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Brief Report

Children's thinking about their own and others' regret and relief

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ABSTRACT

In two experiments using a decision-making game, we investigated children's thinking about regret and relief. In Experiment 1 ($N = 43$, 31 children [5 years 4 months to 8 years 2 months of age] and 12 adults), participants chose between two boxes containing different numbers of stickers. They rated their happiness before learning that the other box contained more (regret) or fewer (relief) stickers. They rerated their chosen box with the counterfactual knowledge. The experience of regret was evident at 5 years of age, and the experience of relief was evident at 7 years of age. In Experiment 2 ($N = 69$, 53 children [5 years 3 months to 6 years 11 months of age] and 16 adults), participants either played the game (self condition) or watched another play the game (other condition). Children in the self condition confirmed the results from Experiment 1. We found no evidence that children up to 7 years of age were able to predict others' regret and relief, a finding that suggests differing developmental trajectories between experiencing and understanding others' regret and relief.

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Introduction

Thinking about what could have been, counterfactual thinking, allows us to speculate about the past and learn for the future (Roese, 1997). Counterfactual emotions, such as regret and relief, result from these thoughts (Kahneman & Miller, 1986; Roese & Olson, 1995). Counterfactual emotions involve reacting to the current state of affairs, just as basic emotions do (Ekman, Friesen, & Ellsworth, 1972), and comparing reality with an alternative world (Landman, 1993; Niedenthal, Tangney,

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& Gavanski, 1994). Being stuck in traffic may lead to anger (a response to reality). Realizing that the traffic would have been avoided if one had left 10 minutes earlier would lead to regret (comparing reality with what could have been).

The example above describes an *experience* of regret—the comparison of reality with a better counterfactual world. Experience of an emotion can be differentiated from *understanding* why someone experiences the same emotion. To understand regret, one must reflect on the reasoning behind the emotion (e.g., “He feels particularly bad because he knows that if he had left the house 10 minutes earlier, he would have avoided this traffic”). In this study, we investigated both aspects of children’s counterfactual emotions: their experience and understanding.

Little research has been published on the development of regret and relief. Guttentag and Ferrell (2004) read 5-, 7-, and 9-year-olds stories involving typical or atypical behavior and acts of commission (choosing to do something) or omission (choosing not to do something). In one typicality story, two boys ride their bikes to school every morning around the pond. One boy, David, took an atypical route, hit a tree root, fell, and hurt himself. The other boy, Bob, took his typical route, hit the root, fell, and hurt himself. In a commission story, two girls each chose one of two boxes to open. One girl, Karen, changed her mind and swapped to the other option. The other girl, Michelle, did not change her mind when given the opportunity. Both girls won the lesser prize. In both stories, the question posed was “Who would be more upset?” In line with the adult literature, atypical actions and acts of commission that result in a negative outcome prompt more regret than typical actions or acts of omission (e.g., Gleicher et al., 1990; Kahneman & Miller, 1986; Kahneman & Tversky, 1982; Landman, 1987). In line with this, 7-year-olds, but not 5-year-olds, claimed that David and Karen would be more upset. Guttentag and Ferrell (2004) argued that 5-year-olds were unable to understand how what could have been might affect the emotional responses to the actual outcome (see also Beck & Crilly, 2009; Ferrell, Guttentag, & Gredlein, 2009; Guttentag & Ferrell, 2008).

In another study, Amsel and Smalley (2000) also found poor performance by 3- to 5-year-olds. Children watched as a doll chose between two boxes. The chosen box contained a more or less desirable prize than the unchosen box. Young children were able to judge how the doll would have felt if the other box had been chosen; that is, they could generate the counterfactual world, as we would expect based on the reasoning literature (see, e.g., Beck, Robinson, Carroll, & Apperly, 2006; Harris, German, & Mills, 1996; Riggs, Peterson, Robinson, & Mitchell, 1998). Yet this judgment did not influence their evaluations of the actual prize.

