

ORIGINAL ARTICLE

'Was it meant to be mean?' Young children's hostile attributional bias and intent attribution skills

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Abstract

Two studies investigated whether young children's hostile attributional bias (i.e., the tendency to assume that others have hostile intentions) may be explained by a lack of intent attribution skills (i.e., the ability to correctly infer others' intentions). We also investigated whether these intent attribution skills depend on children's false-belief understanding. Children who lack false-belief understanding may base their attributions on the observable outcomes of others' behavior, rather than on others' intentions. These hypotheses were tested by assessing intent attributions made by children ages 3–7 years. We systematically varied intent and outcome information in vignettes (Study 1, $N = 151$) and staged interactions with puppets (Study 2, $N = 85$). Results replicated across studies. Children who understood false belief (vs. those who did not) based their attributions more on intent information. However, these intent attribution skills did not affect children's hostile attributional bias. Exploratory analyses showed that children with higher levels of hostile attributional bias, more than others, based their attributions on outcome information. Thus, the findings from this research do not support the assumption that young children with a hostile attributional bias lack intent attribution skills; instead, the findings suggest that these children have a heightened sensitivity for negative outcomes.

KEYWORDS

aggression, attribution, preschool, social cognition, theory of mind

1 | INTRODUCTION

Aggressive children tend to have a hostile attributional bias. Compared to non-aggressive children, they are inclined to attribute hostile intent to another person causing harm, particularly when the other's intentions are unclear (Dodge, 1980; Dodge, Laird, Lochman, & Zelli, 2002). For instance, imagine a 4-year-old boy, who works diligently on building a high block tower in his school class. A peer walks by and tips over the tower. Although it is unclear whether this happened on purpose or not, the boy interprets the provocation as hostile and lashes out aggressively.

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The link between hostile attributional biases and aggressive behavior has been documented extensively (for a meta-analysis, see de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). From the preschool age onwards (e.g., Dodge, Bates, & Pettit, 1990), children's hostile attributional bias puts them at risk for the development of aggressive behavior problems. Hostile attributional biases may predispose children to act aggressively and evoke adverse peer interactions which—ironically—confirm their hostile attributions and foster their aggressive dispositions (Lansford, Malone, Dodge, Pettit, & Bates, 2010). This self-perpetuating effect of hostile attributional biases underscores the importance of early intervention. To devise effective intervention, however, we need to better understand the psychological processes that underlie hostile attributional biases in early childhood.

It has been suggested (Dodge, 2006) that young children's hostile attributional bias may be explained by a lack of understanding that other people's intentions may differ from their behavior (i.e., 'false-belief understanding'; Wellman, Cross, & Watson, 2001). Children who lack false-belief understanding are likely to base their intent attributions on the observable outcomes of events: 'Someone who causes a negative outcome is mean'. In contrast, children who do understand false belief may realize that people's intentions can differ from the outcomes of their behavior: 'Someone may *accidentally* cause a negative outcome and, in that case, the person is *not* mean'.

Children's ability to base their judgments on others' intentions has been studied extensively with regard to children's moral judgments (e.g., Cushman, Sheketoff, Wharton, & Carey, 2013; Piaget, 1932), but has not yet been studied with regard to children's attributions of others' behavior. Such intent attribution skills may, however, be an important determinant of hostile attributional biases in early childhood—a period in life characterized by rapid cognitive maturation and relative malleability of social information processing patterns (Crick & Dodge, 1994). Hostile attributional biases that emerge at this time may start a vicious cycle of negative peer interactions and accumulating hostile social schemas that perpetuate hostile attributional biases in aggressive children, even when they do acquire false-belief understanding (Dodge, 2006).

Empirical scrutiny of the link between young children's hostile attributional bias and intent attribution skills, however, is lacking. Are children who understand false belief more likely to base their attributions on intent information than children who do not understand false belief? Do children who base their attributions more on intent information show lower levels of hostile attributional bias? The present research seeks to answer these questions.

1.1 | FALSE-BELIEF UNDERSTANDING AND CHILDREN'S INTENT ATTRIBUTION SKILLS

There is some evidence to suggest that children's intent attributions depend on their false-belief understanding. One study found that 3- to 8-year-old children who understood false belief were less likely to attribute hostile intent to a story character who unintentionally caused harm than children who did not understand false belief (Killen, Mulvey, Richardson, Jampol, & Woodward, 2011). This finding suggests that young children who understand false belief base their attributions on the positive intentions of the story character rather than the negative outcome of the character's action. However, this study relied on a single story that contrasted positive intentions with a negative outcome (i.e., an 'accidental harm' story). As such, the study leaves open an alternative interpretation, which is that children who understand false belief simply care less if something bad happens, for instance because they are older and are better able to regulate their negative emotions (Thompson, 1991).

This issue has been addressed in another line of research focused on children's moral judgments. This research adopted a study design that assessed children's ability to base their judgments on intent information while controlling for the impact of outcome information. In particular, children were presented with stories that reflected all possible combinations of positive and negative intentions and outcomes: 'accidental harm' (positive intent, negative outcome), 'failed harm' (negative intent, positive outcome), 'intended harm' (negative intent, negative outcome), and 'no harm' (positive intent, positive outcome). This line of research found that between ages 3 and 8, older children based their judgment of the moral acceptability of the story characters' acts more on intent information than younger children did (Nobes, Panagiotaki, & Pawson, 2009; Yuill & Perner, 1988; Zelazo, Helwig, & Lau, 1996). Importantly, this age effect was independent of whether the outcomes of the stories were positive or negative. These findings suggest that children's integration of intent information into their moral judgments is a cognitive skill that improves with age. However,

it remains to be tested whether it is actually false-belief understanding that underlies this improved integration of intent information into children's intent attributions. The present research aims to fill this gap.

