Children's Understanding of Counterfactual Alternatives

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Abstract

This study examines how children integrate information about counterfactual alternatives in making judgments. Previous research in adults had shown that they make judgments on the basis of comparisons between factual events and counterfactual alternatives. We suggest that children adopt a summative strategy instead, where they focus on the presented outcomes, both real and counterfactual, and base their judgments on the overall affective quality of these outcomes. Results from a single experiment comparing adults' and children's responses to a counterfactual judgment task show that children do tend to use a summative strategy as opposed to the comparative strategy adopted by adults. These results were further supported by participants' justifications of their judgments, which were alternative focused for the adults, but outcome focused for the children. The results are discussed in relation to complexity-based theories of the development of human reasoning.

Keywords: Counterfactual; development; complexity; children; reasoning.

Introduction

The ability to consider alternatives is a key component of human rationality (e.g., Byrne, 2005). Both children and adults are frequently exposed to situations where their ability to consider alternative outcomes is an important determinant of their interpretation of these situations. A recent and important example is a government road safety advertisement that shows what happens following a car crash and then rewinds to show an alternative outcome if the young passengers had been wearing seatbelts prior to the crash (www.dft.gov.uk/think/). Findings from empirical research with adults suggest that they would experience negative emotions in response to such an advertisement, as a consequence of comparing what actually happened with its more positive alternative (e.g., Markman, Gavanski, Sherman & McMullen, 1993; Medvec, Madey & Gilovich, 1995). However, it is not clear that children necessarily make the same comparison and therefore whether they would experience similar negative emotions. In this study, we will investigate similarities and differences between adult and children's consideration of alternatives, along with the effects of these considerations on individual judgments, emotional responses and decisions.

Varieties of Counterfactual Thinking When people think about how things could, should or would have been different if other events had happened, they are considering what are known as counterfactual alternatives (i.e., alternatives states of affairs that are contrary to what actually occurred). The consideration of such alternatives has been shown to have profound consequences for people's judgments, their emotions and their decisions (e.g., Roese, 1994; Davis, Lehman, Wortman, Silver & Thompson, 1995; McCloy & Byrne, 2002). Counterfactual alternatives can be categorized in a number of ways. When we imagine a state of affairs that results in an outcome which was better than what actually occurred (e.g., "If I had been driving more slowly, I wouldn't have crashed the car"), this is known as upward counterfactual thinking (Markman, et al., 1993). This can be compared with downward counterfactual thinking, where we imagine alternative states of affairs that would have resulted in a worse outcome than what actually occurred (e.g., "If I hadn't been wearing my seatbelt, I would have been seriously injured"; Markman et al., 1993).

Upward and downward counterfactual thinking have different consequences for our judgments, emotions and decisions. Following negative outcomes, imagining how things could have been better (an upward counterfactual) can make people feel worse about what happened to them, whereas imagining how things could have been worse (a downward counterfactual) can make people feel better about the same event (Roese, 1994; Medvec, et al., 1995). Although they can make people feel worse about negative events, upward counterfactual thoughts have a functional component, in that they may help people prepare for the future, by suggesting alternative courses of action which may lead to positive outcomes (Roese, 1994; Epstude & Roese, 2007).

A further distinction can be made between "pure" counterfactuals, where a change to antecedent events results in a different outcome to what actually occurred (whether that be better or worse than the actual outcome), and

semifactual thoughts (Goodman, 1973), where, although antecedent events have changed, the same outcome occurs (e.g., "even if I had studied harder, I would still have failed the exam"). Counterfactual and semifactual thoughts also have different consequences. Thinking counterfactually about a past event can make that event seem more causal of subsequent outcomes, whereas thinking semifactually about the same event can reduce how causal that event is seen as being (McCloy & Byrne, 2002). The same pattern holds for how controllable past events are seen as being (McCloy, 2000). Counterfactual and semifactual thoughts also have different consequences for how much we regret past events. Where upward counterfactual thoughts can increase the regret felt for past events, semifactual thoughts can reduce the amount of regret that people report (McCloy & Byrne, 2002).

Children's understanding of counterfactual alternatives As described above, when adults make comparisons between reality and different counterfactual alternatives, their reactions show a number of regularities. However, recent research into children's counterfactual thinking suggests that they may not understand these counterfactual alternatives in the same way that adults do.

