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The present study was designed to examine age differences in the understanding of counterfactual emotions and whether this understanding is reflected in social judgments that are influenced by counterfactual thinking.

Six-year-olds, 8-year-olds, 11-year-olds, and adults were presented with 4 scenarios involving two common biases observed in adults' counterfactual thinking: omission bias and temporal order bias. In each of these scenarios, 2 characters were described as making a choice that resulted in the same outcome; the only difference between the characters was their decision process. In the omission/commission scenarios, the decision of one character was framed as an act of omission whereas the other's was framed as an act of commission. In the temporal order scenarios, one character made his decision first whereas the other made his decision second. In one of the scenarios for each bias, the outcome was positive (both characters made the correct decision, resulting in a prize being won by themselves and by other students in their classes), whereas in the other scenarios the decision resulted in a negative outcome (both characters made the wrong decision, resulting in a prize being lost by themselves and by other students in their classes). Following the presentation of each scenario, participants were asked to judge which character (1) would feel worse[better], (2) be likely to be blamed[credited] by others, and (3) deserved to be blamed[credited].

The results revealed that judgments of emotions (i.e., regret & relief) and social ascriptions (others' blame or credit & deserved blame or credit) were heavily influenced

by “what might have happened” for adults whereas children’s responses were determined by reflections on only “what happened” (although some judgments of 11-year-olds resembled that of adults). In addition, the effect of counterfactual thinking biases was more pronounced in the negative outcome stories than in the positive outcome stories.

The results confirm previous evidence that counterfactual thinking ability gradually develops until late childhood. Also, the results show that the judgments of blame and credit can take more than one form by revealing a dissociation between the judgments of others’ blame[credit] and deserved blame[credit].

WHO IS TO BLAME, WHO IS TO CREDIT? COUNTERFACTUAL THINKING AND
CHILDREN'S JUDGMENTS OF EMOTIONS AND SOCIAL ATTRIBUTIONS

by

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Approved by

Committee Chair

To my mother

APPROVAL PAGE

This dissertation written by Ayse Payir and has been approved by the following committee of the Faculty of the Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Have you ever imagined how things could have been different now if you had gone to a different school? Married someone else? Left earlier to catch the flight that you just missed? Or switched the company you had worked for? This mental search for alternatives to actual outcomes is termed *counterfactual thinking* and is a prominent feature of adult thought. Importantly, counterfactual thinking affects our emotions (Roese, 2008), our social judgments (Kahneman & Miller, 1986), and how we make sense of life events (Teigen, 2010).

These alternative scenarios do not come to mind in a random fashion. Although it is possible to undo a past event in a number of ways, when and how we generate counterfactuals depends on the mutability (i.e., the ease of being undone) of a particular event (Kahneman & Tversky, 1982). Specific qualities render some events more mutable than others; negative (Gleicher et al., 1990), exceptional (Wells, Taylor, & Turtle, 1987), temporally close (Miller & McFarland, 1986), or committed (Kahneman & Miller, 1986) outcomes are more mutable than positive, typical, temporally distant, or omitted ones and accordingly, the first group of events trigger more counterfactual thinking than do the second.

Imagining alternative scenarios to actual events also leads to some specific emotions such as regret, relief, and disappointment, which are called *counterfactual emotions* (Kahneman & Tversky, 1982; Kahneman & Miller, 1986). According to Kahneman and Tversky (1982), any factor that constrains the ease of counterfactual generation should also affect *counterfactual emotions*, because these emotions also result from the comparison of reality with its alternatives. Hence, the determinants of mutability mentioned above not only influence counterfactual generation, but also our counterfactual emotions as well as our attributions of counterfactual emotions and related social judgments regarding others (as I will discuss in detail in the subsequent sections).

Although the influence of mutability on adults' counterfactual thinking is well documented, there are only a few studies which have investigated how it affects children's counterfactual thinking (Guttentag & Ferrell, 2004; Meehan & Byrne, 2005; Weisberg & Beck, 2012). Therefore, the research proposed here is designed to examine how mutability of an event affects children's judgments of others' emotions and children's judgments of blame and credit, with a focus on two common biases observed in adults' counterfactual thinking: omission bias (Gleicher et al., 1990; Landman, 1987b) and temporal order effects (Byrne, Segura, Culhane, Tasso, & Berrocal, 2000; Miller & Gunasegaram, 1990).

Determinants of Mutability and Counterfactual Emotions

As was noted above, Kahneman and colleagues (Kahneman & Tversky, 1982; Kahneman & Miller, 1986) argued that events are judged in comparison with their alternatives rather than in isolation, and this comparison ultimately gives rise to

counterfactual emotions (e.g., regret, relief, or disappointment). Roese (1993, 1995, & 2008) argued that counterfactual thinking serves two functions through these emotions: a *preparative function*, which prevents the recurrence of unpleasant events by drawing individuals' attention to their mistakes, and an *affective function*, which helps individuals feel better about less-than-optimal events that could have ended worse (Roese & Olson, 1995).

Counterfactuals are categorized into two subtypes depending on their direction, with each linked to one of the functions mentioned above (i.e., preparative vs. affective) as well as some specific emotions: *Upward* counterfactuals involve comparing reality with a better outcome, thus leading to negative emotional experiences such as *regret*, whereas *downward* counterfactuals (comparing reality with a worse possible outcome) give rise to positive affective responses such as *relief* (Roese, 1994; McMullen, Markman, & Gavanski, 1995).

Although upward counterfactuals lead to negative emotional experiences (e.g., regret, disappointment), they serve the *preparative* function by signaling the future actions which would facilitate success. Evidence for this assumption derives from a study by Markman and colleagues (Markman, Gavanski, Sherman, & McMullen, 1993), who found that participants who played a blackjack game on a computer created more *upward* counterfactuals in loss situations compared to the win or neutral situations. In addition, the participants expecting to play the game again generated more *upward* counterfactuals than did the participants who did not hold such an expectation. Thus, the authors concluded that because the information counterfactuals provide might lead to

better performance in the future, participants who lost or expected to play again created more *upward* counterfactuals.

Downward counterfactuals, on the other hand, are thought to serve the *affective* function by helping individuals derive relief from representations of possible worse outcomes. Support for this argument comes from studies that focused on survivors of trauma or a natural disaster. For instance, Teigen and Jensen (2010) interviewed the survivors of the tsunami disaster that occurred in Southeast Asia in December 2004. They found that the amount of *downward* counterfactuals participants created were 10 times more than the amount of *upward* counterfactuals they created. Similarly, rape victims have been found to draw *relief* from the idea that the outcome could have been even worse, such as ending in more serious injury or death (Burgess & Holmstrom, 1979).

The Life Events Study by Roese (1994, experiment 2) provides direct evidence for the differential role that *upward* and *downward* counterfactuals play. After describing a negative event they experienced the year before and generating either *upward* or *downward* counterfactuals that undo that event, participants in this study reported how thinking about that event made them feel. Results showed that participants who generated *downward* counterfactuals reported experiencing more positive affect than did the participants who generated *upward* counterfactuals. Moreover, participants who were asked to generate *upward* counterfactuals showed more preparative intentions than did the participants who were asked to generate *downward* counterfactuals.

Besides leading to more counterfactual thinking via rendering some events more mutable as previously discussed, biases in counterfactual thinking also intensify *counterfactual emotions*—the emotions experienced as a result of comparing what happened to what might have happened. These emotions in turn influence our future behaviors and social judgments like blaming and giving credit. In the following subsections, the two biases examined in this dissertation—omission and temporal order—are discussed via examples from the adult literature.

Omission bias. It has been found that outcomes following an action (i.e., commission) cause stronger emotional reactions than do identical outcomes following a failure to act (i.e., omission). For instance, Kahneman and Miller (1986) gave participants a story about two businessmen who own shares in two different companies. The character who has shares in company A considers switching his stock to company B but fails to do so, whereas the other character with shares in company B switches his stocks from company B to company A. At the end, both characters find out that if they had owned stock in Company B, they would have been better off. When asked which character would feel worse about the loss, the majority of participants judged that the character who switched from B to A would feel more regretful than the one who owned shares in A at the outset. Kahneman and Miller (1986) argued that because bringing conditions back to their usual states is less effortful by undoing an act rather than by adding an unperformed act, the outcomes following an act of commission lead to more regret than do outcomes following an act of omission (See also, Landman, 1987b; Gleicher et al., 1990).

Temporal order bias. Imagine a scenario in which two characters (Jon and Michael) are given a chance to win an attractive reward. If both characters pick the same color card from a shuffled deck of cards, each would win 1000 British pounds, but if they pick different colored cards, neither of them would win anything. Jon goes first and picks a red card whereas Michael, who goes next, picks a black card; thus, they end up winning nothing. When asked to mutate one event in this story to make these characters win, participants tended to alter Michael's—the second player's—choice (i.e., “if only he selected a red card”) rather than Jon's. Participants also judge that Michael would feel worse than Jon about the outcome, demonstrating the phenomenon called *temporal order bias* (Byrne et al., 2000).

The effect of temporal order has been demonstrated in daily situations as well. When participants in a study by Sherman and McConnell (1996) judged how a basketball team could have had a better season, the majority tended to alter the outcome of the last game of the season although they were explicitly warned that their judgments should reflect games of the entire season.

Several explanations have been suggested for the temporal order bias. Some authors argue that in a temporal order, later events are still fresh in working memory which would render them more available to be remembered and changed compared to earlier events (Miller & Gunesagaram, 1990). Another line of research (Byrne et al., 2000) entertained the possibility that temporal order bias might arise because the first event in a sequence of events is taken as an “anchor”, and thus is presupposed, which makes it relatively resistant to change.

A study by Byrne and colleagues (2000) found evidence for the second explanation. In their first experiment, they interrupted the temporal order of events in the story described above in such a way that a technical difficulty occurs after the first player picks the black card. Once the technical issue is resolved and game starts from the beginning, the first player changes his mind and picks the red card. The second player goes next and picks the black card, and thus nobody wins the prize. When asked to change an event to make these characters win, the participants tended to change the first player's decision, which ruled out the explanation that the most recent event is prone to change due to being fresh in the memory and showed that the first element in a sequence of events is usually presupposed, thus, resistant to change.

Counterfactual Thinking and Social Judgments

Counterfactuals have a close relationship with the attributions of causality—the marker of blame judgments. When creating counterfactuals, the most easily mutated aspect of an event is also generally perceived as the cause of that event (Sherman & McConnell, 1996), which then becomes the target for blame attributions. A study by Gavanski and Wells (1989) nicely illustrates this phenomenon: When participants were asked to imagine a scenario in which a woman dies due to an allergic reaction to the food ordered by her boss, the causal role of the boss is judged to be larger when he had the choice of an alternative meal with no allergic ingredient than when the alternative meal also included the allergic ingredient. Similarly, the causal role of a taxi driver refusing to take a paraplegic couple who later dies in a car accident was rated higher when the

alternative undid the event (the taxi driver himself safely crosses the bridge) than when it did not (the taxi driver also fell from the bridge and drowned).