Amsel and Smalley (2000) included situations that should have led to relief in their study with preschoolers. There is little work on relief with older children. An exception is Guttentag and Ferrell (2004), who used stories with a similar structure to their regret stories, but the unrealized alternative was more negative than reality. In their study, 7-year-olds did not demonstrate an understanding of when others feel relief. Unfortunately, because older children were not tested, there is no positive evidence regarding when children understand relief.

In the tasks described above, participants’ thinking about regret and relief was investigated through their understanding of these emotions in others. It is likely that the story tasks used make high working memory demands. Furthermore, it might be easier for children to experience regret or relief themselves rather than to infer it in others. Amsel and Smalley (2000) used a task where 3- to 5-year-olds might experience counterfactual emotions themselves. Children saw two face-down numbered cards (0–5), and the experimenter had one face-up card. Participants chose one of their cards to turn over, and the player with the higher card won. Trials of interest were those in which the participants’ chosen card and the experimenter’s card were equal, yet the participants’ unchosen card was higher or lower than the experimenter’s card; that is, choosing the other card would have meant that the children won or lost the hand. If children experienced counterfactual emotions, then they should have judged themselves as happier when the unchosen card turned out to be lower than the experimenter’s card and as less happy when the unchosen card turned out to be higher. This is what adults did. However, when preschoolers evaluated their feelings, the unchosen card had no bearing on their rating. Thus, the question remains: When do children experience counterfactual emotions?

In Experiment 1, we sought evidence for children’s experience of regret and relief using a game based on Amsel and Smalley (2000). In Experiment 2, we used the same task and asked children to

report another's feelings to make a comparison between experiencing and understanding counterfactual emotions.

Experiment 1

Method

Participants

A total of 31 children participated: 11 5- to 6-year-olds (mean age = 5 years 7 months, range = 5 years 4 months to 6 years 0 months, 5 boys and 6 girls), 10 6- to 7-year-olds (mean age = 6 years 8 months, range = 6 years 3 months to 7 years 2 months, 1 boy and 9 girls), and 10 7- to 8-year-olds (mean age = 7 years 8 months, range = 7 years 3 months to 8 years 2 months, 6 boys and 4 girls), all from one school serving a predominantly middle-class population. All participants were White British and spoke English as their first language. In addition, 12 university psychology students participated (mean age = 20 years 4 months, range = 18 years 7 months to 24 years 8 months, 1 man and 11 women) and received research credit for participation.

Materials

We used three white boxes, approximately 3 cm³, containing colored smiley face stickers. We also used a scale of five faces ranging from *very happy* to *very sad*. A screen hid the boxes.

Procedure

All child participants completed a simple pretest to confirm their understanding of the scale. The experimenter sat opposite the participants and asked them to point to the very happy face and then to the very sad face (counterbalanced). No children failed this pretest.

Two boxes were placed on the table between the participants and the experimenter. The experimenter explained that only one box could be chosen by participants and that the contents of that particular box was theirs to keep. After opening the chosen box (the *initial box*), participants were asked the *initial question* ("How do you feel after opening your box?") and were asked to rate their happiness using the scale ("Please point to a face"). They were given an *initial score* between 1 (*very unhappy*) and 5 (*very happy*).

Participants were then told that the unchosen box (the *alternative box*) would be opened to "see what you would have won." On identification of the contents, the participants were asked to rate their feelings toward their initial box again using the *alternative question* ("How do you feel about your box now? Please point to a face"). This was the *alternative score* (maximum of 5).

The initial box always contained two or three stickers. Unbeknownst to the participants, the two boxes placed on the table contained an identical number of stickers. While participants were investigating the contents of the initial box, an identical-looking alternative box was taken from behind the screen and subtly replaced the unchosen box. No participants commented on the sleight of hand. On the relief trials, the replaced alternative box contained no stickers (participants were expected to be more positive about the initial box), and on the regret trials, the replaced alternative box contained eight stickers (participants were expected to be less positive). There were four experimental trials that were presented in one of two fixed orders: (a) relief, regret, regret, and relief or (b) regret, relief, relief, and regret. After the fourth trial, participants were thanked and took away the stickers they had accumulated.