1.2 | CHILDREN'S INTENT ATTRIBUTION SKILLS AND HOSTILE ATTRIBUTIONAL BIAS

Intent attribution skills refer to children's ability to make correct inferences about other people's intentions. Hostile attributional biases are a specific form of intent attribution, referring to children's hostile attributions for ambiguous provocations (i.e., harmful outcomes caused by someone whose intentions are unclear). In such ambiguous situations, children's intent attributions cannot be called correct or incorrect. Instead, they reflect a bias rather than a lack of skill. It has been hypothesized (Dodge, 2006) that intent attribution skills and hostile attributional biases are related, such that children who fail to base their attributions on intent information will more often assume that other people have hostile intentions in ambiguous situations.

Preliminary support for this claim was obtained in a longitudinal study that found that children with poor false-belief understanding in preschool (at age 3.5) had higher levels of hostile attributional bias in the early school years (at age of 5–6) (Choe, Lane, Grabell, & Olson, 2013). This finding suggests that poor intent attribution skills may also predict hostile attributional biases. Although promising, this finding was qualified in that the link between hostile attributional biases and false-belief understanding was found only for false-belief tasks requiring children to use mental state language (e.g., 'want', 'think'; Choe et al., 2013), and did not generalize to standard false-belief tasks requiring a nonverbal response (Choe et al., 2013; Yagmurlu, 2013). As children's core understanding of false belief seems more relevant to explain their intent attribution skills than children's use of mental state language, these findings cast some doubt on whether intent attribution skills would be related to hostile attributional biases. However, no study to date has directly tested the link between children's intent attribution skills and hostile attributional bias.

1.3 | THE PRESENT RESEARCH

The present research tested whether (a) children who understand false belief are more likely to base their attributions on intent information, and (b) children who have better intent attribution skills show lower levels of hostile attributional bias. We tested these hypotheses in two studies, one using a traditional vignette paradigm (i.e., stories of hypothetical peer interactions), and one using an in vivo paradigm (i.e., staged interactions with puppets). For both studies, we first assessed children's hostile attributional bias using ambiguous provocation scenarios: either hypothetical stories (Study 1) or a staged event (Study 2). Next, we assessed children's false-belief understanding using standard false-belief tasks. Lastly, we assessed children's intent attribution skills using a 2 (intent) \times 2 (outcome) within subjects design, presenting children with four hypothetical scenarios (Study 1) or staged events (Study 2) under all combinations of positive and negative intent and outcome information. By asking children how 'mean' the protagonist in each of the scenarios was, we assessed to what extent children based their attributions on intent information, independent of the scenario outcomes. The raw data, analysis code, and relevant study materials are available at the Open Science Framework (van Dijk, Poorthuis, Thomaes, & de Castro, 2018).

2 | STUDY 1

2.1 | Method

2.1.1 | Participants

Participants were 151 Dutch children ages of 3 to 7 years, who were recruited from public day care centers and primary schools serving middle class communities ($M_{\text{age}} = 5.58$, $SD = 1.28$; 49.0% male; 96.7% Caucasian). Data from seven additional children were excluded from the analyses because these children did not speak Dutch ($N = 2$), or failed the comprehension check for our main measure ($N = 5$; see procedure). All children received active parental consent to participate in the study (consent rate = 56.4%).

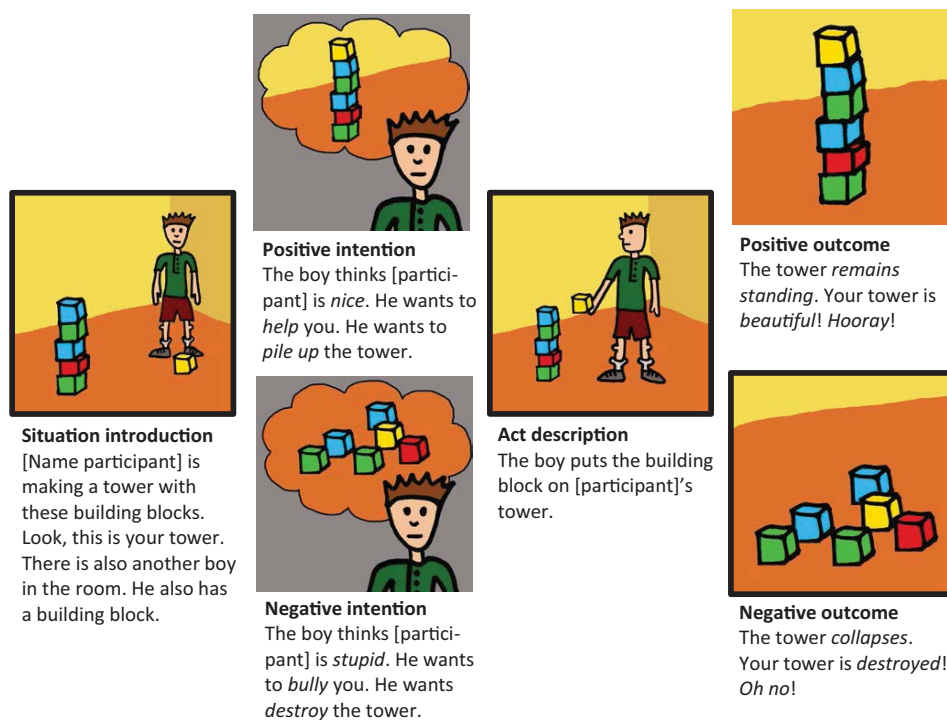


FIGURE 1 Sample vignette used for the assessment of hostile attributional bias (only the boxed drawings) or intent attribution skills (all drawings; four possible combinations).