Past research on children's counterfactual thinking has shown that even very young children show some understanding that past events could have happened otherwise, with children as young as two using phrases such as *almost* in describing a series of events (e.g., "the car almost hit the deer"; Harris, 1997). Although children younger than six years old rarely produce spontaneous counterfactual assertions (Kuczaj & Daly, 1979), they can make reference to imaginary alternative events when making judgments about how events are caused or how they could be prevented (Harris, German & Mills, 1996). Despite this, children show different patterns from adults on a range of counterfactual thinking tasks (e.g., German & Nicols, 2003; Guttentag & Ferrell, 2004; Meehan & Byrne, 2005). This suggests that, although children may be able to construct counterfactual alternatives, they may not deal with these alternatives in the same way as adults (Beck, Robinson, Carroll & Apperly, 2006; Riggs & Beck, 2008).

One particularly interesting study is that by Guttentag and Ferrell (2004), who looked directly at how children and adults deal with different counterfactual alternatives. They presented their participants with scenarios concerning two children who become ill after eating a pudding (because someone else had sneezed on it). In each case the child could have chosen an alternative pudding. For one child, the alternative pudding would not have resulted in illness (an upward counterfactual alternative), whereas for the other child, it would also have resulted in illness (as it too had been sneezed on; a semifactual alternative). Adult participants judged that the child whose alternative would have resulted in a better outcome would feel worse about their choice than the child whose alternative would have resulted in the same outcome. However, five year old children showed the opposite pattern, instead suggesting that the child for whom both alternatives would have resulted in the same negative outcome would feel worse than the child for whom the alternative would have resulted in a better outcome. Guttentag and Ferrell proposed that children, rather than making an upward comparison to the better alternative as adults do, instead summed across possible outcomes in making their emotion judgments (two negative outcomes versus one negative outcome and one positive outcome).

Guttentag and Ferrell's study suggests that children may not integrate information across counterfactual possibilities and factual events in the same way as adults. This could explain why adults and children show different patterns in counterfactual thinking tasks (e.g., German & Nichols, 2003; Meehan & Byrne, 2005). In this study we test whether children's understanding of counterfactual alternative outcomes is, in fact, summative in nature.

Experiment

Method

Participants and Procedure We tested 34 seven-year-old children in Year 3 of primary school (13 males, 21 females) and 22 adult volunteers (mean age 21 years; 6 males, 16 females). All participants were presented with two scenarios concerning a game, one of which resulted in a positive outcome for the protagonist with the other resulting in a negative outcome. All participants were tested individually. For child participants the scenarios were read out loud by the experimenter, and the children were presented with pictures illustrating the different states of affairs described in the scenario. Half of the child participants made judgments about the positive scenario first, and the other half made judgments about the negative scenario. Children made their answers to the judgment task verbally and their answers were recorded by the experimenter. They were also asked by the experiment to justify their answers, and these were again recorded. For adult participants, the scenarios were presented in a booklet, along with the judgment questions and space for recording justifications of choices. Again, half of the adult participants received the positive scenario first, and the other half received the negative scenario first.

Materials and Design. Participants were presented with scenarios describing three child protagonists who take part in a game. In the game, each child selects three boxes from a barrel (some boxes contain prizes and some boxes do not contain prizes). Each child then chooses one of these three boxes to keep. If the box they choose contains a prize they get to keep the prize, and if it does not they receive nothing. In the negative outcome condition, all three children open their chosen box to find that they have not won a prize. Each child is then shown what was in the other two boxes

that they selected from the barrel. For one child, the other two boxes both contain prizes (**1**). For the second child, one box contains a prize and the other does not (**2**). For the third child, neither of the other two boxes contains a prize (**3**). The structure of the positive outcome condition is the same, except that, on opening their chosen box, each child finds that they have won a prize. The structure of the tasks is shown in Figure 1.