Results and discussion

Participants' initial score was subtracted from the alternative score to give a difference score between -4 and 4. Scores below zero showed that participants were more unhappy with their chosen box (the initial box) after having viewed the contents of the alternative box, and these scores indicated regret. Scores above zero indicated relief. Mean scores can be seen in Fig. 1.

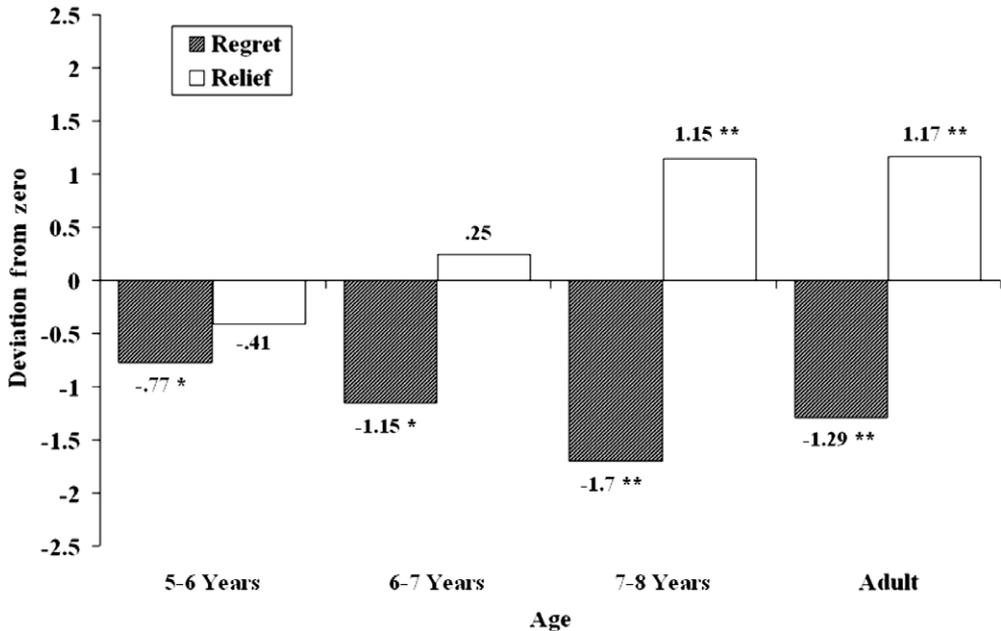


Fig. 1. Mean scores on regret and relief trials in Experiment 1. One asterisk (*) indicates that the score differs from zero at $p < .05$. Two asterisks (**) indicates that the score differs from zero at $p < .025$.

We conducted a 4 (Age) \times 2 (Trial Type: regret or relief) analysis of variance (ANOVA). There was a main effect of trial type, $F(1, 39) = 57.15$, $p < .001$, partial $\eta^2 = .594$, and an interaction between trial type and age, $F(3, 39) = 5.77$, $p = .002$, partial $\eta^2 = .307$. Post hoc Tukey's HSD tests showed that the change between the initial and alternative ratings on the regret and relief trials was significantly different ($p < .01$) for both the 7- to 8-year-olds ($Q = 8.61$) and the adults ($Q = 7.43$). The 6- to 7-year-olds discriminated at the .05 level ($Q = 4.23$), but there was no significant difference between regret and relief for the 5- to 6-year-olds ($Q = 1.10$).

There were no significant differences between age groups on regret scores. However, on relief scores, the 5- to 6-year-olds differed from both the 7- to 8-year-olds ($Q = 4.72$) and the adults ($Q = 4.77$), $p < .05$. There were no other significant differences.