2.1.2 | Materials

We assessed children's hostile attributional bias and intent attribution skills using two sets of vignettes. All vignettes described a hypothetical interaction between the child and a same-gender protagonist. Story themes were peer interactions common to preschool-age children and were drawn from vignettes typically used in research on hostile attributional bias: playing outside, building a block tower, pouring lemonade, and throwing a ball (set A); swinging, building a sand castle, pouring paint, and making a drawing (set B) (Dodge, McClaskey, & Feldman, 1985; Feshbach, 1989).

Each set of vignettes was adaptable and used to assess either children's hostile attributional bias or children's intent attribution skills. To assess hostile attributional bias, we presented the vignettes with a negative outcome and no intent information. To assess intent attribution skills, we systematically varied intent and outcome information (see Figure 1 for an example). This approach enabled us to counterbalance set A and B between children, thus ruling out possible effects of story content on our results (indeed, Set had no significant moderating effect in the primary analyses, $p > .05$).

2.1.3 | Procedure

Children were tested individually in a quiet room in their school or day care center. The sessions lasted 25–30 min and were conducted by the first author or one of three trained graduate students. Before testing, the experimenter checked children's comprehension of the terms 'a little' and 'very' that were used for our main measure.

Hostile attributional bias

For the hostile attributional bias assessment, each child was presented with four vignettes that described ambiguous peer provocations, consisting of negative outcome information and no intent information. The four vignettes were presented in fixed order and illustrated by 8×8 cm color drawings (Figure 1, boxed drawings). Children were asked to pretend that the stories really happened to them. After each vignette, the experimenter asked 'What happened?'

(outcome control question) and repeated the outcome information if children failed this question (2.2% of the answers). Next, the experimenter assessed children's intent attribution by asking: 'Was the boy/girl being mean or not being mean?' When children answered 'mean', they were asked: 'Was the boy/girl just a little mean or very mean?' Thus, scores varied between 0 (*not mean*), 1 (*a little mean*), and 2 (*very mean*). We controlled for response bias by counterbalancing response options, for instance by asking 'mean or not mean?' for some vignettes and 'not mean or mean?' for others.

Scores were averaged across vignettes to create a single hostile attributional bias score. Reliability coefficients for ordinal data were acceptable to good (set A: $\alpha = .85$; set B: $\alpha = .66$; Meulman, Van der Kooij, Heiser, & Kaplan, 2004). Supporting the validity of this assessment, a regression analysis showed that children with higher scores on hostile attributional bias more often indicated that they would respond aggressively to the events in the vignettes, $F(1, 149) = 17.53, p < .001, \beta = .32, R^2 = 0.11$. (We assessed aggressive responses using two additional questions following each vignette, which concerned expressed anger and physical aggression. Reliability was good: $\alpha = .85$ for set A; $\alpha = .88$ for set B.)

False-belief understanding

Next, false-belief understanding was assessed with two standard false-belief tasks: An unexpected content task and a changed location task (Perner, Leekam, & Wimmer, 1987; Wimmer & Perner, 1983). In the unexpected content task, children were presented with a pencil box that contained balloons rather than pencils. They were next asked what their teacher, who never saw inside the pencil box, would think was in the box (target question), what was really in the box (reality control question), and whether the teacher saw inside the box (memory control question).

The changed location task was acted out by the experimenter using toy figurines. Children saw a girl putting her marble in a cabinet. After she left, another girl changed the location of the marble to a box. Children were asked where the girl would look for her marble when she came back (target question), where the marble really was (reality control question), and where the marble was at the beginning of the story (memory control question).

For each task, children passed if they correctly answered both the target question and control questions or failed otherwise. We created a dichotomous variable, distinguishing between children who passed both tasks (1 = *pass*) and who failed at one or both tasks (0 = *fail*). (Analyses using continuous scores yielded the same results.)

Intent attribution skills

Next, for the intent attribution skills assessment, all children were presented with four vignettes under all combinations of positive and negative intent and outcome information, resulting in a 2 (intent) \times 2 (outcome) within subjects design. Whereas the order of story themes was fixed, the order of the four manipulated combinations was randomized for each child. All vignettes followed the same four-step narrative structure, describing (a) the setting, (b) the intent information, (c) the action by the protagonist, and (d) the outcome information (Figure 1). The valence of the manipulated information was repeated three times in the stories, to ensure that our measurements reflected the degree to which children responded to the manipulation, rather than their ability to detect the manipulation. For instance, the negative intent information was repeated as follows: 'The boy thinks [name child] is *stupid*. He wants to *bully* you. He wants to *destroy* the tower'.

After each vignette, children were asked 'What does the boy/girl want to do?' (intent control question) and 'What happened?' (outcome control question). The experimenter repeated the information if children failed either of these questions (6.3% of the answers). Next, children's attributions were assessed with the same attribution questions that we used previously in the hostile attributional bias measure, yielding a 3-point scale (0 = *not mean*, 1 = *a little mean*, 2 = *very mean*). To end the session positively, we presented children with a final vignette that was entirely positive, and we gave them stickers for their participation.

We calculated difference scores representing the main effects of intent information and outcome information on children's attributions (Table 1). Intent-based attribution was calculated as children's average score on the two negative intent scenarios minus their average score on the two positive intent scenarios. Similarly, outcome-based attribution

TABLE 1 Means (*M*), standard deviations (*SD*), range, and zero-order correlations of Study 1 variables (below diagonal, *N* = 151) and Study 2 variables (above diagonal, *N* = 85)

	Study 1			Study 2			1	2	3	4	5	6
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range						
1 Age	5.58	1.28	3.10-7.87	5.26	1.44	3.09-7.66	-	.66***	-.14	.46***	.10	.03
2 False-belief	0.56	0.50	0.00/1.00	0.67	0.47	0.00/1.00	.48***	-	-.11	.35**	.07	.21
3 Hostile attributional bias	1.21	0.61	0.00-2.00	0.86	0.66	0.00-2.00	-.14	-.08	-	.08	.30**	.04
4 Intent-based attribution	0.98	0.75	-1.00-2.00	0.74	0.59	-0.50-2.00	.44***	.40***	-.15	-	-.17	.01
5 Outcome-based attribution	0.57	0.63	-1.00-2.00	0.58	0.63	-1.00-2.00	.07	-.01	.25**	-.26**	-	-.07
6 Gender	0.51	0.50	0.00/1.00	0.51	0.50	0.00/1.00	.03	.07	-.17*	.13	-.14	-

Note. Scores for intent- and outcome-based attribution are difference scores representing the main effects of intent and outcome information on children's attributions for the intent attribution skills task.

