does John know the outcome of the test results?

1. John does not yet know the results
2. John knows the results

Attributions

Action attributions

In your opinion, based only on the information provided, which of the two options did John finally choose?

0 = *John definitely decided NOT to change his answer;* 5 = *John definitely decided to change his answer*

Norm attributions

In your opinion, based only on the information provided, which of the two options do you think most people would choose in this situation?

0 = *Definitely NOT change the answer;* 5 = *Definitely change the answer*

Experiment 3

Conditions

Before condition

Paul and George are stock traders. They work for different trading companies and they do not know each other.

Paul and George initially made the decision to invest in stock portfolio A. During the past year Paul and George were considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

Paul and George finally made a decision between switching and not-switching, one of them decided to switch and the other decided not to switch, but we don't know who decided which.

Paul and George do not know the outcome of their investment decision, but their decisions can no longer be changed.

Compared to Paul, George is now feeling much stronger regret about his decision regarding whether to switch or not.

After condition

Paul and George are stock traders. They work for different trading companies and they do not know each other.

Paul and George initially made the decision to invest in stock portfolio A. During the past year Paul and George were considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

Paul and George finally made a decision between switching and not-switching, one of them decided to switch and the other decided not to switch, but we don't know who decided which.

They have now both reviewed the stock performance reports and know the outcome of their decisions.

Compared to Paul, George is now feeling much stronger regret about his decision regarding whether to switch or not.

Comprehension quiz exam

Did Paul and George switch or not switch from their initial investment decision?

1. They both did not switch
2. One of them switched and the other did not switch, but we don't know who decided what
3. They both switched

Do Paul and George know the outcomes of their final investment decision?

1. No, they still do not know the outcome of their decisions, but their decision cannot be changed
2. Yes, they know the outcome of their decisions, but we don't know whether it was positive or negative
3. Yes, they know the outcome of their decisions, and it was negative
4. Yes, they know the outcome of their decisions, and it was positive

Who feels more regret about the decision made regarding whether to switch or not, Paul or George?

1. Paul feels more regret than George
2. George feels more regret than Paul

Attributions

Action attributions

Reminder - one decided to switch and the other decided not to switch, but we don't know who decided which .In your opinion, based only on the information provided, who probably made the decision to switch investments?

1. Paul (the less regretful)
2. George (the more regretful)

Norm attributions

In your opinion, which is generally more common for stock traders facing this dilemma, the decision to switch or the decision not to switch investments?

1. The decision not to switch
2. The decision to switch

Experiment 4

Conditions

No regret – Before

John is a stock trader. John initially made the decision to invest in stock portfolio A.

During the past year John was considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

John finally made a decision between switching and not-switching, but we don't know what he decided. John still does not know the outcome of his investment decision, but his decision can no longer be changed.

All we know about John's decision is that John is now feeling no regret about his decision regarding whether to switch or not.

Regret – Before

John is a stock trader. John initially made the decision to invest in stock portfolio A.

During the past year John was considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

John finally made a decision between switching and not-switching, but we don't know what he decided. John still does not know the outcome of his investment decision, but his decision can no longer be changed.

All we know about John's decision is that John is now feeling regret about his decision regarding whether to switch or not.

No regret – After

John is a stock trader. John initially made the decision to invest in stock portfolio A.

During the past year John was considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

John finally made a decision between switching and not-switching, but we don't know what he decided. John has now reviewed the stock performance reports and knows the outcome of his decision.

All we know about John's decision is that John is now feeling no regret about his decision regarding whether to switch or not.

Regret – After

John is a stock trader. John initially made the decision to invest in stock portfolio A.

During the past year John was considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A. John finally made a decision between switching and not-switching, but we don't know what he decided.

John has now reviewed the stock performance reports and knows the outcome of his decision.

All we know about John's decision is that John is now feeling regret about his decision regarding whether to switch or not.

Comprehension quiz questions

Does John know the outcome of his final investment decision?

1. No, he still does not know the outcome of his decisions, and his decision cannot be changed
2. Yes, he knows the outcome of his decisions, but we don't know whether it was positive or negative
3. Yes, he knows the outcome of his decision, and we know what that outcome was

What does John feel?

1. No regret
2. Regret

Attributions

Action attributions

In your opinion, based only on the information provided, what did John decide to do?