The ANOVA revealed developmental changes, but we also wanted to see whether there was evidence that participants were experiencing an emotional change that we could call regret or relief. We tested whether scores for each age group deviated from zero using one-sample t tests. A significant positive result demonstrated relief, whereas a significant negative result demonstrated regret. The first evidence for regret was at 5 to 6 years of age, $t(10) = -2.54$, $p = .029$, $r = .63$. Although children in the two youngest age groups did not clearly differentiate regret trials from relief trials, our data suggest that they were showing regret. There was a lag before children experienced relief at 7 to 8 years of age, $t(9) = -7.14$, $p < .001$, $r = .92$. This is the first evidence that children think about relief. Adults demonstrated both regret, $t(11) = -5.34$, $p < .001$, $r = .85$, and relief, $t(11) = 10.38$, $p < .001$, $r = .95$.

Finally, we checked whether child participants did not just use the extremes of the scale (which would have prevented them showing a change in emotion) by comparing their initial responses with 1 for regret (the lowest possible score) and 5 for relief (the highest possible score). Results showed that child participants used the scale appropriately for both regret trials, $t(30) = -10.73$, $p < .001$, $r = .98$, and relief trials, $t(30) = -21.62$, $p < .001$, $r = .79$.

Thus, although we replicated the asymmetry observed by Guttentag and Ferrell (2004) that regret precedes relief, we found some evidence that both emotions were seen at an earlier age than the existing evidence suggests. Perhaps Guttentag and Ferrell's task was particularly difficult because it

involved reasoning about other people. In Experiment 2, we used the same game to investigate whether children experience counterfactual emotions before they can understand when others experience them.

Experiment 2

Method

Participants

A total of 53 children participated: 28 5- to 6-year-olds (mean age = 5 years 10 months, range = 5 years 4 months to 6 years 3 months, 10 boys and 18 girls) and 25 6- to 7-year-olds (mean age = 6 years 10 months, range = 6 years 4 months to 7 years 3 months, 13 boys and 12 girls) recruited from two classes of a U.K. primary school serving a predominantly middle-class population. Participants were White British (58%), Asian British (38%), and Black British (4%). All spoke English as their first language. In addition, 16 university psychology students participated as a comparison group (mean age = 19 years 3 months, range = 18 years 8 months to 25 years 9 months, 2 men and 14 women) and received research credit for their participation. Half of the participants ($n_s = 27$ children and 8 adults) played the game themselves (*self condition*), and half ($n_s = 26$ children and 8 adults) observed someone else play the game (*other condition*).

Materials

We used the same materials from Experiment 1 plus a toy penguin.

Procedure

Participants were allocated to the self or other condition alternately based on the teachers' class list (or, for the adults, on the order in which they were recruited). In the self condition, we replicated the Experiment 1 procedure. In the other condition, the experimenter explained to the children that Arnold, the toy penguin, would play and that they needed to judge how Arnold felt when playing the game. The procedure was otherwise identical to that of the self condition. The initial question was "How do you think Arnold feels about his box? Please point to a face [on the scale]"; the alternative question was "How do you think Arnold feels about his box now? Please point to a face."

On the first trial, the participants were explicitly told "Arnold does not win what is inside this [the alternative] box" just before opening the alternative box. Sleight of hand was not required because Arnold always "chose" the box that contained two or three stickers. At the end of the game, Arnold donated his stickers to the participants.

Results and discussion

We used the same data coding as in Experiment 1. Mean scores can be seen in Fig. 2. A 3 (Age) \times 2 (Condition: self or other) \times 2 (Trial Type: regret or relief) ANOVA revealed a main effect of trial type, $F(1, 63) = 10.34, p = .002$, partial $\eta^2 = .141$. Regret scores (-1.17) were lower than relief scores (-0.33). There were significant interactions between trial type and age, $F(2, 39) = 12.39, p < .001$, partial $\eta^2 = .282$, and between trial type and condition, $F(1, 63) = 19.67, p < .001$, partial $\eta^2 = .238$. A three-way interaction approached significance, $F(2, 63) = 2.83, p = .066$, partial $\eta^2 = .082$. We conducted Tukey's HSD post hoc tests to investigate the significant interactions.