* $p < .05$. ** $p < .01$. *** $p < .001$.

was calculated as children's average score on the two negative outcome scenarios minus their average score on the two positive outcome scenarios. Higher scores on these variables indicate that children based their attributions more on intent or outcome information, respectively.

2.2 | Results

2.2.1 | Analytical approach

Data were analyzed using two 2 (intent) \times 2 (outcome) ANOVAs including children's responses on each vignette of the intent attribution skills task as the dependent variables. Firstly, we included false-belief understanding (pass/fail) as a between-subjects factor to test whether children who understood false belief based their attributions more on intent information than children who did not understand false belief— independent of whether the outcomes of the stories were positive or negative. Secondly, we used hostile attributional bias (scale: 0-8) as a continuous between-subjects factor to test whether children with higher levels of hostile attributional bias were less likely than others to base their attributions on intent information. Because our dependent variables were ordinal, we also tested our hypotheses using simple regression analyses on interval-level difference scores representing the main effects of intent and outcome information (as in Table 1). These analyses yielded identical results.

2.2.2 | Preliminary analyses

Table 1 presents descriptive statistics and zero-order correlations for the Study 1 variables. Firstly, we checked whether the manipulation was effective. A 2 (intent) \times 2 (outcome) ANOVA showed that it was. Children considered protagonists to be 'more mean' when intent and outcome information were negative vs. positive, as indicated by significant main effects for intent, $F(1, 150) = 248.50$, $p < .001$, $\eta_p^2 = .62$, and outcome, $F(1, 150) = 120.35$, $p < .001$, $\eta_p^2 = .45$. Thus, the manipulation was effective. We also found a significant intent \times outcome interaction, $F(1, 150) = 9.13$, $p = .003$, $\eta_p^2 = .06$, indicating that the effect of intent information was stronger in negative outcome stories ($\eta_p^2 = .57$) than in positive outcome stories ($\eta_p^2 = .40$).

Next, we checked for age and gender differences. Children who understood false belief tended to be older ($M = 6.11$, $SD = 0.98$, $N = 85$) than children who did not ($M = 4.89$, $SD = 1.29$, $N = 66$), $t(149) = 5.94$, $p < .001$, $\eta_p^2 = .23$. Age was not correlated with hostile attributional bias (Table 1). Boys tended to score higher on hostile attributional bias ($M = 1.31$, $SD = 0.59$) than girls ($M = 1.10$, $SD = 0.61$), $t(149) = 2.14$, $p = .034$, $\eta_p^2 = .03$. The false-belief

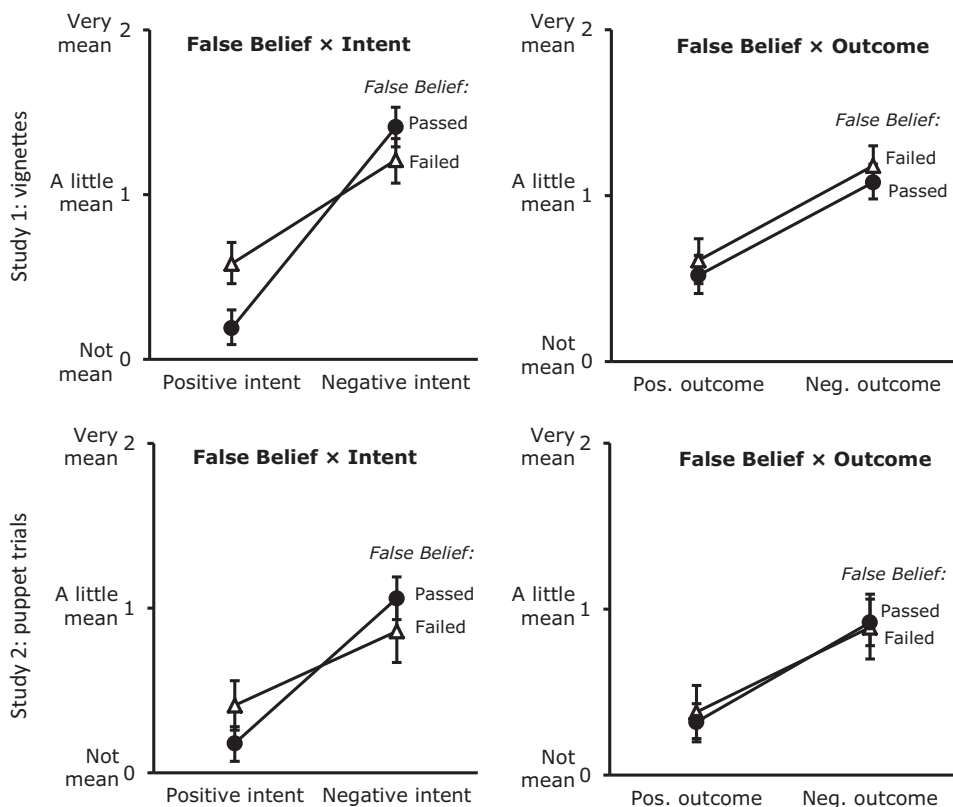


FIGURE 2 Average attribution scores of children who failed false-belief tasks and children who passed false-belief tasks in Study 1 (upper panels) and Study 2 (lower panels), when presented with positive vs. negative intent information (left panels), or positive vs. negative outcome information (right panels). Error bars represent 95% confidence intervals.

groups did not differ with regard to gender ($p = .415$). Neither gender nor age moderated any of the primary analyses (all $ps > .05$). Unless reported below, controlling for age in the analyses did not change the results.