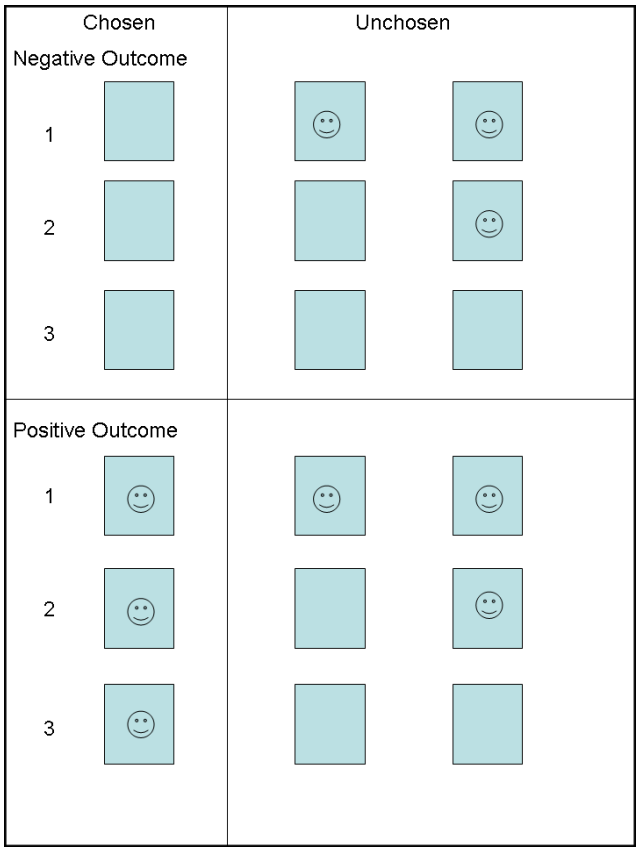

Figure 1. Structure of the situations described in the experimental materials.

For the negative scenario, participants were asked to put the three children described in the story in order of how unhappy they felt. For the positive scenario, participants were asked to put the three children described in the story in order of how happy they felt. When they had made each ranking, participants were asked to explain why they had chosen this order.

Based on previous studies with adults we predicted that adults would based their judgments of unhappiness (negative scenario) and happiness (positive scenario) on comparisons between the achieved outcome and the counterfactual alternatives presented (i.e., the content of the other two boxes). For the negative scenario, we therefore predicted that the adults would rank Child 1 as feeling the most unhappy, as both alternatives presented would have resulted in better outcomes than what actually happened (two boxes with prizes). We predicted that adults would rank Child 3 as feeling the least unhappy, as both alternatives presented would have resulted in the same outcome as what actually happened (two empty boxes). Child 2, who had one alternative that would have resulted in a better outcome, and one that would have resulted in the same outcome (one box with a prize and one empty box) would be ranked by adults as falling in between the other two. For the positive scenario, we predicted that adults would rank Child 3 as feeling the most happy, as both of the alternatives presented would have resulted in a worse outcome. We predicted that adults would rank Child 1 as feeling least happy, as both of the alternatives presented would have resulted in the same outcome. Child 2 would, again, be ranked be ranked by adults as falling in between the other two in terms of happiness.

We predicted that children would adopt a different strategy to that of adults in making their judgments in such situations. If children, rather than making comparisons between the achieved outcome and counterfactual alternative outcomes, are instead summing across outcomes we would predict that children would show different patterns in their rankings from those of adults for both the negative and the positive scenarios. For the negative scenario, we therefore predicted that the children would rank Child 3 as feeling the most unhappy, as the actual outcome and the alternatives presented would all result in negative outcomes (3 negative outcomes). We predicted that children would rank Child 1 as feeling the least unhappy, as, although the actual outcome was negative both alternatives presented would have resulted in a positive outcome (1 negative outcome). Child 2, who had one alternative that would have resulted in a positive outcome, and one that would have resulted in a negative outcome (2 negative outcomes) would be ranked by children as falling in between the other two. For the positive scenario, we predicted that children would rank Child 1 as feeling the most happy, as all of the boxes that they had selected, whether chosen or not, would result in a positive outcome (3 positive outcomes). We predicted that children would rank Child 3 as feeling least happy, as, although the actual outcome was positive, both of the alternative boxes presented would have resulted in negative outcomes (1 positive outcome). Child 2 would, again, be ranked be ranked by adults as falling in between the other two in terms of happiness (2 positive outcomes).

We also predicted that adults and children would differ in their justifications of their choices. Adults' justifications should focus on comparisons between the actual outcome and the alternatives. Children's justifications should instead focus on the affective qualities (positive or negative) of the potential outcomes, without comparison between them.