Combining across the self and other conditions to investigate the first interaction, 5- to 6-year-olds showed no difference in their responding between the regret and relief trials. The 6- to 7-year-olds did so at the .05 level ($Q = 3.47$), and adults did so at the .01 level ($Q = 7.29$). Post hoc tests on the second interaction showed that in the self condition participants discriminated between the regret and relief trials at the .01 level of significance ($Q = 7.34$), but the same difference was not seen in the other condition.

We used one-sample t tests to see whether responses differed from zero. In the self condition, the adults demonstrated experience of both regret, $t(7) = -5.38, p = .001, r = .90$, and relief, $t(7) = 10.58$,

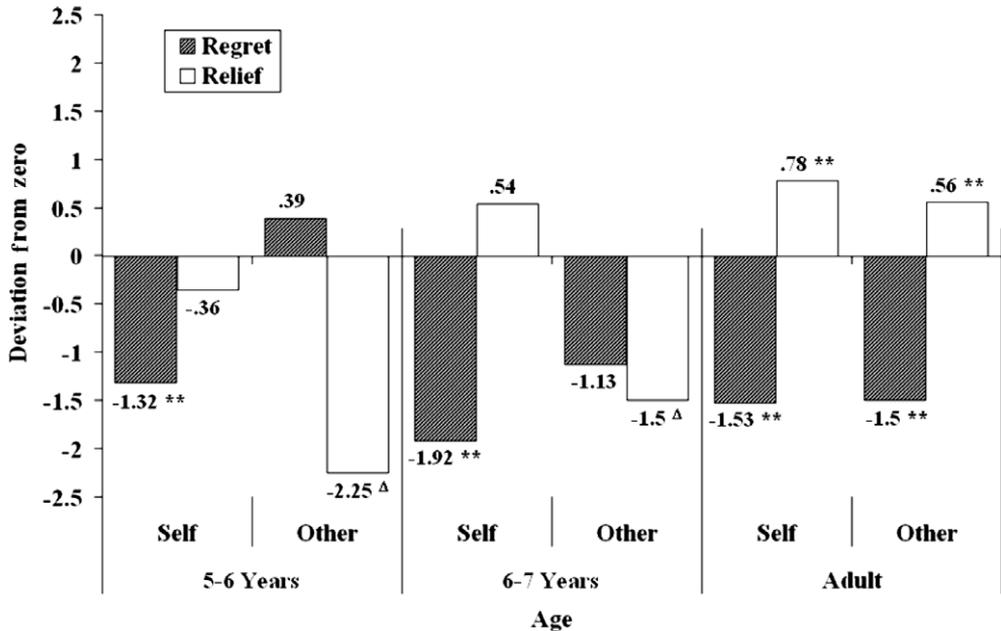


Fig. 2. Mean scores on regret and relief trials (self and other conditions) in Experiment 2. One asterisk (*) indicates that the score differs from zero in the expected direction at $p = .05$. Two asterisks (**) indicates that the score differs from zero in the expected direction at $p = .025$. A triangle (Δ) indicates that the score significantly differs from zero in an unexpected direction at $p = .05$.

$p < .001$, $r = .97$. The 5- to 6-year-olds experienced regret, $t(13) = -3.04$, $p = .009$, $r = .64$, but not relief, $t(13) = -0.96$, $p = .355$, $r = .26$. The 6- to 7-year-olds also experienced regret, $t(12) = -5.19$, $p < .001$, $r = .83$, but not relief, $t(12) = 1.24$, $p = .237$, $r = .34$. In the other condition, the adults demonstrated understanding of both regret, $t(7) = -7.94$, $p < .001$, $r = .95$, and relief, $t(7) = 4.97$, $p = .002$, $r = .88$. The 5- to 6-year-olds' ratings were not significantly different from zero for regret, $t(13) = 1.12$, $p = .285$, $r = .30$, but they were for relief, $t(13) = -7.62$, $p < .001$, $r = .90$. However, the children said that Arnold would feel worse on discovering that the unchosen box was empty. The 6- to 7-year-olds showed the same pattern: no evidence of regret, $t(11) = -1.76$, $p = .107$, $r = .47$, and systematically "inappropriate" responses on relief trials, $t(11) = -2.91$, $p = .014$, $r = .66$.

