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# The development of regret and relief about the outcomes of risky decisions



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#### ABSTRACT

Although a number of studies have examined the developmental emergence of counterfactual emotions of regret and relief, none of these has used tasks that resemble those used with adolescents and adults, which typically involve risky decision making. We examined the development of the counterfactual emotions of regret and relief in two experiments using a task in which children chose between one of two gambles that varied in risk. In regret trials they always received the best prize from that gamble but were then shown that they would have obtained a better prize had they chosen the alternative gamble, whereas in relief trials the other prize was worse. We compared two methods of measuring regret and relief based on children's reported emotion on discovering the outcome of the alternative gamble: one in which children judged whether they now felt the same, happier, or sadder on seeing the other prize and one in which children made emotion ratings on a 7-point scale after the other prize was revealed. On both of these methods, we found that 6- and 7-year-olds' and 8- and 9-year-olds' emotions varied appropriately depending on whether the alternative outcome was better or worse than the prize they had actually obtained, although the former method was more sensitive. Our findings indicate that by at least 6 or 7 years children experience the same sorts of counterfactual emotions as adults in risky decision-making tasks, and they also

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suggest that such emotions are best measured by asking children to make comparative emotion judgments.

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#### Introduction

There has been a recent surge of research interest in the development of counterfactual thinking (for reviews, see Beck & Riggs, 2014; Rafetseder & Perner, 2014). Some of this research has focused on the development of emotions thought to require counterfactual thinking abilities, specifically regret and relief (Burns, Riggs, & Beck, 2012; McCormack & Feeney, 2015; O'Connor, McCormack, & Feeney, 2012; O'Connor, McCormack, & Feeney, 2014; Rafetseder & Perner, 2012; van Duijvenvoorde, Huizenga, & Jansen, 2014; Weisberg & Beck, 2010; Weisberg & Beck, 2012). Researchers studying early and middle childhood have primarily focused on attempting to pinpoint the age at which children first experience these emotions (O'Connor et al., 2012; Rafetseder & Perner, 2012; van Duijvenvoorde et al., 2014; Weisberg & Beck, 2010, 2012). Although this research has proved fruitful, there is still considerable disagreement over when regret can first be observed developmentally (Rafetseder & Perner, 2012; Weisberg & Beck, 2012). It is possible to identify three methodological issues that make it difficult both to resolve this disagreement and to integrate developmental findings with the larger body of research on regret conducted with adults. The current study directly addresses these issues.

All of these developmental studies have used a simple paradigm requiring children to choose between two boxes to win a prize of stickers or candies. Children see the prize from their chosen option and then rate how they feel about that prize on an emotion rating scale ranging from very happy to very sad (the exact nature of this scale differs across studies). When giving these initial ratings, children have received only what is termed *partial* feedback; they have seen the prize resulting from their choice, but they have not yet seen the prize they would have won if they had made a different choice. Children are given *complete* feedback when they see both what they have won and what they would have won if they had made a different choice. Emotion ratings are subsequently made after complete feedback. If the prize from the unchosen option is better than that from the chosen option, children reporting that they now feel sadder are assumed to be experiencing regret about their choice; if it is worse, children reporting that they now feel happier are assumed to be experiencing relief.

Although all of the developmental studies employed this basic procedure, they differ from each other in the exact way that counterfactual emotions are assessed; moreover, the task they use also differs in important ways from the type of task typically used to examine counterfactual emotions in adolescents and adults (Burnett, Bault, Coricelli, & Blakemore, 2010; Camille et al., 2004; Coricelli et al., 2005). We focus on three methodological issues stemming from these differences: the nature of the choices children need to make, the extent to which their emotional responses can be based on a single comparison between the prize received and the best or worst prize available, and the way in which emotion ratings are used to measure regret/relief. Each of these issues is described in turn.

#### Choice and risky decision making

Experiments examining regret and relief in adolescents and adults have used paradigms in which the choice that participants make is more complex than simply choosing between two boxes. Such studies typically align with research in the broader decision-making literature insofar as the tasks involve choosing between alternatives that vary in associated risk. In most tasks, the choice is between two gambles, with gambles giving participants the opportunity to win or lose points (e.g., Bault, Coricelli, & Rustichini, 2008; Coricelli et al., 2005; Mellers, Schwartz, & Ritov, 1999). For example,

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