Although being perceived as the cause of a negative event increases the likelihood of blameworthiness, it is not always sufficient to render an act culpable; people also take some other qualities of acts into account when making blame judgments. One such quality is the degree of control over the harmful outcome. It has been found that if perpetrators are perceived as having increased control over the outcome, they are attributed more blame and given less compensation (Goldinger, Kleider, Azuma, & Beike, 2003). The culpable blame model (Alicke, Buckingham, Zell, & Davis, 2006) explains the link between mutability and blame as follows: The awareness that the harmful outcome could have been avoided amplifies the emotional reactions of observers and whether this amplified affect will lead to blame judgments depends on the observers' perception of outcome control. If the observer concludes that the perpetrator had taken all precautions to prevent the harmful outcome but was unsuccessful, then she or he is evaluated as not culpable for what happened. On the other hand, if the observers conclude that the negative event is a result of negligence, then the perpetrator is judged as culpable and the judgments of blame increase. Thus, a mutable event will lead to greater blame only if the perpetrator is judged as having some control.

Previous research has similarly demonstrated an effect of temporal order on blame judgments. For instance, for one of the previously mentioned stories in which two characters are supposed to pick the same card to win a prize, the participants not only altered the second player's hand more than the first player's, but they also thought that

the second player would feel more regretful and would be blamed more by the first player (Miller & Gunesagaram, 1990).

Similarly, a study by Miller and Gunesagaram (1990) also demonstrated how temporal order bias is reflected in blame judgments. In this experiment, subjects were given a role of either teacher or student and asked to prepare exam questions about an article. In order to generate an effect of temporality, two conditions were created; in the *student-first* condition, student participants were made aware that they were the first to prepare the questions, whereas in the *student-second* condition, they were told that the teacher came early and prepared the questions already. The results revealed that when the questions of students and teachers did not match, students criticized a teacher more when the teacher selected the questions after they did, reflecting the tendency that the second event in a pair of events is perceived as more mutable and blameworthy than the first. They also tended to judge the questions selected by the teacher—whose questions did not match theirs—more reasonable and fairer when the teacher prepared the questions before they studied than when s/he prepared them after they studied. Moreover, when students played the role of the teachers, they picked the easier questions when they prepared them after students studied compared to when they prepared them before students begin studying, revealing how their behavior is shaped by the anticipation of blame from the students (Miller & Gunesagaram, 1990). These findings reveal that in the case of temporality bias, the judgments of regret parallel the judgments of blame.

Interestingly, a recent study (Payir, Guttentag, & Burns, 2014) revealed that people's judgments of "how much one will be blamed by others" and "how much one

deserves to be blamed” may follow a different pattern. In this study, participants attributed an amount of regret, blame by others, and deserved blame to different characters who made a decision that determined whether this character and his classmates will win a prize. The characters made their choices either by tossing a coin, deciding on their own, deciding on an option and then changing their mind, or ignoring the advice from others while making the choice, and all choices led to the same negative outcome (i.e., losing the prize). The results demonstrated a difference between the amount of *regret*, *blame by others*, and *deserved blame* across the four conditions; moreover, the amount of *regret* and *blame by others* followed a similar pattern whereas there was a dissociation between *blame by others* and *blame deserved*, with the former being greater than the latter. Interestingly, for the stories with the positive outcome (i.e., winning the prize), different conditions led to different amount of relief and credit as well, however, there was no dissociation between *credit by others* and *deserved credit*, suggesting that different factors, at least to some degree, affect judgments of blame and credit.

What accounts for the dissociation found by Payir et al. (2014) between blame by others and blame deserved? The dual process theory of moral reasoning (Greene et al., 2001) suggests that our moral judgments are under the control of two distinct mechanisms: *automatic settings* and *manual mode*. There are different types of *automatic settings*—reflexes and intuitions to name a couple—but the common feature underlying them is relying on emotions. On the other hand, *manual mode* leads to a more cognitively controlled and reflective judgment. In order to illustrate how *automatic settings* and *manual mode* differ, Greene (2014) uses the classical trolley problem

(Thomson, 1985), in which people are asked to imagine a trolley approaching five workmen, and the only possible way to save them is having one other man killed. Generally, people think that it is morally acceptable to switch the trolley to another track away from five workmen and onto one (the *switch* case); however, they think that it is morally unacceptable to throw a fat man off a footbridge in front of the running trolley to stop it killing five men (the *footbridge* case), although both of these actions have the same cost/benefit ratio. Greene (2014) argues that the answer to the *switch* case results from the manual mode (“It is okay to switch the train to save more lives.”) whereas the answer to the *footbridge* case results from the automatic settings (“It is not okay to push one to save more.”). The evidence for this reasoning comes from the neuroimaging studies revealing that the former problem leads to an activation in brain areas associated with controlled cognition whereas the latter leads to an activation in brain areas associated with emotion (Greene, 2014).

Applying dual-process theory to Payir et al.’s (2014) findings suggests that when participants made judgments of blame by others, they assumed that *automatic settings* are likely predominate as an influence on people’s moral judgments in this context; accordingly, participants judged that blame by others would be affected by the same factors as, and would closely track in intensity, feelings of regret of the scenario protagonist. In contrast, asking participants to explicitly reflect on how much blame was deserved would be likely to evoke more *manual mode* styles at analyses, resulting, in this case (in which all outcomes were actually determined by chance) in much lower ratings of deserved blame than blame by others.

As previously mentioned, the dissociation between blame by others and deserved blame was not observed regarding the paralleling judgments in positive outcome scenarios (i.e., credit by others and deserved credit). For these scenarios, credit by others and deserved credit were mostly—but not entirely—similar to the patterns of relief. It is not clear why deserved blame is different from blame by others whereas deserved credit is similar to credit by others. One explanation would be that both judgments of credit are the product of the manual mode whereas blame by others is the product of automatic settings. In any case, it is noteworthy in this context that the Payir et al. (2014) study is not the first to have found the factors that affect social judgments following positive outcomes are not always the same as the factors that affect social judgments following negative outcomes. For example, it has been found that base-rate (i.e., estimates of the probability of an outcome) information does not affect the amount of blame attributed to an immoral act whereas it affects the amount of credit attributed to a moral act (McGraw, 1987). Similarly, although situational factors have no influence on blame assigned to an immoral act, it influences how much credit is assigned to a moral act (McGraw, 1985, experiment 1), in line with the finding that mental state attributions have less influence on credit judgments than they have on blame judgments (Fincham, 1985). Although the acts described in stories used in the current study did not vary as a function of morality valence (i.e., they were neither moral nor immoral and the outcome was determined by chance) unlike the studies mentioned above, these studies are still important revealing that asymmetries occur between the judgments of blame and credit (Ross & Ditecco, 1975).

Development of Counterfactual Thinking

In 1996, Harris, German, and Mills conducted a study in which they told young children short stories involving a mishap—for instance, a girl who walks into a clean room with her muddy shoes and makes the floor dirty. After answering the questions testing their memory of the event (i.e., “Is the floor dirty now?” & “Was the floor dirty before?”), children judged whether the floor would still be dirty if the girl had taken her shoes off. This question required them to engage in counterfactual reasoning, because participants needed to imagine an alternative outcome—in which the character takes her shoes off—to an already occurred outcome in order to reach the correct judgment that “the floor would be clean”. Harris and colleagues (1996) found that children as young as 3 are capable of providing this answer.

Other studies have located the beginnings of counterfactual thinking at somewhat older ages. For instance, Riggs and colleagues (Riggs, Peterson, Robinson, & Mitchell, 1998) found that children aged 5 and younger find both counterfactual thinking and false-belief tasks equally difficult, which, according to the authors, originates from the fact that both tasks require imagining a counterfactual situation as well as being able to disengage from “here and now”. For example, in one of their stories, Peter, a firefighter, was at home when Sally went out. Next, Peter received a call and had to leave home to put out the fire in the post office. When children were asked “If there had been no fire, where would Peter be now?” (Counterfactual reasoning task) and “Where does Sally think Peter is?” (false-belief task), children aged five and younger found both tasks difficult (See also Guajardo, Parker, & Turley-Ames; 2009 for a similar pattern of results). The finding that

children with autism—a population known to experience problems in false-belief tasks—have similar difficulties with counterfactual thinking tasks (Peterson & Bowler, 2000) further supports this argument. Still other studies showed that the performance of 3-year-olds in counterfactual reasoning tasks decreases sharply when presented with positive events (German, 1999) and that they can reason counterfactually only when the task itself is relatively easy (German & Nichols, 2003).

Taking an individual differences approach, some researchers (Beck, Riggs, & Gorniak, 2009; Beck et al., 2011; Burns, Riggs, & Beck, 2012) argued that the degree to which executive function (EF) abilities play a role in counterfactual reasoning can inform us about the nature of the difficulty children experience in counterfactual (CF) reasoning tasks. Using a battery of CF and EF (inhibitory control & working memory) tasks, Burns and colleagues (2012) found that inhibitory control, but not working memory, predicted children's performance on CF tasks.

Rafetseder and colleagues (Rafetseder & Perner; 2014) have argued that the studies demonstrating counterfactual reasoning by children younger than 6 failed to control for the possibility that children could have been relying on basic, non-counterfactual forms of reasoning. For instance, Rafetseder and colleagues argued that when children reach the conclusion that “the floor would be clean if Carol had taken her shoes off” (Harris et al, 1996), they simply made use of the well-known fact that “if people take their dirty shoes off when entering a clean room, floors will stay clean” rather than simulating the counterfactual world in which Carol takes her shoes off. This argument received support when only a small percentage of 5-year-olds reached the

correct conclusion (that the floors would still be dirty) after adding a second character—who walks after Carol did and makes the floor dirty—to the original story. Thus, Rafetseder and colleagues concluded that counterfactual reasoning develops gradually and is not fully achieved before the age of 12.

Development of Counterfactual Emotions

The realization that an unpleasant experience could have been avoided results in feelings of regret, whereas the realization that a potentially aversive outcome has just been avoided leads to an experience of relief. Children's *experience* of regret and relief has usually been studied in the context of a chance game where children make (or witness others make) a choice between different options and rate how they (or others) feel about the choice they (or others) made at different points: once after the disclosure of the chosen option and once following the disclosure of the unchosen option. In an initial series of studies using this procedure, Amsel and Smalley (2000) found that the information about the alternate state of affairs—the unchosen box including either a better (regret trials) or worse (relief trials) prize—did not lead to a decrease or an increase in children's ratings of their own and others' happiness for children aged 5 or younger, revealing that they neither experience nor understand regret and relief until age 6 or older.

Using the same procedure, Weisberg and Beck (2010) found that at around the age of 5 to 6, children begin to feel less happy about their choice when the alternate option includes a better prize; they experience regret although there is no attribution of regret to others up to the age of 7. Their relief trials revealed that before the age of 7,

children neither feel relieved nor attribute relief to others upon realizing that the alternate option leads to a worse outcome. Although Weisberg and Beck (2012) found an earlier age for the experience of regret (at age 4) and relief (at age 5) in a later study using a different scale for the second emotion rating (after revealing the content of the unchosen option), studies which also controlled repeated questioning (O’connor, McCormack, & Feeney, 2012; Burns et al., 2012) found no evidence for the experience of regret up to the age of 6.