1. John decided not to switch
2. John decided to switch

Norm attributions

In your opinion, which is generally more common for stock traders facing this dilemma, the decision to switch or the decision not to switch investments?

1. The decision not to switch
2. The decision to switch

Procedure and data disclosures

Data collection

In all experiments, data collection was completed before conducting an analysis of the data.

Exclusions

In Experiment 1 we excluded participants who failed the manipulation attention check (pre-registered). We report both findings with and without exclusions.

Conditions reporting

Experiment 1

All collected conditions are reported.

Experiment 2

All collected conditions are reported.

Experiment 3

We also added two conditions where the decision-maker and the observer learned that the outcome was positive or negative. The conditions did not significantly differ from the After-unknown condition and therefore not reported in the main manuscript.

The two added conditions and their results are reported below:

After negative condition

Paul and George are stock traders. They work for different trading companies and they do not know each other.

Paul and George initially made the decision to invest in stock portfolio A. During the past year Paul and George were considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

Paul and George finally made a decision between switching and not-switching, one of them decided to switch and the other decided not to switch, but we don't know who decided which.

They have now both reviewed the stock performance reports and know the outcome of their decisions. Although they made different decisions, both Paul and George find out that the result of their decision was a loss of 1.2millionUSD.

Compared to Paul, George is now feeling much stronger regret about his decision regarding whether to switch or not.

After positive condition

Paul and George are stock traders. They work for different trading companies and they do not know each other.

Paul and George initially made the decision to invest in stock portfolio A. During the past year Paul and George were considering whether to switch and invest in stock portfolio B or to keep the investment in stock portfolio A.

Paul and George finally made a decision between switching and not-switching, one of them decided to switch and the other decided not to switch, but we don't know who decided which.

They have now both reviewed the stock performance reports and know the outcome of their decisions. Although they made different decisions, both Paul and George find out that the result of their decision was a profit of 1.2 million USD.

Compared to Paul, George is now feeling much happier about his decision regarding whether to switch or not.

Results for excluded conditions

Decision		**Action more regretted**	**Inaction more regretted**	**N**	**Action more regretted**	**Inaction more regretted**	**50-50 χ2**	***p***	***d***
After-negative		74	20	94	79%	21%	31.02	<.001	
After-positive		86	15	101	85%	15%	49.91	<.001	
	Difference						1.36	.243	.16
Behavioral norms		**Action norms**	**Inaction norms**	**N**	**Action norms**	**Inaction norms**	**50-50 χ2**	***p***	
After-negative		68	26	94	72%	28%	18.77	< .001	
After-positive		64	37	101	63%	37%	7.22	.007	
	Difference						1.79	.181	-.19
Regret-norms interaction		**Action more regretted**	**Inaction more regretted**	**N**	**Action more regretted**	**Inaction more regretted**	**Interaction χ2**	*p*	
After-negative	Action norms	55	13	68	81%	19%	.68	.408	.17
	Inaction norms	19	7	26	73%	27%			
After-positive	Action norms	55	9	64	86%	14%	.09	.769	.06
	Inaction norms	31	6	37	84%	16%			

Experiment 4

All collected conditions are reported.

Dependent variables exclusions

All collected dependent variables are reported.

Variables reporting

Participants were asked to briefly explain their answers to each of the two attributions in one sentence. This was meant to assess reasons for possible failure to replicate. Since the results were as expected in the pre-registrations and then replicated, we did not analyze or report these results in this study.

In Experiment 4 we also collected action-inaction trait orientation at the beginning of the survey to examine individual differences for exploratory purposes. This data was not pre-registered nor analyzed.

Additional analyses

Experiment 1

Both regret and norms are measured, not manipulated, yet we supplemented our analyses to examine a possible interaction of action-inaction attributed behavior and norms. Most participants (70-88%) in the no-regret condition indicated conformity (action-action and inaction-inaction alignment between decision and norms; *d* = 1.28), but in the regret condition most participants interpreted regret to be a result of taking action regardless of norms (action-decision > 78%, *d* = 0.06). Therefore, observing no-regret signaled conformity to action-inaction norms, whereas observing regret signaled action regardless of norms.