2.2.3 | False-belief understanding and children's intent attribution skills

We tested whether children who understood false belief based their attributions more on intent information than children who did not understand false belief, using a 2 (intent) \times 2 (outcome) mixed ANOVA including false-belief understanding (pass/fail) as a between-subjects factor. Results supported this prediction; the intent \times false belief interaction was significant, $F(1, 149) = 28.03$, $p < .001$, $\eta_p^2 = .16$ (Figure 2). This effect remained significant when we controlled for age, although the magnitude of the effect decreased (i.e., $\eta_p^2 = .06$). We also checked the outcome \times false belief interaction, which was not significant. The extent to which children based their attributions on outcome information did not depend on their false-belief understanding, $F(1, 149) = 0.03$, $p = .871$, $\eta_p^2 < .01$.

2.2.4 | Children's intent attribution skills and hostile attributional bias

We tested whether children with higher levels of hostile attributional bias were less likely than others to base their attributions on intent information, using a 2 (intent) \times 2 (outcome) mixed ANOVA including hostile attributional bias (scale 0–8) as a continuous between-subjects factor. Results did not support this prediction. Children with higher levels of hostile attributional bias were not less likely than others to base their attributions on intent information; the intent \times hostile attributional bias interaction was not significant, $F(1, 149) = 3.21$, $p = .075$, $\eta_p^2 = .02$ (Figure 3). We also explored the outcome \times hostile attributional bias interaction. This effect was significant. Children with higher levels of hostile attributional bias were more likely than others to base their attributions on outcome information, $F(1, 149) = 9.62$, $p = .002$, $\eta_p^2 = .06$. Lastly, we found that the correlation between children's hostile attributional bias and false-

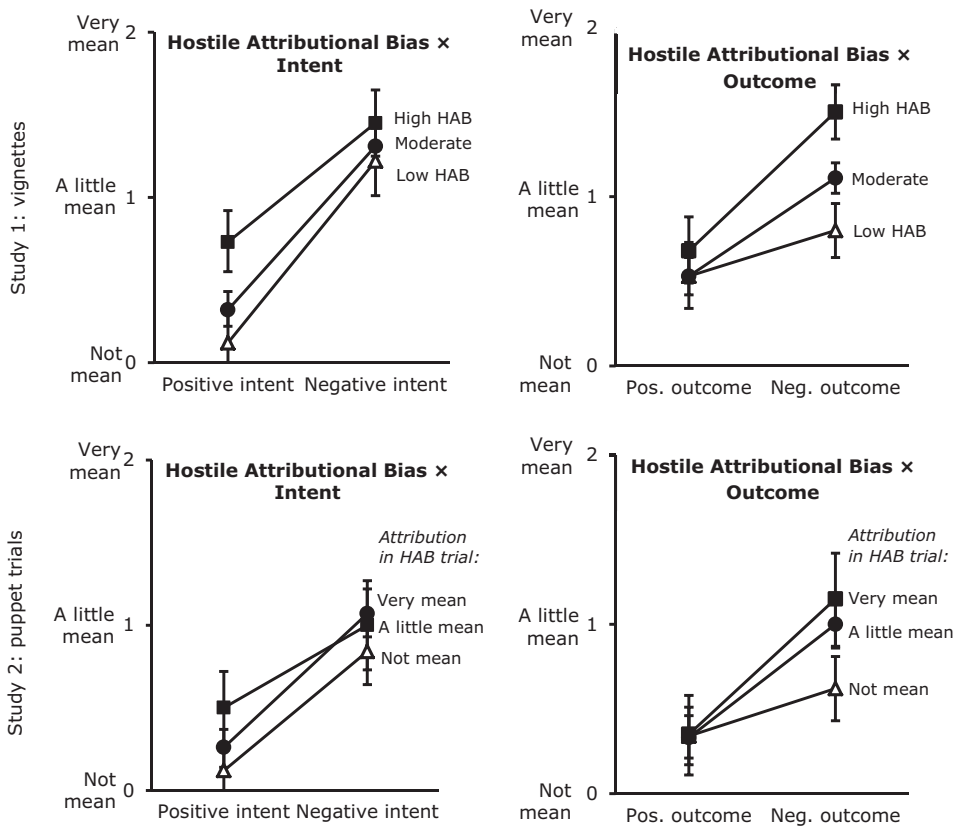


FIGURE 3 Average attribution scores of children with different levels of hostile attributional bias in Study 1 (upper panels) and Study 2 (lower panels), when presented with positive vs. negative intent information (left panels), or positive vs. negative outcome information (right panels). For graphical display Study 1 hostile attributional bias scores (scale 0–8) were split into three groups: low (below $M - 1 SD$, $N = 30$), moderate (within $1 SD < M < 1 SD$, $N = 91$), and high (above $M + 1 SD$, $N = 30$). Study 2 hostile attributional bias scores were assessed in one trial. Response categories were: not mean ($N = 25$), a little mean ($N = 47$), and very mean ($N = 13$). Error bars represent 95% confidence intervals.

belief understanding was not significant (Table 1). Thus, the link between intent attribution skills and children's hostile attributional bias was not supported by the data.

2.3 | Discussion

The results from Study 1 provide support for the first of our two hypotheses. As predicted, children's intent attribution skills depended on their understanding of false belief. Contrary to our prediction, however, these skills did not affect children's hostile attributional bias. Exploratory analyses demonstrated that children with higher levels of hostile attributional bias, more than others, based their attributions on outcome information. Thus, the results from Study 1 do not support the view that young children with a hostile attributional bias have poor intent attribution skills. Instead, Study 1 findings suggest that these children may be primarily influenced by the negative outcome of an event. As these latter findings were exploratory, a replication study seemed warranted before interpreting them.