Not surprisingly, the experiments conducted by Rafetseder and Perner (2012) did not demonstrate an experience of regret before the age of 9. As previously mentioned, these authors argued that the so-called lag between reasoning counterfactually and experiencing counterfactual emotions is due to the spurious results created by the tasks which do not really require children to compare the actual state of affairs with the alternate ones (Rafetseder et al., 2012; 2014, Perner & Rafetseder, 2011). Indeed, the authors provided some convincing evidence that the studies claiming to find an earlier age for regret provide the evidence for the experience of frustration—the experience of which, unlike regret, does not require a comparison between what happened and what might have happened—rather than regret (Rafetseder et al., 2012).

In order to investigate how children make judgments of regret and relief *in others*, Guttentag and Ferrell (2004) presented children with stories about two characters who need to decide between two courses of action. Each story was different only in terms of the characters’ context of decision-making: One character did the things that he or she typically does, whereas the other character chose to act atypically. The participants’ task

was to judge which character would feel worse about the outcome or whether they should feel the same. Guttentag and Ferrell (2004) found that children aged 7 years or older thought the character whose decision were framed as atypical would feel worse than the character whose decision was framed as typical. However, 5-year-old children judged that both characters should feel the same about what happened, thus showing no signs of the understanding of regret at age 5. Similarly, in a second experiment, the researchers found that when judging two characters who experienced the same negative outcome, children aged 7 years or older thought that the character whose decision was framed as an act of commission would feel worse than the character whose decision was framed as an act of omission, whereas 5-year-old children judged that both characters would feel the same.

Mutability and Children's Counterfactual Thinking

To our knowledge, there is only one developmental study (Guttentag and Ferrell, 2004) that investigated whether children's thinking is prone to the typicality bias. As mentioned in the above section, Guttentag and Ferrell (2004) found that children aged 7 years or older showed typicality bias by thinking that the character whose decision were framed as atypical would feel worse than the character whose decision was framed as typical. However, 5-year-old children thought both characters should feel the same about the outcome, thereby showing no signs of typicality bias. In the same study, the researchers also found that up to the age of 5, children are not prone to the omission bias at least when making judgments regarding the emotions of others; they judged that two characters would feel the same in result of the same negative outcome although one

character's decision was framed as an act of commission whereas the other's was framed as an act of omission.

Meehan and Byrne (2005) conducted the first study which examined the effect of temporal order in young children's counterfactual thinking. Using the card game story previously described, they investigated whether 6- and 8-years-old children are sensitive to the standard temporal order effect. Their results showed that both age groups showed the temporal order effect, thus, they tended to change the second player's decision rather than the first. This study also investigated how temporality affects children's judgments of emotions (regret) and social attributions (blame), which will be discussed in the following sections.

Counterfactual Thinking and Children's Judgments of Emotions and Social Attributions

What clues do children rely on when they make attributions of regret, relief, blame, credit, or victim compensation? Does counterfactual thinking have any effect on these judgments? Unfortunately, the developmental studies that link counterfactual thinking and social judgments are quite scarce—excluding the studies that concerned how children attribute *counterfactual emotions* to others that I discussed previously—and the research focusing on these judgments mostly study them from a moral development perspective.

Traditionally, there is a dichotomy in terms of what children take into account when making moral judgments. One perspective—in accordance with Piaget (1932, as mentioned in Nobes, Panagiotaki, & Pawson, 2009)—argues that *outcome* is the most

important determinant of the moral judgments children make; yet, another line of research states that Piaget underestimated the sophistication of children's judgment, for which *intention* is the major decision point (Nobes et al., 2009).

In order to understand the factors that children rely on when making moral judgments, researchers studying moral development design experiments where children decide whether an act is acceptable or not. In one of these studies (Zelazo, Helwig, & Lau, 1996), adults and 3-, 4-, and 5-year-olds judged whether a behavior was acceptable and assigned punishment to the perpetrator (either punish or not) in both normal (e.g., hitting causes the animal to cry & petting makes the animal smile) and noncanonical (i.e., hitting makes the animal smile & petting makes the animal cry) scenarios focusing on *physical* harm. The results showed that although all participants based their judgments of acceptability relying in part on outcome, with age, there was an increasing sensitivity to intention information. There were age differences in punishment judgments as well; adults and 5-year-olds tended to use the conjunction rule (punish when both the intention and outcome is negative) whereas the two younger age groups tended to rely only on either intention or outcome. According to the authors, these results show that young children's moral judgments operate via some underlying moral concepts such as harm, which help children create moral rules that can be generalized across situations. The same pattern of results was found in a follow-up study, which focused on *psychological* harm using the same procedure described above (Helwig, Zelazo, and Wilson, 2001).

On the other hand, a recent study by Nobes et al. (2009) demonstrated that intention is the major influence on children's moral judgments (i.e., acceptability of an

accidental act) and outcome—along with negligence—affect these judgments only when the act is deliberate or intended. According to these authors, previous studies, which attributed a greater role to the outcome, confounded outcome and negligence; when the outcome was negative, children—who have a tendency to think that everything can be foreseen, hence, prevented—assumed that the agent was careless.

In one of the two developmental studies which focused the relationship between counterfactual thinking and social judgments, Meehan and Byrne (2005) examined the role of temporal order on children’s regret and blame judgments. This study showed that, starting from the age 6, children are prone to the temporal order effect—previously demonstrated in adults’ “if only” judgments and regret attributions. However, for 6-year-olds, there was a dissociation between “if only” thoughts and the judgments of guilt and blame: Although 6-year-olds also had a tendency to alter the second player’s decision, they did not show any preference for “who feels more guilt” or “who will be blamed more by the other”. According to the authors, this dissociation may be an indication that their counterfactual thinking is still under development.

A study by Powell, Derbyshire, and Guttentag (2012) examined the extent to which three moral principles—omission, physical contact, and intention—affect judgments of children and adults. In their first experiment, they investigated the role of omission bias in moral judgments using two different kinds of stories about a switch operator who makes a decision about pulling (commission) or not pulling (omission) a switch to make a train move to a different track. In harm-only stories, the negative outcome (i.e., one child getting splashed) occurs due to either omission (i.e., the switch

operator does not pull the switch causing the train to pass across a puddle splashing water) or commission (i.e., the switch operator pulls the switch which makes the train move to a different track splashing water). In harm/benefit stories, on the other hand, the same behaviors of the switch operator (i.e., not pulling the switch/omission, pulling the switch/commission) lead to a benefit (i.e., saving 5 kids from getting splashed) in addition to causing harm (i.e., getting one child splashed).

The results revealed that, for all ages, the switch operator's behavior is judged as worse in harm-only stories. Interestingly, 5 to 6 year-olds continued to judge the operator's behaviors as bad in harm/benefit stories as well, whereas 7 to 8 year-olds and adults judged the operator's behaviors as good in these stories. In terms of omission bias, participants from all age groups judged commission as worse in harm-only stories, thus providing evidence for the existence of this bias in moral judgments for all ages. However, young children's responses differed from older children's and adults' for harm/benefit stories: Although adults and the 7-8 year-olds concluded commission as better when the operator switched to splash one child while saving other five, the 5-6 year-olds did not exhibit any preference between omission and commission in harm/benefit stories, judging both operators' behavior as equally good or bad.

Present Study

Mutability in counterfactual thinking affects several aspects of psychological functioning; biases that render some outcomes more mutable than others modify our emotional expression and interpretation of situations, our decision-making, and our judgments of others. Thus, our personal and social lives are greatly influenced by

mutability generated by these biases, and yet we do not know very much about how these biases develop and how they manage to exert their influence.

Studying the development of counterfactual thinking biases that determine mutability can help us understand their origin: Do they emerge together with the ability to think counterfactually, or are they derived from other aspects of development (Beck et al., 2014)? If these biases emerge with the ability to think counterfactually, then children should show these biases as soon as they start to engage in counterfactual thinking. On the other hand, if they derive from some other aspect of development, then these biases may be partially dissociated from the development of counterfactual thinking and may only emerge as children gain more experience with counterfactual thinking. Hence, the biases and counterfactual thinking should not necessarily emerge at the same point in development.

The studies conducted so far (Guttentag & Ferrell, 2004; Meehan & Byrne, 2005; Weisberg & Beck, 2012) have found age differences in the extent to which these biases affect judgments, thus supporting the second notion that children's reasoning is prone to these biases only after they are first able to engage in counterfactual thinking. However, the number and scope of these studies are limited, which calls for further study. Hence, the overarching goal of this study was to examine the developmental change in the ability to understand the situations which create regret and relief in others, and the degree to which this understanding reflected in social judgments such as blame and credit.

Using two different outcomes (i.e., negative & positive), the effect of mutability on children's judgments of counterfactual emotions and social attributions were

investigated via two factors that have been found to affect mutability: omission and temporal order. In the omission/commission scenarios, the choice of one character was framed as an act of omission whereas the other's was framed as an act of commission. In the temporal order scenarios, one character made his choice first whereas the other made his choice second. In the positive outcome scenarios, both characters win a prize whereas in the negative outcome scenarios, both characters lose a prize as a result of the choices they made. After each story, participants were asked to make judgments of who would feel worse[better], who would be blamed[credited] more by others, and who deserves more blame[credit].

Based on the previous literature, it was predicted that adults and older children will take “what might have happened” into account when making their judgments. Hence, they will mostly pick the target response reflecting the effect of mutability—created by omission/commission and temporal order biases—on their social judgments. On the other hand, because younger children will heavily rely on “what happened” when responding, they will not provide the target response significantly more than other responses revealing no effect of mutability on their judgments. It was specifically hypothesized that the mutability has the following effects on the judgments of participants:

- (1) Among all age groups, 6-year-olds will be the least likely to judge that the target character would feel worse[better] and would be blamed[credited] more by others; the majority of 6-year-olds will distribute regret[relief] and blame[credit] by

others equally between the two acts (i.e., omitted vs. committed & first vs. second).

- (2) Starting from age 8, the majority of child participants will judge that the target character would feel worse[better] and would be blamed[credited] more by others. However, there will be some significant age differences regarding this ability: 11-year-olds will be more likely than 8-year-olds to make this judgment.
- (3) The influence of mutability will be attenuated in positive outcome stories compared to negative outcome stories; however, this effect will be reflected on the responses of 11-year-olds and adults only.
- (4) There will be a dissociation between blame by others and deserved blame judgments: Participants' judgments will be more likely to be influenced by mutability when they make judgments about others' blame compared to when they make judgments about deserved blame. Hence, others' blame judgments will lead to more target responses than deserved blame judgments. We have no strong prediction for a similar dissociation between credit by others and deserved credit judgments.

The present study contributes to our understanding of the development of counterfactual thinking in several important ways. First, this is the only study that examines the effects of two different factors known to affect mutability—omission and temporal order—within the context of a similar set of scenarios, and these biases were studied here via their effects on both emotions and social judgments (e.g., regret &

blame), permitting us to assess whether these two forms of judgments are affected by event mutability factors in similar ways across age.

Second, the present research extends previous findings by examining whether counterfactual thinking biases in children operate differently in positively versus negatively charged outcomes. A study from our lab (Payir et al., 2014) found that credit judgments do not follow the pattern of blame judgments and that judgments regarding the amount of blame thought to be attributed by others differs from the amount of blame that is judged to be actually deserved. The present study is the first to inspect these dissociations (originally observed in adults' emotional and social judgments) in children's judgments.