Regret-norms interaction		**Action Decision**	**Inaction Decision**	**N**	**Action Decision**	**Inaction Decision**	**χ2**	***d***
Regret	Action norm	64	15	79	81%	19%	.10	0.06
	Inaction norm	14	4	18	78%	22%	*p* = .748ns	
No regret	Action norm	49	21	70	70%	30%	30.08	1.28
	Inaction norm	4	29	33	12%	88%	*p* < .001	

Note: The left two action-inaction columns are counts; the right two action-inaction columns are percentages. *d* indicates a converted Cohen's *d* from the chi-square score.

Experiment 2

Forty-five participants failed the manipulation check in Experiment 2. When we excluded these 45 participants, the results remained largely the same. We report these results here.

Specifically, most of the contrasts remained to be similar in terms of magnitudes and statistical significance. A few exceptions include: (1) the no-regret-control contrast changed from significant to marginally significant for the before norms situation and the after action-inaction behaviors, (2) the no-regret-control contrast changed from marginally significant to significant for the after-norms situation.

Experiment 2: Means, standard deviation, of all conditions (after exclusion)

		Action/Inaction		Norms	
	N	*M*	*SD*	*M*	*SD*
Before-Regret	46	2.78	1.26	2.57	1.03
Before-No regret	51	1.51	1.25	2.04	1.22
Before-Control	48	2.21	.99	2.46	1.22
After-Regret	46	3.33	1.23	2.67	1.28
After-No regret	40	1.88	1.18	1.85	1.17
After-Control	36	2.39	1.05	2.39	1.13

Note. Action/Inaction = action-inaction attributions (0 = Inaction; 5 = Action). Norms = action-inaction norm perceptions (0 = Inaction; 5 = Action). Before = prior to the target learning of the outcomes, After = after the target learned of the result, but outcomes not known to the observer.

Experiment 2: Contrasts between the regret conditions (after exclusion)

		Regret-No regret		Regret-Control		No regret-Control	
		Diff	*d*	*Diff*	*d*	*Diff*	*d*
Before	Action-inaction	1.27*** [.80, 1.74]	1.10	.57* [.10, 1.05]	0.50	-.70** [-.16, -.24]	-0.60
	Norms	.53* [.05, .1.00]	0.45	.11 [-.37, .59]	0.09	-.42 [-.89, .05]	-0.36
After	Action-inaction	1.45*** [.95, 1.95]	1.25	.94*** [.42, 1.45]	0.81	-.51 [-1.04, .02]	-0.44
	Norms	.82** [.32, 1.33]	0.71	.29 [-.23, .80]	0.24	-.54* [-.1.07, -.01]	-0.46

Note. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Brackets detail 95% confident intervals. Before = prior to the target learning of the outcomes, After = after the target learned of the outcome, but outcomes not known to the observer.

For the contrast between the after and before condition,

Experiment 2: Contrasts between the after and before conditions (after exclusion)

After-Before

	Regret		No regret		Control	
	Diff	*d*	*Diff*	*d*	*Diff*	*d*
Action-inaction	.54* [.06, 1.02]	0.47	.37 [-.12, .85]	0.32	.18 [-.33, .69]	0.16
Norms	.11 [-.38, .59]	0.09	-.19 [-.68, .30]	-0.16	-.07 [-.58, .44]	-0.06

Note. Numbers in the cells are comparisons between the before conditions (prior to the target learning of the outcomes) and after conditions (after the target learned of the outcome). * $p < .05$. Brackets detail 95% confident intervals.

Both regret and norms are measured, not manipulated, yet we supplemented our analyses to examine a possible interaction of action-inaction attributed behavior and norms. The interaction between regret and norms was $F(2, 306) = 3.66$, $p = .027$, $\eta_p^2 = .02$. Higher perceived action norms were associated with higher attributions of action in the no-regret condition ($M_{diff} = .70$, [.23, 1.15], $p = .003$, $d = .60$)[1], but not in the regret condition ($M_{diff} = -.05$ [-.50, .39], $p = .814$ns, $d = .04$). Meaning, that observing expressions of no-regret was interpreted as conformity (alignment with norms), whereas observing regret was interpreted as being over action regardless of norms.

[1] Using median (2.00) as the cut-off point of action-inaction on the 0-5 norms scale, to mirror the reporting contrasts in Experiment 1. The effect without the split was stronger.