Results

For the negative scenario, the pattern of results was exactly as we had predicted (see Figure 2). Of our 22 adult participants, 20 judged that Child 1 would feel most

unhappy and Child 3 least unhappy with Child 2 falling in between (order 1-2-3; 91%). None of the adult participants chose the opposite order (order 3-2-1; 0%). A Page's trend test shows a significant trend to rank the protagonists in the order 1-2-3 in adult participants ($L(3, 22) = 305$; $\chi^2(1) = 38.2$, $p < 0.001$). Of our 34 child participants, only 6 chose the order most often chosen by adult participants (1-2-3; 18%). The most common pattern amongst our child participants was to judge that Child 3 would feel the most unhappy and Child 1 the least unhappy with Child 2 falling in between (order 3-2-1; 71%). A Page's trend test shows a significant trend to rank the protagonists in the order 3-2-1 in child participants ($L(3, 34) = 441$; $\chi^2(1) = 16$, $p < 0.001$). A Fisher's exact test shows that the frequency of choice of these two main patterns of rankings (1-2-3 and 3-2-1) is significantly different between adult and child participants ($p < 0.000$).

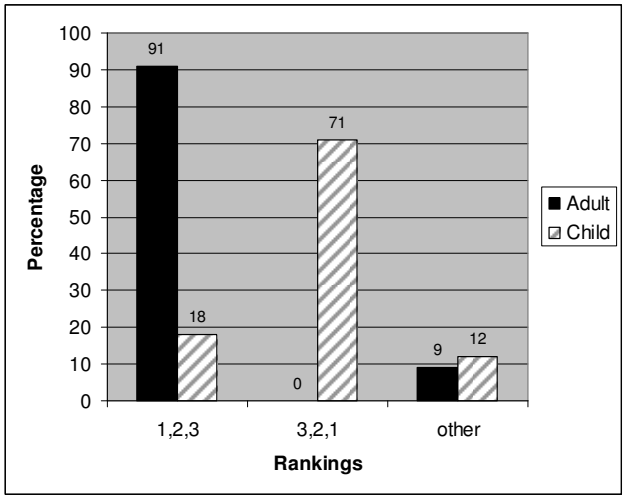

Figure 2. Pattern of rankings for the negative outcome scenario.

For the positive scenario, the pattern of results was also as we had predicted (see Figure 3). Of our 22 adult participants, 20 judged that Child 3 would feel most happy and Child 1 least happy with Child 2 falling in between (order 3-2-1; 91%). None of the adult participants chose the opposite order (order1-2-3; 0%). A Page's trend test shows a significant trend to rank the protagonists in the order 1-2-3 in adult participants ($L(3, 22) = 305$; $\chi^2(1) = 38.2$, $p < 0.001$). Of our 34 child participants, only 5 chose the order most often chosen by adult participants (3-2-1; 15%). The most common pattern amongst our child participants was to judge that Child 1 would feel the most happy and Child 3 the least happy with Child 2 falling in between (order 1-2-3; 76%). A Page's trend test shows a significant trend to rank the protagonists in the order 3-2-1 in child participants ($L(3, 34) = 449$; $\chi^2(1) = 24.7$, $p < 0.001$). A Fisher's exact test shows that the frequency of choice of these two main patterns of rankings (3-2-1 and 1-2-3) is significantly different between adult and child participants ($p < 0.000$).

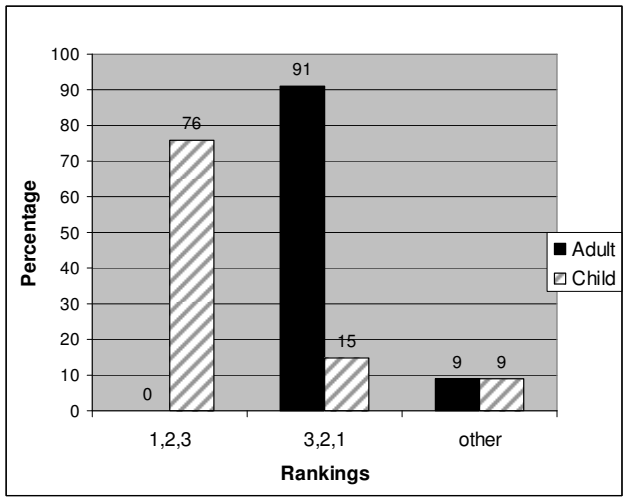

Figure 3. Pattern of rankings for the positive outcome scenario.