CHAPTER II

METHOD

Participants

The child participants were 18 6-year-olds (8 females, $M = 6.62$ years, $SD = .42$ years, range = 6.03 years – 6.92 years), 20 8-year-olds (10 females, $M = 8.44$ years, $SD = .34$ years, range = 8 years – 8.99 years), and 19 11-year-olds (14 females, $M = 11.48$ years, $SD = .34$ years, range = 11 years – 11.95 years). One 6-years-old and one 8-years-old could not participate in the second of two testing sessions, so they could not provide their responses for the positive outcome stories. All Participants were recruited from a private school and provided parent consent for participation.

Adult participants were 72 undergraduate students (50 females) who participated for course credit.

Materials

Appendix B includes the four stories and task questions that were used in the study. In two of these stories (omission/commission story 1 & temporal order story 1) two students and their classmates experience a negative outcome as a result of the choices these two students make. Although the students and their classmates experience the same negative outcome (not winning a prize) in each story, the actions of one character (the target character) was rendered more mutable than the other's: In the

omission/commission story, the target character switches from one choice to the other (commission) whereas the other does not (omission). In the temporal order story, one character makes his choice first whereas the other (the target character) makes his choice second.

After each story, the participants were asked to answer (1) whether one character would feel worse than the other about their choice or they would they feel equally bad, (2) whether one character would be blamed more than the other by their classmates or they would they be blamed equally, and (3) whether one character deserves more blame than the other or do they deserve equal blame. Participants were also asked to explain their responses to each of these questions.

In the remaining two stories (omission/commission 2 & temporal order 2), two students make a choice that leads to a win for themselves and their classmates. As in the negative outcome stories, the characters in each story experience the same outcome (winning a prize) and one character's choice was rendered more mutable than other's using the same procedure described above. After each of the positive outcome stories, the participants answered the following questions: (1) whether one character would feel better than the other about their choice or would they feel equally good, (2) whether one character would be credited more than the other by their classmates or would they be credited equally, and (3) whether one character deserves more credit than the other or do they deserve equal credit. Participants were also asked to explain their responses to these questions.

With children, the experimenter used puppets, cards, and boxes (see Appendix C) to act out the flow of the events as she read each story. The puppets were designed in a way that did not depict the emotional reactions of the characters. In order to include both genders in the stories, the characters in the omission/commission stories were presented as females whereas the characters in the temporal order story were presented as males. The names of the characters were clearly written on each puppet.

Procedure

All participants received the four stories and their accompanying questions as described above. Each participant received either the two positive outcome stories first or the two negative outcome stories first. The order of positive versus negative outcome stories was counterbalanced as best as possible across participants at each age. Similarly, the ordering of the story type (omission/commission vs temporal order) was counterbalanced as best as possible across participants at each age, such that if a participant received the positive omission/commission story before the positive temporal order story, that participant also received the negative omission/commission story before the negative temporal order story. All participants were asked the task questions in the same order for all stories: (1) emotion question, (2) blame or credit from others question, (3) deserving blame or credit question.

The task procedure was adjusted slightly to meet the response ability level of participants in each age group. Adults received booklets that included the four stories. Each story was printed on a separate page with their accompanying questions. After each story, adults were reminded about the key elements of the story before being presented

with the questions and at the end of each question, space was provided for them to write their answers. They completed the study in a single setting as one group in their classroom.

Because testing children for negative and positive outcome stories at a single session would be exhaustive for them, child participants completed the study in two sessions held between one and two weeks apart. Six and 8-year-olds were tested individually in a quiet room in their school. The experimenter told the stories using puppets to depict the flow of the events. After each story, the experimenter reminded children about the key elements of the story via asking comprehension questions (e.g. “So, Amy picked which box?”) and any wrong answers were corrected at this time. Children answered the task questions in any way that they desired (i.e., by pointing, by calling out a name, or by using the puppets) and the experimenter kept a written record of responses. A slightly different procedure was used with 11-year-olds, who were tested in groups of 2 to 4 in a quiet room in their school. They were provided with the booklets that adults received and instructed to listen to the experimenter as she told the stories using the puppets. After reminding the children about the key elements of the story, the experimenter asked each task question in the order described above. After every question, experimenter waited for each child to write their response before posing the next question.

CHAPTER III

RESULTS

Preliminary Analyses

Gender effects. A preliminary analysis revealed that there were no significant effects of gender on participants' judgments of emotions or their judgments of blame and credit. Accordingly, gender was not included as a variable in any of the analyses described below.

Order effects. A preliminary analysis also revealed that there was no significant effect of story order on participants' judgments. Accordingly, story order was not included as a variable in any of the analyses described below.

Outcome effects. Paired t-tests were run between the judgments of regret vs. relief, blame by others vs. credit by others, and deserved blame vs. deserved credit in order to assess whether the effect of mutability was more pronounced in negative outcome stories than it was in positive outcome stories. Participants were given 1 point if they had selected the target response and 0 if they had selected any other response (nontarget & equal).

The paired t-tests revealed that participants were more likely to attribute regret ($M = .64, SD = .48$) than to attribute relief ($M = .46, SD = .50$) to the target characters, $t(253) = 5.44, p < .01$. They were also more likely to attribute *blame* ($M = .59, SD = .49$) than to

attribute credit ($M = .26, SD = .44$) to the target characters, $t(253) = 9.73, p < .01$ and thought that the target characters deserve blame more ($M = .18, SD = .38$) than they deserve credit ($M = .11, SD = .11$), $t(253) = 2.52, p < .05$. Accordingly, separate analyses were conducted for responses to the positive outcome vs. the negative outcome stories.

Story Effects. In order to test whether the effect of mutability was more pronounced in one type of story than the other, a paired t-test was run to compare the judgments of regret[relief], blame[credit] by others, and deserved blame[credit] across the omission/commission and temporal order stories using the same scoring procedure above.

The mean for the judgments of regret did not differ across the stories; however, the mean for blame by others judgments was higher in the temporal order story ($M = .65, SD = .48$) than in the omission/commission story, ($M = .51, SD = .50$), $t(128) = 2.62, p = .01$. The means for the judgments of deserved blame for the two stories were not significantly different.

In terms of positive outcome stories, the mean of relief in the temporal order story ($M = .54, SD = .50$) was significantly higher than the mean of relief in the omission/commission story ($M = .39, SD = .49$), $t(126) = 3.20, p = .01$. The temporal order story also led to higher credit by others judgments ($M = .54, SD = .50$) compared to the omission/commission story ($M = .15, SD = .36$), $t(126) = 4.79, p = .01$. The same pattern of difference was observed between the two stories for the judgments of deserved credit ($M = .17, SD = .38$ vs. $M = .05, SD = .21$), $t(126) = 3.26, p = .01$. Because of the

differences that were found between the two types of stories, we analyzed each story type separately.

Age Differences in Judgments of Emotions and Social Attributions

Negative outcome stories. Table 1 presents the percentage of participants at each age providing each type of response—target, nontarget, and equal—in each story for the judgments of regret, blame by others, and deserved blame. In the omission/commission story, the target character was the one whose choice was framed as an act of commission and in the temporal order story, the target character was the one who made his decision second.

Because the focus was on the effect of mutability, hence the amount of “target response”, the responses other than “target” were combined into a single “other” category and a 4 (ages) x 2 (Target vs. Other responses) chi-square analysis was conducted for each judgment type—regret, blame by others, and deserved blame.

Omission/Commission story. There was a significant age difference for judgments of *regret*, $\chi^2(3, N = 129) = 36.38, p < .01$. Paired comparisons revealed that the percentage of 6-year-olds, $\chi^2(1, N = 90) = 32.47, p < .01$, 8-year-olds, $\chi^2(1, N = 92) = 16.70, p < .01$, and 11-year-olds, $\chi^2(1, N = 91) = 6.55, p = .01$, who thought that the target character would feel worse was significantly smaller than the percentage of adults who made that judgment. Also, significantly fewer 6-year-olds than 11-year-olds concluded that the target character would feel worse, $\chi^2(1, N = 37) = 6.68, p = .01$. The differences between the regret judgments of 6- and 8-year-olds and 8- and 11-year-olds were not significant.

The judgments of blame by others revealed a similar pattern of responses. There was a significant age difference, $\chi^2(3, N = 129) = 37.90, p < .01$, and pairwise comparisons yielded the following results: The percentage of participants in each child group who concluded that the target character's classmates would blame the target character more than the non-target character was significantly smaller than the percentage of adults who provided that response, $\chi^2(1, N = 90) = 27.79, p < .01$, $\chi^2(1, N = 92) = 19.09, p < .01$, and $\chi^2(1, N = 91) = 6.75, p < .01$, for the comparisons of the adults with the 6-year-olds, 8-year-olds, and 11-year-olds respectively. Also, the percentage of 11-year-olds who provided the target response was significantly greater than the percentage of 6-year-olds who provided that response, $\chi^2(1, N = 37) = 6.71, p = .01$. None of the other pairwise comparisons were significant.

In marked contrast with the analyses of regret and blame by others, a chi-square analysis for the judgments of *deserved blame* did not reveal any significant age differences in patterns of responding.

Additional analyses were run to test the hypotheses that the judgments of regret will resemble the judgments of others' blame and that judgments of others' blame will differ from the judgments of deserved blame. As hypothesized, there was no significant difference between the judgments of regret and others' blame whereas judgments of deserved blame led to significantly less target responses compared to others' blame, $\chi^2(1, N = 258) = 25.57, p < .01$. When individual tests for each age group were conducted to see which group's responses differed between the judgments of others' blame and

deserved blame, we found that this was the case for the adults, $\chi^2(1, N = 144) = 36.03, p < .01$, and the 11-year-olds, $\chi^2(1, N = 38) = 4.89, p < .05$.

Temporal order story. A chi-square analysis revealed a significant age difference for judgments of regret, $\chi^2(1, N = 129) = 12.759, p < .05$. Pairwise comparisons revealed that a greater percentage of adults than 6-year-olds, $\chi^2(1, N = 90) = 11.25, p < .01$, and 8-year-olds, $\chi^2(1, N = 92) = 4.621, p < .05$, concluded that the target character would feel worse about losing the prize. Also, a greater percentage of 11-year-olds than 6-year-olds judged that the target character would feel worse and this difference was marginally significant, $\chi^2(1, N = 37) = 3.29, p = .07$.

The pattern of judgments for blame by others resembled the judgments of regret. There was an overall significant age difference, $\chi^2(3, N = 129) = 13.13, p < .01$. The percentage of 6-year-olds who concluded that the target character will be blamed more was significantly smaller than the 11-year-olds, $\chi^2(1, N = 37) = 4.56, p < .05$, and adults, $\chi^2(1, N = 90) = 12.22, p < .01$, whose patterns of responses did not differ from each other. Although fewer 8-year-olds picked the target response compared to adults (55% vs. 76%) as observed for the judgments of regret, this difference was only marginally significant, $\chi^2(1, N = 92) = 3.53, p = .06$.

As was found with responses to the omission/commission story, there were no significant age differences in patterns of response for the judgments of *deserved blame*.

Additional analyses were run to compare the judgments of regret with judgments of others' blame and the judgments of others' blame with the judgments of deserved blame. There was no significant difference between the judgments of regret and others'

blame as expected whereas judgments of deserved blame led to significantly less target responses compared to others' blame, $\chi^2 (1, N = 258) = 70.17, p <.01$. When individual tests for each age group were conducted, it was found that the responses of adults, $\chi^2 (1, N = 144) = 68.29, p <.01$, 11-year-olds, $\chi^2 (1, N = 38) = 6.76, p <.01$, and 8-year-olds, $\chi^2 (1, N = 40) = 3.75, p = .05$, differed between these two judgments.