We checked whether child participants were not responding at the extreme end of the scale (which would prevent them from showing change in emotion). This was the not case for regret, $t(52) = -7.88$, $p < .001$, $r = .98$, or relief, $t(52) = -24.01$, $p < .001$, $r = .66$.

Performance in the self condition confirmed the findings from Experiment 1 in that the 5- to 7-year-olds showed regret. However, they showed no evidence of relief. Performance by children in the other condition was worse in that the 5- to 6-year-olds did not indicate that Arnold would feel regret. Similarly, for the 6- to 7-year-olds, it was only when playing the game themselves that their regret scores differed from zero. The other condition also revealed systematically inappropriate responding (see also Guttentag & Ferrell, 2004, Experiment 2). On relief trials, the 5- to 7-year-olds responded as if Arnold felt worse after discovering that the unchosen box contained no stickers. One possible explanation for this is that children, unable to apply counterfactual thinking to infer what emotion another might feel, based their ratings on a different feature of the game. On regret trials the unchosen box contained eight stickers; however, on relief trials it was empty. Perhaps seeing an empty box led children to think that the experimenter was "mean," and they inferred that Arnold would like the game less and rated him as unhappy. Future work should identify when children make adult-like inferences about others' emotions based on counterfactuals.

General discussion

We found positive evidence of children's experience of regret at 5 years of age (younger than previously reported) and found positive evidence of children's experience of relief at 7 years of age (which had not yet been observed previously). This replicated the lag between regret and relief reported by Guttentag and Ferrell (2004) but extended this to children's experience as well as their understanding of others' emotions. Most important, we observed that children experience counterfactual emotions before they understand why others have them.

In Experiment 1, we reported the first positive evidence concerning when children experience relief. Beginning at age 7 to 8 years of age, children reported feeling happier when the counterfactual outcome would have been worse than the reality they experienced. That relief is experienced later than regret may reflect a bias in children's counterfactual reasoning that is also seen in adults. Gleicher and colleagues (1990; see also Roese, 1997) reported that adults more frequently think counterfactually when real outcomes are negative. German (1999) observed that 5-year-olds more often referred to a counterfactual when they heard stories with negative outcomes than when they heard stories with positive outcomes.

However, one might question whether our procedure really induces relief. One might think that genuine relief is felt when one expects a negative outcome but it is avoided. Thus, our trials measured a positive counterfactual emotion (the outcome could have been worse) that lagged behind its negative counterpart (the outcome could have been better). But it may be that including this element of anticipation would lead children to experience relief at an earlier age. Comparisons between different counterfactual emotions are needed.

In Experiment 2, despite evidence that 5- to 7-year-olds experienced regret (self condition), they had great difficulty in predicting the correct counterfactual emotions in others. For children to have a mature understanding that others feel regret after experiencing a negative outcome, they must be able to identify all of the relevant actual and counterfactual information and infer how the others will evaluate the possible alternative outcomes. These extra cognitive demands may explain the asymmetry between the self and other conditions (see, e.g., Pillow & Anderson, 2006, for a comparable asymmetry in reasoning development).

An important question remains for future research. Children passed our regret task at 5 years of age, substantially earlier than the previously published literature had reported. Yet it remains unknown at what age children first show regret. Future research should adapt decision-making tasks to make them accessible for even younger children and explore the emergence of this understanding. The relationship between counterfactual emotions and other types of counterfactual reasoning should also be investigated (see Beck & Crilly, 2009).

In two experiments, we explored children's experience and understanding of counterfactual emotions. We found that children as young as 5 years of age demonstrated experience of regret and that 2 years later they demonstrated experience of relief. However, we found no evidence for children up to 7 years of age being able to explain these same complex emotions in others. This dissociation between experience and understanding should be the subject of future work if we are to understand when children think about what might have been just as well as adults.

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