These results suggest that, while adults are using a comparative strategy in making their judgments, relying on the contrast between factual outcomes and counterfactual alternatives, children are adoption a different strategy. Children instead sum across outcomes, both factual and counterfactual, in making their judgments choosing as the most unhappy those with the most potential negative outcomes (for the negative scenario) and as the most happy those with the most positive outcomes (for the positive scenario).

An examination of the justifications provided by our adult and child participants also supports our predictions. For the negative scenario, all of the participants whose ranks showed the order 1-2-3 (20 adults and 6 children) referred in their justifications to a comparison between the factual outcome and the counterfactual alternatives. Those whose ranks showed the order 3-2-1 (24 children) instead focused on the outcomes, both factual and counterfactual. These participants suggested that Child 3 would be the most unhappy because none of the boxes that they selected contained a prize, and that Child 1 would be the least unhappy because 2 of the 3 boxes that they had chosen contained a prize. For the positive scenario, all of the participants whose ranks showed the order 3-2-1 (20 adults and 5 children) again referred in their justifications to a comparison between the factual outcome and the counterfactual alternatives. They indicated that Child 3 would feel relief and feel lucky at their "against the odds" win. Those whose ranks showed the order 1-2-3 (26 children) instead focused on the outcomes. These participants suggested that Child 1 would be the most happy because all of the boxes that they selected contained a prize, and that Child 3 would be the least happy because 2 of the 3 boxes that they had chosen did not contain a prize.

Discussion

The results of this experiment indicate that children integrate information about counterfactual alternatives in a different way to adults. The judgments made by our adult participants suggest that they are using the contrast between factual events and counterfactual alternatives in making their judgments. This is in line with previous work on adult counterfactual thinking (e.g., Markman, Gavanski, Sherman & McMullen, 1993; Medvec, Madey & Gilovich, 1995). The pattern of judgments made by the children in our study suggests that they do not make use of comparisons between factual events and counterfactual alternatives in making their judgments. Instead they focus on the outcomes presented, both factual and counterfactual, and base their judgments on the overall affective character of these outcomes (the proportion of positive to negative outcomes).

This experiment was designed to follow up the suggestion of Guttentag and Ferrell (2004) that children adopt such a summative strategy in their counterfactual judgments. It was explicitly designed to test for such a strategy by systematically varying the proportions of negative and positive outcomes presented to participants. We also extended the work of Guttentag and Ferrell by examining scenarios in this task with both negative and positive outcomes. This allowed us to look at children's understanding of counterfactual alternatives that are both better (upward counterfactuals) and worse (downward counterfactuals) than the outcomes of factual events.

Our hypotheses were further supported by the evidence from participants' justifications for their choices. Adult participants made reference to comparisons between what actually happened and what could have happened otherwise in their justifications. Most of the children in our study instead focused on the outcomes presented, both real and potential, and justified their choices based on the overall affective character of these outcomes. The small number of child participants who showed adult-like patterns in their judgments (6 for the negative scenario, 5 for the positive scenario), rather than focusing on the outcomes, showed evidence of making comparisons in their justifications, suggesting that their pattern of results were the result of their making similar inferences to those of the adult participants.

Why might children employ a different strategy to that of adults? We would argue that a summative strategy is simpler than a comparative strategy, as it requires only that the participant keep track of the affective status of potential outcomes. A comparative strategy, in contrast, requires not only that a participant keeps track of the affective status (positive or negative) of potential outcomes, but also that they make comparisons between them in order to make a judgment. This account is in line with other theories that suggest that take a complexity-based account of the development of children's reasoning competence (e.g., Andrews & Halford, 2002; Halford & Andrews, 2004) and apply this further to account for patterns in adult reasoning (e.g., Halford, Baker, McCredden & Bain, 2005).

Our findings have some potential practical implications. If we take the example of the road safety campaign mentioned in the introduction, our results may suggest that presenting a positive alternative of how things could have gone better may not effectively elicit the desired negative affect and intentions for future behavior that it would in adults (c.f., Roese, 1994), as these responses are dependent on a comparison between the two alternative states of affairs presented. Information campaigns aimed at children must take into account their understanding of alternative states of affairs. Further research could examine whether young children adopt similar summative strategies in other tasks where they must integrate information across multiple alternatives, for example, in judging the quality of decisions.

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