Positive outcome stories. Table 2 represents the percentage of participants at each age providing each type of response—target, nontarget, and equal—in each story for the judgments of relief, credit by others, and deserved credit. As in the negative outcome stories, for the omission/commission story, the target character was the one whose choice was framed as an act of commission and for the temporal order story, the target character was the one who made his decision second. As was done with the negative outcome stories, the responses other than “target” were combined into a single “other” category for chi-square analyses, and a 4 (ages) x 2 (Target vs Other responses) chi-square test was conducted for each judgment type separately for each story.

Omission/Commission story. A chi-square revealed a significant age difference for the judgments of relief, $\chi^2 (3, N = 129) = 17.91, p <.01$. Pairwise comparisons revealed that the percentage of adults who judged that the target character would feel better was higher than the percentage of 6-year-olds, $\chi^2 (1, N = 90) = 9.95, p <.01$, 8-year-olds, $\chi^2 (1, N = 92) = 8.90, p <.01$, and 11-year-olds, $\chi^2 (1, N = 91) = 4.67, p <.05$, who provided that response. The comparisons between the child groups were not significant.

The judgments of credit by others revealed a similar pattern of responses. There was an overall significant age difference, $\chi^2 (3, N = 129) = 13.44, p <.01$. Pairwise

comparisons revealed that the amount of adults who chose the target response was significantly greater than 6-year-olds, $\chi^2 (1, N = 90) = 5.36, p <.05$, and 8-year-olds, $\chi^2 (1, N = 92) = 5.92, p <.05$, and the difference between 11-year-olds and adults was marginally significant, $\chi^2 (1, N = 91) = 3.55, p = .06$.

Once again, there was no significant age difference for the judgments of *deserved credit*.

Additional analyses were run to compare the judgments of relief with judgments of others' credit and the judgments of others' credit with the judgments of deserved credit. There was a significant difference between the judgments of relief and others' credit, $\chi^2 (1, N = 254) = 18.07, p <.01$, and an additional analysis showed that only responses of adults revealed that difference, $\chi^2 (1, N = 144) = 12.81, p <.01$. There was also a significant difference between the judgments of others' credit and deserved credit, $\chi^2 (1, N = 254) = 7.50, p <.01$, and once again, only adults' responses reflected a significant difference between these two judgments, $\chi^2 (1, N = 144) = 8.74, p <.01$.

Temporal order story. There was a significant age difference for the judgments of relief, $\chi^2 (3, N = 129) = 15.99, p <.01$. Pairwise comparisons revealed that the percentage of adults who judged that the target character would feel better than the nontarget character was greater than the percentage of 6-year-olds, $\chi^2 (1, N = 90) = 9.33, p <.01$, 8-year-olds, $\chi^2 (1, N = 92) = 9.11, p <.01$, and 11-year-olds, $\chi^2 (1, N = 91) = 4.86, p <.05$, who provided the same response.

The analysis for the judgments of *credit by others* also revealed an overall significant age difference, $\chi^2 (3, N = 129) = 12.355, p <.01$. Pairwise comparisons showed

that more adults compared to 6-year-olds, $\chi^2(1, N = 90) = 3.98, p < .05$, and 8-year-olds, $\chi^2(1, N = 92) = 9.63, p < .01$, judged that the target character would be credited more.

As observed with previous stories, an analysis for deserved credit judgments did not yield a significant age difference.

As done with the omission/commission story, additional analyses were run to compare the judgments of relief with the judgments of others' credit and the judgments of others' credit with the judgments of deserved credit. There was a significant difference between the judgments of relief and others' credit, $\chi^2(1, N = 254) = 6.99, p < .01$. An additional analysis showed that only the responses of adults showed that difference, $\chi^2(1, N = 144) = 5.66, p < .05$. There was also a significant difference between the judgments of others' credit and deserved credit, $\chi^2(1, N = 254) = 13.07, p < .01$. Again, it was only adults whose responses differed between these two judgments, $\chi^2(1, N = 144) = 13.39, p < .01$.

Explanations

The responses to the request for an explanation by the participants who selected one of the characters in response to each question (rather than responding "the same" or "equal") were classified into one of the three following categories:

(1) Alternative/Choice: The explanation involves a reference to the alternative outcome or the choice of the character (e.g., "Barb[Lia] would feel worse[better], because she picked the right[wrong] box at the beginning but then she switched", "Rob[Tom] would be blamed[credited] more/deserves more blame[credit], because they could have won[lost] if he had picked the other card"), (2) Other: The explanation involves some

element of the story or something that is made up by the participant (e.g., “Barb[Lia] would feel worse[better], because her parents are poor and they needed the money”, or “Their friends really wanted them to win”), or (3) No explanation.

The explanations of participants who responded that the two characters would feel the same and would be blamed[credited] equally were also divided into 3 categories: (1) Same Outcome: the explanation involves a reference to the fact that both characters experienced the same outcome (e.g., “they would feel equally bad[good] because they both lost[won]”, or “they both lost[won] for everyone), (2) Alternative/Choice: the explanation involves a reference to the alternative outcome or the choices of the characters (e.g., “One switched and the other did not” or “If they had not picked the same card, they could have lost”), or (3) No explanation.

Although the above categories were sufficient for the categorization of explanations that were provided to the emotion and blame/credit from others questions, an initial inspection of the explanations that were provided in response to the deserved blame/credit question indicated that these questions elicited somewhat different kinds of explanations from those provided to the other questions. Hence, deserved blame/credit explanations were grouped into one of the following categories: (1) Same outcome: the explanation involves a reference to the fact that both characters experienced the same outcome (e.g., “they both made wrong choices”), (2) Chance/Probability: the explanation involves a reference to the fact that it is a game of chance or the odds were the same for both characters (e.g., “It was a 50/50 chance for both” or “they were equally likely to win”) (3) Social Conventions: the explanation involves a reference to social rules of

fairness or niceness (e.g., “it would not be fair to blame[credit] one more than the other”, “The other would feel sad if he is blamed more”), or (4) No explanation.

A second coder who was blind to the hypotheses coded 36 randomly selected explanations after receiving training for the coding system. The agreement between the first and second coder was high (Cohen’s $K = 0.84$). Because the number of responses in some categories was small, the explanations were collapsed across the two story types for each of the positive and negative outcome pairs of stories for the following statistical analyses.

Negative outcome stories. Table 3 represents the justifications provided for each response type (target, nontarget, & equal) at each age.

Judgments of regret. All participants who thought that the target character would feel worse justified their response with a reference to the alternative outcome or the choice of the character, with the exception of one 8-year-old. When the nontarget character was picked, again, making a reference to the alternative outcome or the choice of the character was the most common justification.

When the judgment was “equally bad”, the majority of the participants made a reference to the fact that both characters experienced the same outcome although some 6-year-olds (19%, 4 of 21 instances) did not provide any explanation. The percentage of participants who made a reference to the fact that the outcome was the same for both characters was 76% (16 of 21 instances) for the 6-year-olds, 89% for 8-year-olds (16 of 18 instances), 93% for 11-year-olds (14 out of 15 instances), and 96% for adults (27 of 28 instances).

Judgments of blame by others. When participants judged that the target character will be blamed more than the nontarget character by their classmates, participants almost always justified their response by making a reference to the alternative outcome or the choice of the target character. The percentages for such a justification was 86% for 6-year-olds (6 of 7 instances), 93% for 8-year-olds (14 of 15 instances), 95% for 11-year-olds (20 of 21 instances) and 100% for adults (108 of 108 instances). When the nontarget character was chosen as a response, again, a reference was made to the alternative outcome or the choice of the characters most of the time.

When participants judged that both characters would be blamed equally, the common justification was a reference to the fact that the outcome was the same for both characters. The percentages for each age group who provided such a justification were 59% for 6-year-olds (13 out of 22 instances), 88% for 8-year-olds (21 out of 24 instances), 85 % for 11-year-olds (11 out of 13 instances) and 88% for adults (30 out of 34 instances). A group of 6-year-olds (36%, 8 out of 22 instances) and a few 8-year-olds (13%, 3 out of 24 instances) did not provide any explanation for their equal blame response whereas some adults (12%, 4 out of 34 instances) made a reference to the alternative outcome or the choice of the character.

Judgments of deserved blame. All participants who picked the target character justified their response with a reference to the alternative outcome or the choice of the character except 6-year-olds (75%, 6 out of 8 instances). Only 3 participants (two 6-year-olds and one 8-years-old) concluded that the nontarget character deserves more blame.

The justification for this response always involved a reference to the alternative outcome or the choice of the target character.

Justifications of equal deserved blame led to a different pattern of responses for each age group. Six-year-olds justified this response either with reference to the fact that both characters experienced the same outcome (50% of the time, 13 of 26 instances), or by making a reference to social conventions (15%, 4 of 26 instances) and for 35% of the instances (9 out of 26), they did not provide any explanation. Eight-year-olds explained their equal deserved blame response by the following justifications: both characters experienced the same outcome (56%, 18 of 32 instances), it was just a game of chance (3%, one of 32 instances), it is not nice or fair to blame one more than the other (28%, 9 of 32 instances), or no explanation (13%, 4 of 32 instances). Eleven-year-olds' explanation for equal deserved blame response was explained by a reference to the fact that both characters experienced the same outcome for 36% of the time (11 of 31 instances), by a reference to the fact that it was just a game of chance or probability for 26% of the time (8 of 31 instances), and via a reference to social conventions for 36% (11 of 31 instances) of the time. For adults, the equal deserved blame judgments were justified by the following: a reference to the fact that both characters experienced the same outcome (40%, 48 of 120 instances), a reference to the fact that it was just a game of chance (45%, 54 of 120 instances), by a reference to social conventions (14%, 17 of 120 instances), no explanation (1 %, 1 of 120 instances).

A 4 (age) X 4 (justification) chi-square test revealed that there was a significant age difference for the justifications of equal deserved blame, $\chi^2(4, N = 209) = 69.99, p$

<.01. Pairwise comparisons revealed that 6-year-olds differed from 11-year-olds, $\chi^2 (3, N = 67) = 18.73, p = .01$, and adults, $\chi^2 (1, N = 156) = 43.65, p < .01$. Similarly, 8-year-olds also differed from both 11-year-olds, $\chi^2 (3, N = 71) = 11.79, p < .01$, and adults, $\chi^2 (3, N = 160) = 29.25, p < .01$. Lastly, 11-year-olds significantly differed from adults, $\chi^2 (3, N = 158) = 8.89, p < .05$, in terms of the justification they provided for equal deserved blame.

Positive outcome stories. Table 4 represents the justifications provided for each response type (target, nontarget, & equal) at each age.

Judgments of relief. As seen in table 4, all participants—except one 8-year-old—who judged that the target would feel better, justified this response by a reference to the alternative outcome of affairs or the choice of the character. Similarly, when the nontarget character was selected, the most common justification was a reference the alternative outcome or the choice of the character. The numbers in some answer categories were too small to test age differences for the justification of the nontarget character, because the nontarget character was almost never chosen as feeling better for the temporal order story, whereas she was chosen meaningfully often by all ages in the omission/commission story (see table 1) and the common justification was that “she picked the correct box at her first choice” or “she did not second-guess herself”.