Experiment 3

We found an exploratory interaction between perceived norms and the before-after manipulation. In the before-outcome condition, participants rated action as more regretted when norms were for action (86%) than when norms were for inaction (62%) ($\chi2 = 7.66$, $p = .006$, $d = .56$); but in the after-outcome condition, the interaction between norms and behavior attributions was not significant (action norms: 73%, inaction norms: 85%; $\chi2 = 2.10$, $p = .147$, $d = -.29$). Therefore, regret was generally associated with more action, but when observers saw that decision-makers regretted without knowing the outcome, they relied on normative cues, with inaction norms leading to weaker perceptions of action as regretful. When observers learned that decision-makers knew the outcome and were regretful, action-inaction norms mattered less, possibly because regret was then perceived to be less about norms and more about the outcome.

Outcome-norms interaction		**Regret is action**	**Regret is inaction**	**N**	**Regret is action**	**Regret is inaction**	***Contrast* χ2**	***p***	***d***
Before	Action norms	49	8	57	86%	14%	7.66	.006	.56
	Inaction norms	28	17	45	62%	38%			
After	Action norms	50	19	69	72%	28%	2.10	.147	-.29
	Inaction norms	29	5	34	85%	15%			

Note. Contrast χ2 = chi-square test comparing the before and after conditions. *d* indicates a converted Cohen's *d* from the chi-square score

Experiment 4

Both regret and norms are measured, not manipulated, yet we supplemented our analyses to examine a possible interaction of action-inaction attributed behavior and norms. Most participants (59-61%) in the no-regret condition indicated conformity (action-action and inaction-inaction alignment between decision and norms; $\chi 2 = 5.32$, $p = .016$), but in the regret condition most participants interpreted regret to be a result of taking action regardless of norms (action norms: 67%, inaction norms: 59%; $\chi 2 = .93$, $p = .216$ns). Expressions of no-regret were interpreted as conformity to action-inaction norms, whereas expressions of regret were interpreted as action regardless of norms.

Regret-norms interaction		**Action Decision**	**Inaction Decision**	**N**	**Action Decision**	**Inaction Decision**	**χ2**	***d***
Regret	Action norm	56	28	84	67%	33%	.93	.16
	Inaction norm	31	22	53	59%	41%	*p* = .216ns	
No regret	Action norm	42	27	69	61%	39%	5.32	.40
	Inaction norm	28	40	68	41%	59%	*p* = .016	

Note: The left two action-inaction columns are counts; the right two action-inaction columns are percentages. *d* indicates a converted Cohen's *d* from the chi-square score.

As in Experiment 3, we tested an exploratory interaction between perceived norms and the before-after manipulation. In the before-outcome condition, participants rated action as more regretted when norms were for action (64%) than when norms were for inaction (45%) ($\chi 2 = 5.02$, $p = .025$, $d = .39$); but in the after-outcome condition, the interaction between norms and behavior attributions was not significant (action norms: 64%, inaction norms: 53%; $\chi 2 = 1.70$, $p = .192$ns, $d = .22$). The results are consistent with those in Experiment 3. When observers saw that decision-makers regretted without knowing the outcome, they relied on perceived normative cues, and were less likely to attribute regret to action when inaction was the norm. The effect of perceived normative cues diminished when observers learned that decision-makers knew the outcome and were regretful.

Outcome-norms interaction		**Regret is action**	**Regret is inaction**	**N**	**Regret is action**	**Regret is inaction**	***Contrast χ2***	***d***
Before	Action norms	47	26	73	64%	36%	5.02	.39
	Inaction norms	29	35	64	45%	55%	*p* = .025	
After	Action norms	51	29	80	64%	36%	1.70	.22
	Inaction norms	30	27	57	53%	47%	*p* = .192	

Note: The left two action-inaction columns are counts; the right two action-inaction columns are percentages. *d* indicates a converted Cohen's *d* from the chi-square score.

Summary of additional analyses

The dependent variables of action-inaction attributions and action-inaction norm perceptions were both measured together and in the same order. Above we reported misalignments between the two by examining the interaction, yet we caution that the links and interactions between the two should be interpreted with caution. Both factors seem affected by manipulated emotions, yet since norm perceptions were not manipulated we cannot infer causality or draw conclusions regarding the nature of the relationship. Norm perceptions could be either independent of, associated with, affected by, or affecting action-inaction attributions. Future research manipulating one the factors while measuring the other could shed light on the relationship between the two factors and the causal chain, to test norm-theory assumptions (Kahneman & Miller, 1986).