3 | STUDY 2

Study 1 used a vignette-based paradigm. Although vignettes are commonly used to assess children's attributions in the context of ambiguous interactions, they are not without limitations. People's anticipated responses in

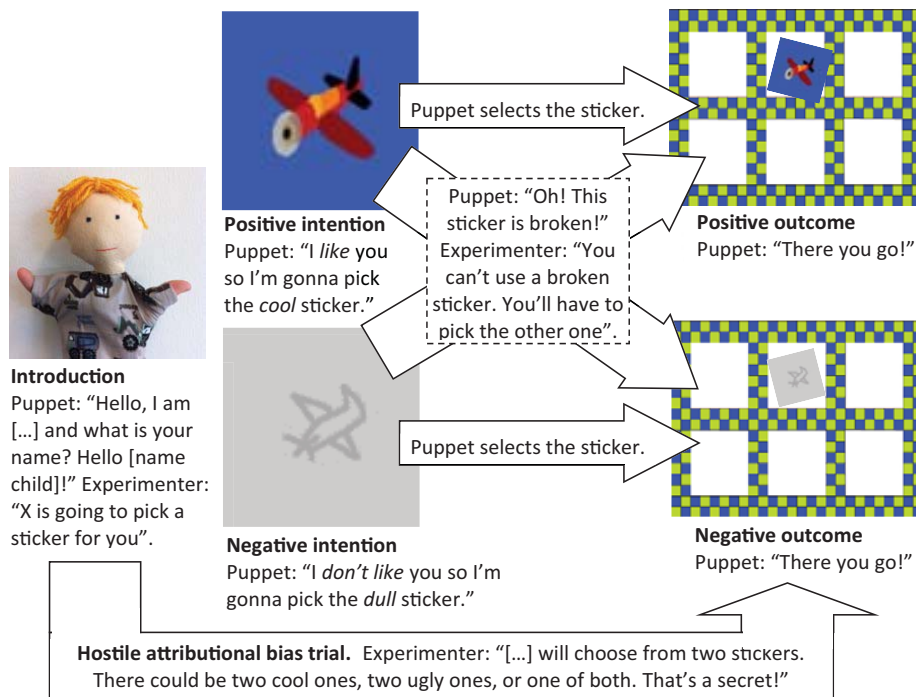


FIGURE 4 Sticker Game procedure. Each arrow represents a trial (practice trial not included).

hypothetical situations do not necessarily correspond with their actual responses during in vivo situations (Robinson & Clore, 2002). Accordingly, in Study 2, we assessed children's attributions in the context of staged interactions with hand puppets.

3.1 | Method

3.1.1 | Participants

Participants were 85 Dutch children ages 3 to 7 years, who were recruited from a preschool and a primary school in The Netherlands ($M_{\text{age}} = 5.26$, $SD = 1.44$; 49.4% male; 100.0% Caucasian). Data from four additional children were excluded. These children did not speak Dutch ($N = 1$), failed to complete all trials ($N = 1$), or failed a procedural check ($N = 2$, see procedure). All children received active parental consent to participate in the study (consent rate = 68.6%).

3.1.2 | Procedure

Children were tested individually in a quiet room in their (pre)school. The experimental sessions lasted 25–30 min and were conducted by the first author, who at that time was not aware of Study 1 results. Before testing, the experimenter checked children's comprehension of the terms 'a little' and 'very' that were used for our assessment of intent attributions. All children succeeded.

Next, the experimenter introduced the 'Sticker Game', which provided an in vivo context to measure children's hostile attributional bias and intent attribution skills. Children were told that they were going to play six trials of a sticker trading game with same-gender hand puppets. Each trial was played with a different puppet, operated by the experimenter. Children received a colorful 9×13 cm cardboard card on which they could adhere six stickers. The experimenter showed that there were two kinds of stickers: 'cool' and 'dull' stickers. The cool stickers were colorful and neatly drawn whereas the dull stickers were grey and sloppily drawn. The experimenter emphasized the crux of the game: The puppet determined whether children received a cool or dull

sticker. Next, children were asked which stickers they liked best. Two children preferred the dull stickers; their data were excluded from the analyses.

Trial 1: Practice

The session started with a practice trial: The puppet selected a cool sticker (positive outcome) without stating why (ambiguous intent). This trial served two purposes. Firstly, the practice trial familiarized children with the game procedures (Figure 4). Secondly, and crucially, the practice trial showed children that some stickers were defective: The sticker they selected for the puppet would tear as they tried to remove it, because it was partially glued onto the sticker sheet. The experimenter then explained that the tearing was not children's fault because some of the stickers were 'broken' and encouraged children to take the other sticker. Children thus learned that sometimes, the initially selected sticker could not be used for trading.

Trial 2: Hostile attributional bias

Next, the experimenter presented children with an ambiguous provocation trial to assess their hostile attributional bias. In this trial, the puppet selected a dull sticker (negative outcome) without stating why (ambiguous intent). To ensure that the puppet's intentions were ambiguous, the two stickers that the puppet chose from were concealed—hence it was unclear for children whether the puppet could not help but select a dull sticker (benign intent), or had the opportunity to select a cool sticker but deliberately chose not to (hostile intent). After the trial, the experimenter assessed children's intent attributions with the same questions that we used to assess intent attributions in Study 1. Scores varied between 0 (*not mean*), 1 (*a little mean*), and 2 (*very mean*). Supporting the validity of this hostile attributional bias measure, we found that children with higher scores were more likely to respond aggressively by selecting a dull sticker for the puppet in return, despite the experimenter telling them that 'puppets do not like to receive dull stickers', $\chi^2(1) = 4.46$, $p = .035$, $b(SE) = 0.73(0.36)$, Nagelkerke $R^2 = 0.07$. (At the end of this trial, we also administered an aggression measure modeled after the hot sauce paradigm (Lieberman, Solomon, Greenberg, & McGregor, 1999), but this measure did not significantly correlate with children's hostile attributional bias.)