Once again, the typical justification for equal relief response was a reference to the fact that both characters experienced the same outcome; 85% of the responses of 6-year-olds (17 of 20 instances), 92% of the responses of 8-year-olds (23 of 25 instances), 100% of the responses of 11-year-olds (17 of 17 instances), and 96% of adults (45 of 47 instances) provided that justification.

Judgments of credit by others. All participants who judged that the target character would receive more credit justified this response by a reference to the alternative outcome or the choice of the character. The number of participants who judged that the nontarget character would be credited more was very small and this response was justified by a reference to an alternative outcome or the choice of the character for 50% of the time (1 of 2 instances) by 6-year-olds, 68% of the time by 8-year-olds (2 of 3 instances), 100% by 11-year-olds, and 86% of the time by adults (6 of 7 instances).

When participants judged that the characters would be credited equally, they almost always justified this response by reference to the fact that the outcome was the same for both characters (e.g. “They both won”). This justification was used for 76% of the time (22 of 29 instances) by 6-year-olds, 94% of the time (31 of 33 instances) by 8-year-olds, 100% of the time (28 of 28 instances) by 11-year-olds, and 99% of the time (82 of 83 instances) by adults. Twenty-four percent (7 of 29 instances) of 6-year-olds, 2% (2 of 33 instances) of 8-year-olds, and 1% (1 of 83) of adults did not provide an explanation for their equal credit response. These percentages revealed an overall significant age difference, $\chi^2(3, N = 173) = 22.86, p < .01$.

Judgments of deserved credit. When participants judged that the target character deserves more credit, they always justified this response via a reference to the alternative outcome or the choice of the character. When 6-year-olds picked the nontarget character, they justified their response by a reference to the alternative outcome or the choice of the character for 67% of the time (2 of 3 instances) and they provided no explanation for

33% of the time (1 of 3 instances). Eight-year-olds never judged that the nontarget character deserves more credit and 11-year-olds and adults always justified their nontarget character choice with a reference to the alternative outcome or the choice of the character (3 of 3 instances for both groups).

As observed with the negative outcome stories, the justifications for equal deserved credit led to a different pattern of responses than judgments of equal relief and equal credit by others. Although the most common justification for this response was reference to the fact that the outcome was the same for both characters, adults made use of the justification of chance or probability reasonably often and the two youngest child groups either made a reference to social conventions or provided no explanation for their equal deserved blame response. These differences lead to a significant age effect when a 4 (age) X 4 (justification) chi-square was run, $\chi^2 (9, N = 217) = 42.99, p < .01$. Pairwise comparisons revealed that adults differed significantly from 6-year-olds, $\chi^2 (3, N = 149) = 27.44, p = .01$, 8-year-olds, $\chi^2 (3, N = 158) = 16.88, p < .01$, and 11-year-olds, $\chi^2 (2, N = 152) = 6.59, p < .05$, significantly in this manner. Also, there was a significant difference between 6- and 11-year-olds, $\chi^2 (2, N = 59) = 7.44, p < .05$.

The Differences between the Negative and Positive Outcomes

The preliminary analyses revealed that the influence of mutability on the judgments of emotions and social attributions was more pronounced in the negative outcome stories than in the positive outcome stories. In order to detect whether this effect was uniform across the age groups, separate t-tests were run for each age to

compare the judgments of regret vs. relief, blame by others vs. credit by others, and deserved blame vs. deserved credit.

The judgments of 6-year-olds did not differ as a function of outcome. However, the mean for 8-year-olds' regret ($M = .45, SD = .50$) was higher than the mean for their relief ($M = .24, SD = .43$), $t(37) = 2.48, p < .05$. The same pattern observed for blame by others ($M = .37, SD = .49$), versus credit by others ($M = .05, SD = .23$), $t(37) = 4.39, p < .01$, and deserved blame ($M = .20, SD = .41$) versus deserved credit ($M = .02, SD = .16$), $t(37) = 2.49, p < .05$. Outcome type significantly affected the judgments of 11-year-olds as well. They were more likely to attribute regret ($M = .61, SD = .50$) than relief ($M = .34, SD = .48$), $t(37) = 2.24, p < .05$, and more likely to think that others would blame ($M = .55, SD = .50$) the target characters more than they would credit them ($M = .18, SD = .39$), $t(37) = 4.20, p < .01$. Lastly, adults' mean of regret judgments ($M = .80, SD = .40$) was higher than their mean for their relief ($M = .62, SD = .49$), $t(143) = 4.24, p < .01$. The same pattern observed for blame by others ($M = .75, SD = .43$) versus credit by others ($M = .38, SD = .48$), $t(37) = 7.79, p < .01$.

CHAPTER IV

DISCUSSION

Overview

The primary goal of the present study was to examine developmental change in children's judgments about counterfactual-thinking-based emotions and judgments of blame and credit—two social causal ascriptions that are related to counterfactual thinking. Although the development of an understanding of these emotions in children has been studied previously, no previous study has examined social causal attributions in relation to children's counterfactual thinking and understanding of counterfactual emotions.

A second goal of this study was to examine whether the understanding of counterfactual emotions and children's social causal judgments show a different developmental pattern for situations in which the outcome of a decision has been positive versus negative. Previous studies with both children and adults have focused primarily on situations leading to negative outcomes and hence, the existing evidence for differences between positive and negative outcomes in terms judgments of emotions and social attributions is quite limited.

Using two stories based on two common biases observed in adults' counterfactual thinking (i.e., Omission/commission & Temporal order), we asked adults and children

from age 6 to 11 to judge which one of the two characters in these stories would feel worse[better], be blamed[credited] more by others, and deserves more blame[credit]. As hypothesized, the results revealed striking differences between adults' and children's judgments and between comparable judgments across negative and positive outcomes.

Judgments of Regret

In line with previous literature (Gleicher et al., 1990; Miller & Gunasegaram, 1990), for the negative outcome stories, adults consistently picked the target character for judgments of regret, that is, attributed more regret to the character who switched (omission/commission story) or who was the second player (temporal order story). In contrast, the target character was not the dominant choice for children younger than 11.

Six-year-olds in particular selected the target character less frequently than did 11-year-olds and adults, while eight-year-olds' target responses emerged as a bridge between the choices of the 6- and 11-year-olds—always higher than the responses of the younger, but lower than the responses of the older children, albeit not significantly. Although a majority of the 11-year-olds selected the target character for both scenarios, they did that less often than the adults, a difference that was statistically significant for the omission/commission story. An examination of the justifications that participants provided for the selection of the target character revealed that, across all ages, target character responses were almost always justified with a reference to an alternative outcome or the choice of the character, revealing that some consideration of the “counterfactual” (the fact that a different response would have results in a more positive outcome) affected their response.

Some participants at all ages judged that the two characters would feel equally bad, but this judgment was particularly common among the 6-year-olds. The choice of equal regret was almost always justified (at all ages) with a reference to the fact that the outcome was the same for both characters, revealing that the thoughts of “what happened” alone, rather than both “what happened” and “what might have happened”, was the driving force for these responses. Interestingly, 6-year-olds picked the nontarget character as often as the target character when judging who would feel worse, but still justified this response with a reference to an alternative outcome or the choice of the participant. These findings suggest that for at least some of the 6-year-olds, even when they gave some thought to the counterfactual, their reasoning about the effects of the counterfactual on the characters’ emotions did not follow the pattern typically found with older children and adults.

Judgments of Blame by Others

As hypothesized, the pattern of responses for others’ blame judgments strongly resembled the pattern of regret judgments discussed above: Six-year-olds picked the target character less than did 11-year-olds and adults, while 8-year-olds were more likely than 6-year-olds and less likely than 11-year-olds to judge that the target character would be blamed more by the others, although their responses did not differ from these two groups significantly. Eleven-year-olds were the closest to adults; although they did not pick the target character as frequently as did adults for the omission/commission story, they were as likely as adults to provide the target response for the temporal order story. The justifications for target character responses almost always involved a reference to an

alternative outcome or the choice of the character as observed in judgments of regret, revealing that judgments of blame from others were affected by a consideration of the counterfactual scenarios and/or more directly by a reflection on the emotional impact of the different scenarios on the judgments of blame from others.

As observed for the judgments of regret, concluding that both characters would be blamed equally by their classmates was also a common response across the groups, but 6- and 8-year-olds were especially likely to pick that response. Judgments of equal blame were almost always justified by explaining that both characters experienced the same outcome revealing that the thoughts of “what happened” (without reflecting on the counterfactual alternatives) was the determining factor for this choice.

These findings regarding judgments of regret and blame from others are generally consistent with the findings from previous research which has demonstrated that although children at age 6 may be able to engage in counterfactual thinking in some contexts, they do not seem to apply counterfactual thinking to help with their understanding of emotions (Guttentag & Ferrell, 2004). More importantly, the current findings extend previous research by showing that 6-year-olds’ social judgments do not seem to be affected by counterfactual thinking, or at least, the same factors known to affect counterfactual thinking in adults do not consistently affect children’s judgments of regret and blame.

In accordance with the previous literature, 11-year-olds and to some degree 8-year-olds performed more like adults than did 6-year-olds, although the 6- and 8-year-olds in the present study were less likely than similarly-aged children in the study by Meehan and Byrne (2005) to respond in a manner similar to that of adults for the

temporal order story. One possible explanation for this difference is that although the stories used in the current study and in the study by Meehan and Byrne (2005) share the key elements of the temporal order bias, the counterfactual judgment tasks derived from these stories differed from each other in an important respect. After presenting the story, Meehan and Byrne asked children who would feel worse and be blamed more by the other player and the participants' task was making a choice between the first and the second player. On the other hand, in the current study, participants were provided with a third option, equal regret or blame, which may have led to a decrease in target responses overall in the current study. This would also explain why even the adults in our study provided the target response less often in both stories as compared to previous studies where the task was a forced choice between two characters (Kahneman & Miller, 1986; Miller & Gunasegaram, 1990).

Judgments of Deserved Blame

Based on the dual theory of moral reasoning (Greene et al., 2001; Greene, 2014), it was hypothesized that judgments of deserved blame would invoke a more reflective, less emotion-focused analysis of the situation than would judgments of others' blame; hence, we predicted that the target character would be picked less for the judgments of deserved blame compared to judgments of others' blame. The present findings for adults are consistent with that prediction and support the findings by Payir et al. (2014), who previously found dissociation between these two judgments with adults.

Current findings also provide the first evidence for the dissociation between these two judgments in children. Although the 6-year-olds' selected the target equally often,

and at a low rate, for both kinds of responses, the 8-year-olds selected the target less frequently when making deserved blame judgments than when making judgments about blame from others for the temporal order story while the 11-year olds, like adults, exhibited that pattern of responses with both stories. Thus, in all cases in which participants were significantly more likely to select the target than the nontarget when making judgments of regret and blame from others, participants exhibited dissociation between the two forms of blame judgments. These findings suggest that, as early as 8-years-of-age, children's judgments of blame are affected by situational factors differently for judgments of deserved blame than for judgments of blame from others, such that their judgments of blame from others correspond more closely with their judgments of the emotional impact of those situational factors than is the case for judgments of deserving blame – the pattern predicted by Greene's dual theory of moral reasoning.

The modal response for deserved blame judgments across all ages was that the characters deserved equal blame for the negative outcome. An examination of the justifications provided for this response revealed that it was common for participants at all ages to justify or explain this response with simple reference to the fact that the outcome was the same for both characters, while some participants at each age justified their response through reference to social conventions for blame judgments (e.g., that it is not nice blame people). The examination of participants' justifications also revealed one rather dramatic age difference in responses; for the adults, unlike children at any of the three ages, the modal explanation for an "equal" deserved blame judgment was that because the outcome was actually the result of chance factors, neither character should be

blamed at all. Thus, even though most participants at each age judged that the two characters were deserving of equal blame, it was only the adults who commonly made reference to the effects of chance when providing an explanation for their judgment.

Thus, more generally, even when adults and children thought that the characters deserved equal blame, they reached this conclusion via different reasoning processes, and the emergence of two new justification categories for deserved blame judgments (in comparison with judgments of blame from others) shows that different factors are involved in the two kinds of blame judgments. This finding supports our analysis, based on the dual theory of moral reasoning (Greene et al., 2001; 2014) that deserved blame judgments are more reflective and less emotion-focused than are judgments of blame from others.

Judgments of Relief

The findings from the positive outcome stories revealed that for both stories, adults were more likely than any child group to judge that the target character would feel better than the nontarget character. Although all children tended to provide the target response more in the temporal order story compared to the omission/commission story, they did not differ from each other in terms of the target responses they provided. As observed for the regret judgments, the justification for judging that the target character would feel better than the nontarget almost always involved a reference to the alternative outcome or the choice of the participant.

The modal response for 6-and 8-year-olds was that the two characters would feel equally good which was also common among 11-year-olds and adults and was justified

with a reference to the fact that both characters won no matter what. Interestingly, the nontarget character in the omission/commission story was also picked fairly often by all ages, but especially for all children and this response was justified by arguing that the nontarget character picked the right box on her first try or that she was confident in her choice.

Judgments of Credit by Others

The judgments of others' credit resembled the judgments of relief in terms of age differences. Adults picked the target character more than did any child group for the omission commission story, and for the temporal order story, 11-year-olds were as likely as adults to judge that the second player would receive more credit than the first.

As observed in judgments of relief, for all participants, but especially for children, the modal response for other's credit judgments was equal credit, which again was justified by a reference to the fact that both characters and their classmates won the prize. Once again, the nontarget character in the omission/commission story was picked relatively often; the participants justified this response by a reference to the fact that "she picked the right box on her first try" – an explanation that was notably different from the explanations provided for responses to the corresponding negative outcome story.

Judgments of Deserved Credit

As discussed previously, the dissociation between the judgments of others' blame and the judgments of deserved blame supported the dual theory of moral reasoning (Greene et al., 2001; Greene, 2014). Because different factors influence blame and credit judgments (Fincham, 1985; McGraw, 1985; Payir et al., 2014; Ross & Ditecco, 1975),

and the influence of mutability is thought to be attenuated when the outcome is positive (Landman, 1987b), no strong prediction was made for judgments of credit by others and deserved credit. Although we found evidence for this dissociation in adults' judgments for positive outcomes, children's responses did not reveal any difference between others' credit and deserved credit, a finding that contrasts with what was found when the outcome was negative.

Across all ages, the participants tended to judge that the characters deserved equal credit for the choices they made. For children at all ages, this response was almost always justified by reference to the fact that the outcome was the same for both characters. Even for the adults, the most common explanation for the judgment that the two characters deserved equal credit was that the outcome was the same in each case. A minority of adults, however made reference to chance or probability when they judged that the characters deserved equal credit (while none of the children mentioned this justification).

The Differences between Negative and Positive Outcomes

This is the first study which examined whether children's judgments of emotions and social attributions are influenced by counterfactual thinking across both negative and positive outcomes. As observed in the previous studies with adults (Gleicher et al., 1990; Landman, 1987b; Roese, 1997; Roese & Hur, 1997), the effect of mutability was attenuated in scenarios with a positive outcome compared to those with a negative outcome. Participants age 8 and older selected the target character more often for judgments of regret and others' blame compared to the judgments of relief and others'

credit, revealing that mutability is less likely to influence social judgments when the outcome is positive. However, this effect was not evident in responses of 6-year-olds because they did not show consistent evidence for omission/commission or temporal order bias even with the negative outcome stories.

What explains these differences between the responses of participants across the negative and positive outcomes? Previous studies have found that positive outcomes seem to trigger less counterfactual thinking than do negative outcomes (Roese, 1997). Hence, we are less likely to take the alternative state of affairs into account and more likely to focus solely on the outcome or other factors when making judgments following positive outcomes whereas our judgments are more likely to be based on “how things could have been different” when the outcome is negative. The kinds of justifications provided with the positive outcome stories (e.g., “It does not matter how they did as long as they won”) further supports this view.

Not only were participants less likely to select the target character with positive than with negative outcome stories, but it was also found that the pattern of responses across the different forms of judgments varied as a function of outcome valence. In particular, even when participants thought that the target character would feel better, this judgment of emotion was not consistently reflected in their credit attributions. This difference in social causal attributions for positive vs negative outcomes may be explained by the observation that different factors affect judgments of blame versus judgments of credit (Fincham, 1985; McGraw, 1985; Ross & Ditecco, 1975).

The Differences between Omission/Commission and Temporal Order Stories

Although not expected, omission/commission and temporal order stories led to somewhat different patterns of responding. Temporal order turned out to be a more powerful trigger of counterfactual thinking compared to omission/commission; although the effect of omission/commission was mostly attenuated in positive outcome stories, the effect of temporal order was still pronounced on judgments of emotion even when the outcome was positive. Perhaps, in the temporal order scenarios, the focus is heavily on the second player because the first player's choice serves as an anchor and sets the context for the second player's choice. That a lot of participants in both positive and negative version of the temporal order story explained that the second player "made the winning decision" or "the pressure was on the second player" when they justified their response supports this hypothesis. On the other hand, the omission/commission stories were more complex, involving a comparison across the two characters of the nature of their decision process.

Conclusion

Altogether, these results support the observations from previous literature that the biases in counterfactual thinking do not necessarily emerge together with the ability to think counterfactually (Guttentag & Ferrell, 2004; Meehan & Byrne, 2005; Weisberg & Beck, 2012). Although the exact age when the ability to think counterfactually emerges is still debated, it is accepted that children have this capacity starting from age 5 to 6. On the other hand, as replicated by the current study, the effect of biases on children's judgments based on counterfactual thinking is not prevalent even at the age of 8 and there

are significant differences even between the responses of 11-year-olds and adults. Similarly, current results also strongly support the argument that counterfactual thinking ability gradually develops at least until late childhood with multiple layers of this ability (e.g., basic counterfactual thinking, understanding counterfactual emotions, anticipating counterfactual emotions) developing at different ages.

Current results also extend the previous findings by showing that the judgments of blame and credit can take more than one form. The findings revealed a dissociation between the judgments of others' blame[credit] and deserved blame[credit], with the former being more emotion-based and influenced more by counterfactual thinking biases than the latter. This dissociation was especially pronounced in negative outcome stories; starting from age 8, participants judged that the target characters deserved less blame than others would attribute them whereas it was only adults who judged that the target characters deserved less credit than they would be attributed.

Limitations and Future Directions

One limitation of this study is that we were able to test American adults and children only, although the judgments we examined might be influenced by culture. It would therefore be interesting to examine these effects cross-culturally. We revealed that deserved blame judgments of children, for instance, can be guided by social conventions such as "being kind to others", so future studies might investigate whether different norms guide children's judgments in different cultures.

A second limitation of this study is that we examined how counterfactual thinking influence children's and adults' judgments of emotions and social attributions following

outcomes that are actually determined by chance events rather than by morally charged acts. In this context, it is noteworthy how powerful the effects of counterfactual thinking were on judgments of emotions and blame by others even for the adults who understood that the outcomes were dependent upon chance. A possible follow-up to the current study might involve examining whether these judgments will differ as a function of context. For instance, will children be more likely to take “what might have happened” into account in their judgments if the outcomes are morally charged? Or when they have serious consequences? It is possible that morally charged acts or more serious consequences may render the alternative outcome more salient, and this saliency effect would help children start picking the target response at an earlier age as demonstrated by Ferrell et al. (2009).

Although the current findings demonstrated that biases in counterfactual thinking do not automatically emerge once the ability of counterfactual thinking develops, it should also be noted that these biases are not totally absent in children’s reasoning; they are just not as prevalent as they are in adults’, and future studies can examine why this is the case. Does the absence of the effect of mutability on children’s judgments result from the underdevelopment of counterfactual reasoning? Or do children rely on some other factors when making such judgments although they are as capable as adults in imagining how things could have been different?

Based on Goldinger et al. (2003)’s findings, Beck and colleagues (2014) argued that if counterfactuals are generated automatically but do not affect judgments, they must either be suppressed or discounted. In the current study, when adults spontaneously

judged that the characters deserved equal blame, half of the adults justified this response by saying that the chances were equal for both characters, in other words, this more reflective judgment made them suppress the temporal order and omission/commission biases suggesting that if counterfactual generation is automatic for them, then they must have suppressed the effects of it when they judged the characters deserve equal blame. On the other hand, when children judged that the characters deserve equal blame, they did not provide any clue that they were suppressing the effect of these biases which reveals that counterfactual thinking may not be automatic for them.

Hence, another follow-up study could examine whether differences in adults' and children's judgments result from automaticity. As discussed in Beck et al. (2014), children might be competent in counterfactual reasoning, but might not yet have developed the automaticity that is observed in adults' counterfactual thinking. A future study can provide further evidence for this account by providing participants with explanations of why two characters deserve equal blame and test whether children and adults will be equally likely to pick the explanation that suppresses the effect of counterfactual biases.

Lastly, it should be acknowledged that the number of adult participants in this study was three times larger than the number of child participants at any age group. Hence, the power of the pairwise comparisons between the adults and each of the child groups was considerably greater than was the power of the pairwise comparisons between any two child groups, a factor that could have affected the pattern of significant pairwise-comparison differences that was found here.