Trials 3–6: Intent attribution skills

Next, children's intent attribution skills were assessed in the remaining four trials. This assessment used a 2 (intent) \times 2 (outcome) within subjects design, similar to Study 1. The four possible combinations of positive and negative intent and outcome information were presented in a different, randomized order for each child. The intent information was manipulated by the puppet's initial selection of either the cool sticker (positive intent) or the dull sticker (negative intent). The outcome information was manipulated by which sticker the puppet actually handed over to the child: the cool sticker (positive outcome) or the dull sticker (negative outcome). Two trials had mismatching intent and outcome information. In these cases, the sticker that the puppet initially selected (intent) was 'broken' so that the puppet had no choice but to hand over the other sticker (outcome). After each trial, children's attributions were assessed with the same questions that were used for the hostile attributional bias assessment (0 = *not mean*, 1 = *a little mean*, 2 = *very mean*). As in Study 1, we calculated difference scores representing the main effects of intent information and outcome information on children's attributions (i.e., intent-based attribution and outcome-based attribution).

To end the sticker game positively, the puppet from the trial with negative intent and outcome information apologized to the child and gave three attractive stickers to stick over the dull ones. Children were allowed to keep the stickers as a reward for their participation.

False-belief understanding

Lastly, false-belief understanding was assessed with the same tasks as in Study 1. We created a dichotomous score, distinguishing between children who passed both tasks (1 = *pass*) and children who failed on one or both tasks (0 = *fail*). (Analyses using continuous scores yielded the same results.)

3.2 | Results

3.2.1 | Analytical approach

We adopted the same analytical approach as in Study 1. Again, we reanalyzed the data using simple regression analyses on interval-level difference scores representing intent- and outcome-based attribution, and the results were identical.

3.2.2 | Preliminary analyses

Table 1 presents descriptive statistics and zero-order correlations for the Study 2 variables. Firstly, we tested whether the manipulation of intent and outcome information was effective. It was: A 2 (intent) \times 2 (outcome) ANOVA showed that children considered puppets to be 'more mean' if intent and outcome information were negative vs. positive, as indicated by main effects for both intent, $F(1, 84) = 133.84$, $p < .001$, $\eta_p^2 = .61$, and outcome, $F(1, 84) = 70.30$, $p < .001$, $\eta_p^2 = .46$. We also found a significant intent \times outcome interaction, $F(1, 84) = 17.13$, $p < .001$, $\eta_p^2 = .17$, indicating that the effect of intent information was stronger in negative outcome trials ($\eta_p^2 = .55$) than in positive outcome trials ($\eta_p^2 = .25$).

Next, we tested for age and gender differences. Children who understood false belief tended to be older ($M = 5.93$, $SD = 1.16$, $N = 57$) than children who did not ($M = 3.91$, $SD = 0.91$, $N = 28$), $t(83) = -8.09$, $p < .001$, $\eta_p^2 = .43$. Hostile attributional bias was not correlated with age (Table 1). Descriptively more girls (76.7%) than boys (57.1%) understood false belief, but this difference was not significant ($p = .055$). Unlike Study 1, we found no gender differences in hostile attributional bias ($p = .726$). The primary findings were not moderated by age or gender (all $ps > .05$). Unless reported below, controlling for age in the analyses did not change the results.

3.2.3 | False-belief understanding and children's intent attribution skills

We tested whether children who understood false belief based their attributions more on intent information than children who did not understand false belief, using a 2 (intent) \times 2 (outcome) mixed ANOVA including false-belief understanding (pass/fail) as a between-subjects factor. As in Study 1, the predicted effect was supported by a significant intent \times false belief interaction (Figure 2), $F(1, 83) = 11.73$, $p = .001$, $\eta_p^2 = .12$, and the outcome \times false belief interaction was not significant, $F(1, 83) = 0.35$, $p = .553$, $\eta_p^2 < .01$. When we controlled for age, the intent \times false belief interaction became nonsignificant. Instead, the intent \times age interaction was significant, showing that older children based their attributions more on intent information than younger children did, $F(1, 82) = 9.61$, $p = .003$, $\eta_p^2 = .11$. Thus, the link between children's false-belief understanding and intent attribution skills was supported by the data, although we cannot rule out that this effect is partially driven by other age-related factors (e.g., improved executive functioning).

3.2.4 | Children's intent attribution skills and hostile attributional bias

We tested whether children with higher levels of hostile attributional bias were less likely than others to base their attributions on intent information, using a 2 (intent) \times 2 (outcome) mixed ANOVA including hostile attributional bias (scale 0–2) as an ordinal between-subjects factor. As in Study 1, we found no intent \times hostile attributional bias interaction, $F(1, 83) = 0.53$, $p = .467$, $\eta_p^2 < .01$ (Figure 3), but we did find a significant outcome \times hostile attributional bias interaction, $F(1, 83) = 8.07$, $p = .006$, $\eta_p^2 = .09$. We again found no correlation between children's hostile attributional bias and false-belief understanding (Table 1). Thus, the link between intent attribution skills and children's hostile attributional bias was not supported by the data. However, our findings do suggest that, compared to others, children with a hostile attributional bias were more strongly influenced by negative outcomes.

3.3 | DISCUSSION

Study 2 replicated the results from Study 1 using in vivo interactions to assess children's intent attributions. Children who understood false belief based their attributions more on intent information than children who did not understand false belief, but these intent attribution skills, in turn, were not linked to children's hostile attributional bias. Instead, we

again found that children who based their attributions more on outcome information had higher levels of hostile attributional bias than others.