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APPENDIX A

TABLES

Table 1. Percentage of Participants at Each Age Who Provided Each Response (Negative Outcome Stories)

Story and Judgment type	Age			
	6 years	8 years	11 years	Adults
Omission/Commission				
Regret (%)				
Target	17	40	58	85
Nontarget	28	10	0	0
Equal	56	50	42	15
Blame by Others (%)				
Target	6	20	42	74
Nontarget	17	5	21	3
Equal	78	75	37	24
Deserved Blame				
Target	28	15	10	24
Nontarget	6	5	0	0
Equal	67	80	90	73
Temporal Order				
Regret				
Target	33	50	63	75
Nontarget	6	10	0	1
Equal	61	40	37	24
Blame by Others				
Target	33	55	68	76
Nontarget	22	0	0	0
Equal	44	45	32	24
Deserved Blame				
Target	17	20	26	8
Nontarget	6	0	0	1
Equal	77	80	74	91

Table 2. Percentage of Participants at Each Age Who Provided Each Response (Positive Outcome Stories)

Story and Judgment type	Age			
	6 years	8 years	11 years	Adults
Omission/Commission				
Relief				
Target	12	16	26	54
Nontarget	29	21	37	11
Equal	59	63	37	35
Credit by Others				
Target	0	0	5	25
Nontarget	12	11	16	10
Equal	88	89	79	65
Deserved Credit				
Target	6	0	0	7
Nontarget	6	0	16	4
Equal	88	100	84	89
Temporal Order				
Relief				
Target	29	32	42	69
Nontarget	12	0	5	0
Equal	59	68	53	31
Credit by Others				
Target	18	11	32	50
Nontarget	0	5	0	0
Equal	82	84	68	50
Deserved Credit				
Target	13	5	21	21
Nontarget	13	0	0	0
Equal	75	95	79	79

Table 3. Number of Instances for Each Justification (Negative Outcome Stories)

Judgment/Response/Justification	Age			
	6 years	8 years	11 years	Adults
Regret				
<i>Target Character</i>	n = 9	n = 18	n = 23	n = 115
Alternative outcome	9	17	23	114
Other	0	1	0	0
No explanation	0	0	0	1
<i>Nontarget Character</i>	n = 6	n = 4	n = 0	n = 1
Alternative outcome	6	3	0	1
Other	0	1	0	0
No explanation	0	0	0	0
<i>Equal</i>	n = 21	n = 18	n = 15	n = 28
Same outcome	16	16	14	27
Choices	1	1	1	1
No explanation	4	1	0	0
Blame By Others				
<i>Target Character</i>	n = 7	n = 15	n = 21	n = 108
Alternative outcome	6	14	20	108
Other	0	1	1	0
No explanation	1	0	0	0
<i>Nontarget Character</i>	n = 7	n = 1	n = 4	n = 2
Alternative outcome	6	1	4	2
Other	0	0	0	0
No explanation	1	0	0	0
<i>Equal</i>	n = 22	n = 24	n = 13	n = 34
Same outcome	13	21	11	30
Choices	1	0	2	4
No explanation	8	3	0	0
Deserved Blame				
<i>Target Character</i>	n = 8	n = 7	n = 7	n = 23
Alternative outcome	6	6	7	22
Other	0	0	0	1
No explanation	2	1	0	0
<i>Nontarget Character</i>	n = 2	n = 1	n = 0	n = 1
Alternative outcome	2	1	0	1
Other	0	0	0	0
No explanation	0	0	0	0
<i>Equal</i>	n = 26	n = 32	n = 31	n = 120
Same outcome	13	18	11	48
Chance/probability	0	1	8	54
Social conventions	4	9	11	17
No explanation	9	4	1	1

Table 4. Number of Instances for Each Justification (Positive Outcome Stories)

Judgment/Response/Justification	Age			
	6 years	8 years	11 years	Adults
Relief				
<i>Target Character</i>	n = 7	n = 9	n = 13	n = 89
Alternative outcome	7	8	13	89
Other	0	0	0	0
No explanation	0	1	0	0
<i>Nontarget Character</i>	n = 7	n = 4	n = 8	n = 8
Alternative outcome	6	2	8	8
Other	0	1	0	0
No explanation	1	1	0	0
<i>Equal</i>	n = 20	n = 25	n = 17	n = 47
Same outcome	17	23	17	45
Choices	1	0	0	0
No explanation	2	2	0	2
Credit by Others				
<i>Target Character</i>	n = 3	n = 2	n = 7	n = 54
Alternative outcome	3	2	7	54
Other	0	0	0	0
No explanation	0	0	0	0
<i>Nontarget Character</i>	n = 2	n = 3	n = 3	n = 7
Alternative outcome	1	2	3	6
Other	0	0	0	0
No explanation	1	1	0	1
<i>Equal</i>	n = 29	n = 33	n = 28	n = 83
Same outcome	22	31	28	82
Choices	0	0	0	0
No explanation	7	2	0	1
Deserved Credit				
<i>Target Character</i>	n = 3	n = 1	n = 4	n = 20
Alternative outcome	3	1	4	20
Other	0	0	0	0
No explanation	0	0	0	0
<i>Nontarget Character</i>	n = 3	n = 0	n = 3	n = 3
Alternative outcome	2	0	3	3
Other	0	0	0	0
No explanation	1	0	0	0
<i>Equal</i>	n = 28	n = 37	n = 31	n = 121
Same outcome	20	31	30	96
Chance/probability	0	0	0	22
Social conventions	2	1	0	0
No explanation	6	5	1	3

APPENDIX B

STORIES

Omission/Commission Story (Negative)

In a school, the principal organized a game for the students in each of two classes. For this game, a student makes a choice between two boxes. There is a win sticker in only one of the boxes and if the student picks the box that has the sticker, she and everyone else in her class each win \$10.

The teacher of class one chose Amy to play the game and showed her the two boxes: A green box and a red box. Amy thought for a while and picked the green box. The teacher asked Amy if she wanted to change his choice. Amy decided to stay with the green box. Unfortunately, the red box was the winning box so no one in that class won anything.

The teacher of class two chose Barb to play the game and showed her two boxes: A blue box and a white box. Barb thought for a while and picked the blue box. The teacher asked Barb if she wanted to change her choice. Barb decided to switch from the blue box to the white box. Unfortunately, the blue box was the winning box so no one in that class won anything.

So, remember: Amy first picked the green box. When the teacher asked her whether she wanted to change her choice, Amy decided to stay with the green box. But the red box had the prize so Amy, and everyone in her class, lost the game. In a different

class, Barb first picked the blue box. When the teacher asked her whether she wanted to change her choice, she said that she did want to switch, so she switched from the blue to the white box. But the blue box had the prize so Barb, and everyone in her class, also lost the game.

So,

- (1) Who do you think would feel worse about the choice she made? Amy, who picked the green box at first and didn't change her mind, and lost because the red box was the winner or Barb, who picked the blue box at first but then switched to the white box and lost because the blue box was the winner? Or do you think they would feel equally bad? Why do you think so?
- (2) Because each girl lost the game, no one in either girl's class won anything. Who do you think would be blamed more by the others in her class for having lost the game? Amy, who picked the green box at first and didn't change her mind, and lost because the red box was the winner or Barb, who picked the blue box at first but then switched to the white box and lost because the white box was the winner? Or do you think they would be blamed equally? Why do you think so?
- (3) Who do you think deserves to be blamed more? Or do you think they deserve equal blame? Why do you think so?

Temporal Order Story (Negative)

In a different school, the principal organized a different game. For this game, two students are chosen to play and each student picks a card—either a yellow card or an orange card. If they both pick the yellow card or both pick the orange card, they and each

of their classmates win \$10. However, if one of them picks the yellow card and the other picks the orange card, no one wins anything.

The teacher selected Michael and Rob to play this game. Michael went first. Rob was not in the room when Michael picked his card. Michael looked at the yellow card and the orange card and decided to pick the orange card. Then Rob came into the room and it was his turn. Rob didn't know that Michael had picked the orange card. Rob looked at the cards and decided to pick the yellow card. So, because one picked orange and the other picked yellow, neither of them won anything and none of their classmates won anything.

So, remember: Everyone wins if Michael and Rob pick the same color card. Michael went first and picked the orange card. Rob didn't know what card Michael had picked, and when he went second, he picked the yellow card. Because one picked orange and the other picked yellow, they lost the game.

So,

(1) Who do you think would feel worse about the choice he made? Michael who went first and picked the orange card, or Rob who went second and picked the yellow card? Or do you think they would feel equally bad? Why do you think so?

(2) Because they lost the game, no one in either boy's class won anything. Who do you think would be blamed more by the others in their class for having lost the game? Michael, who went first picked the orange card or Rob, who went second and picked the yellow card? Or do you think they would be blamed equally?

Why do you think so?

(3) Who do you think deserves to be blamed more for not winning the game? Or do you think they deserve equal blame? Why do you think so?

Omission/Commission Story (Positive)

In a school, the principal organized a game for the students in each of two classes. For this game, a student makes a choice between two boxes. There is a win sticker in only one of the boxes and if the student picks the box that has the sticker, she and everyone else in her class each win \$10.

The teacher of class one chose Susan to play the game and showed her the two boxes: A pink box and a purple box. Susan thought for a while and picked the purple box. The teacher asked Susan if she wanted to change her choice. Susan decided to stay with the purple box. Fortunately, the purple box was the winning box so everyone in that class won \$10.

The teacher of class two chose Lia to play the game and showed her two boxes: A brown box and a yellow box. Lia thought for a while and picked the brown box. The teacher asked Lia if she wanted to change her choice. Lia decided to switch from the brown box to the yellow box. Fortunately, the yellow box was the winning box so everyone in that class won \$10.

So, remember: Susan first picked the purple box. When the teacher asked her whether she wanted to change her choice, Susan decided to stay with the purple box. The purple box had the prize so Susan, and everyone in her class, won the game. In a different class, Lia first picked the brown box. When the teacher asked her whether she wanted to change her choice, she said that she did want to switch, so she switched from

the brown to the yellow box. The yellow box had the prize so Lia, and everyone in her class, also won the game.

So,

- (1) Who do you think would feel better about the choice she made? Susan, who picked the purple box at first and didn't change her mind, and won because the purple box was the winner or Lia, who picked the brown box at first but then switched to the yellow box and won because the yellow box was the winner? Or do you think they would they feel equally good? Why do you think so?
- (2) Because each girl won the game, everyone in either girl's class won \$10. Who do you think will be credited more by the others in her class for having won the game? Susan, who picked the purple box at first and didn't change her mind, and won because the purple box was the winner or Lia, who picked the brown box at first but then switched to the yellow box and won because the yellow box was the winner? Or do you think they would be credited equally? Why do you think so?
- (3) Who do you think deserves to be credited more? Or do you think they deserve equal credit? Why do you think so?

Temporal Order Story (Positive)

In a different school, the principal organized a different game. For this game, two students are chosen to play and each student picks a card—either a green card or a blue card. If they both pick the green card or both pick the blue card, they and each of their classmates win \$10. However, if one of them picks the green card and the other picks the blue card, no one wins anything.

The teacher selected Tom and Jon to play this game. Jon went first. Tom was not in the room when Jon picked his card. Jon looked at the blue card and the green card and decided to pick the blue card. Then Tom came into the room and it was his turn. Tom didn't know that Jon had picked the blue card. Tom looked at the cards and decided to pick the blue card. So – because they picked blue, both of them and all of their classmates won \$10.

So, remember: Everyone wins if Jon and Tom pick the same color card. Jon went first and picked the blue card. Tom didn't know what card Jon had picked, and when he went second, he picked the blue card. Because both picked blue, they won the game.

So,

- (1) Who do you think would feel better about the choice he made? Jon who went first and picked the blue card, or Tom who went second and picked the blue card? Or do you think they would feel equally good? Why do you think so?
- (2) Because they won the game, everyone in each boy's class won \$10. Who do you think would be credited more by the others in their class for having won the game? Jon, who went first and picked the blue card or Tom, who went second and picked the blue card? Or do you think they would be credited equally? Why do you think so?
- (3) Who do you think deserves to be credited more? Or do you think they deserve equal credit? Why do you think so?

APPENDIX C
EXPERIMENTAL MATERIALS

Figure 1. Materials for the Negative Omission/Commission Story



Figure 2. Materials for the Negative Temporal Order Story



Figure 3. Materials for the Positive Omission/Commission Story



Figure 4. Materials for the Positive Temporal Order Story