4 | GENERAL DISCUSSION

It has been argued that in early childhood, hostile attributional biases may be predominantly explained by children's intent attribution skills (Dodge, 2006). Two studies tested this hypothesis. Study 1 used a well-established method of assessing intent attributions by using stories of hypothetical interactions and Study 2 used a more ecologically valid method by using staged interactions with puppets. Results generalized across methods. As expected, we found that children's ability to base their attributions on intent information depended on their understanding of false belief. However, and contrary to our prediction, children's hostile attributional bias did not depend on the ability to base their attributions on intent information, nor on their understanding of false belief. Thus, our results do not support the view that hostile attributional biases in early childhood may be explained by children's attribution skills. Instead, they suggest that hostile attributional biases may be related to children's heightened sensitivity to negative outcome information.

4.1 | FALSE-BELIEF UNDERSTANDING AND CHILDREN'S INTENT ATTRIBUTION SKILLS

Previous research established that children who understand false belief are less likely to attribute hostile intent to a story character who accidentally causes harm than children who do not understand false belief (Killen et al., 2011). These previous findings seem to imply that children who understand false belief have better intent attribution skills, but they may also imply that these children simply are less upset by the harm itself. The present research ruled out this alternative explanation by using a 2 (intent) \times 2 (outcome) design, which showed that children who understood false belief were more likely than others to base their attributions on intentions, irrespective of whether the outcomes of the scenarios were positive or negative.

The link between false-belief understanding and intent attribution skills was partly accounted for by age differences in Study 1, and fully so in Study 2. False-belief understanding and age were highly correlated and so we cannot disentangle whether increases in children's intent attribution skills are explained by false-belief understanding or some other age-related process. For instance, meta-analytical evidence suggests that the development of executive functions precedes the development of false-belief understanding (Devine & Hughes, 2014). The same may be true for intent attribution skills. Children may need certain levels of working memory capacity and inhibitory control before they can base their attributions on implicit intent information and override their initial response to salient outcome information (Carlson & Moses, 2001).

Although the exact developmental underpinnings of children's intent attribution skills remain to be mapped, our findings do show that these skills improve with age. This finding, along with previous research showing that older children base their moral judgments more on intent information, illustrates that children's core capacity to understand others' mental states (Baird & Moses, 2001; Schult, 2002) is also apparent in how children process emotionally involving situations, such as accidental harm (Nobes et al., 2009; Yuill & Perner, 1988; Zelazo et al., 1996).

4.2 | CHILDREN'S INTENT ATTRIBUTION SKILLS AND HOSTILE ATTRIBUTIONAL BIAS

We found no evidence that children with higher levels of hostile attributional bias were less skilled at basing their attributions on intent information, or had poor understanding of false belief. Children who attributed benign intent when others' intentions were explicitly positive still attributed hostile intent when others' intentions were ambiguous. This finding corroborates experimental research finding that aggressive and nonaggressive children's responses to a staged peer provocation only differed when the peer's intentions were ambiguous (i.e., attributional bias), and not when the peer's intentions were clearly positive or negative (i.e., attributional skills) (Dodge, 1980). Similarly, longitudinal research has found that children's aggression was predicted by their tendency to perceive anger in

non-angry faces (i.e., anger perception *bias*), but not by their ability to detect anger in angry faces (i.e., anger perception *skills*; Fine, Trentacosta, Izard, Mostow, & Campbell, 2004). Together, these findings suggest that intent attribution skills and hostile attributional biases are distinct psychological processes that operate independently from one another.

Still, one may wonder why children's ability to base their attributions on explicit intent information did not translate into lower levels of hostile attributional bias. One possible explanation is that hostile attributional biases are predominantly driven by hostile schemas. Such schemas are based on children's social experiences (Crick & Dodge, 1994) and are thought to guide children's interpretations if situational cues are unclear (Burks, Laird, Dodge, Pettit, & Bates, 1999). Thus, children may understand that harm can be caused by accident, but still attribute hostile intent in ambiguous situations that trigger their hostile schemas. Another possible explanation is that hostile attributional biases are explained by deficiencies in more advanced attribution skills, such as the ability to read subtle intent cues (Horsley, de Castro, & Van der Schoot, 2010). This latter explanation resonates with research showing that children's hostile attributional bias was not predicted by their core understanding of false belief, but was predicted by their more advanced ability to explain false belief (Choe et al., 2013). Given that the current findings suggest that children's core intent attribution skills do not influence their hostile attributional bias, future research could now explore the role of more advanced attribution skills.

4.3 | NOVEL FINDING: CHILDREN'S SENSITIVITY TO NEGATIVE OUTCOMES

A novel finding from this research is that children who hold a hostile attributional bias, more than others, based their attributions on outcome information. The same negative outcomes elicited hostile attributions in some children but not others, and this was irrespective of how much children based their attributions on intent information from the person causing harm. Some children's attributions were simply more affected by the harm itself. Hence, one main conclusion from our research is that some young children's heightened sensitivity to negative outcomes may be an important determinant of their hostile attributional bias.

What may account for these individual differences in children's sensitivity to negative outcomes? One possible explanation is that exposure to aversive social experiences such as peer rejection or harsh parenting may sensitize children to negative outcomes, such that any negative event readily triggers hostile intent attribution (e.g., Dodge, Pettit, Bates, & Valente, 1995; Perren, Ettekal, & Ladd, 2013; Weiss, Dodge, Bates, & Pettit, 1992). Relatedly, children's heightened outcome-sensitivity may reflect limited working memory capacities. That is, some children may lack the cognitive resources needed to consider cues other than highly salient negative outcomes (Choe et al., 2013). Indeed, research in adults has shown that more cognitive resources are required to decide that another person's behavior is unintentional vs. intentional (Rosset, 2008). Future research could investigate these possibilities in order to enhance our understanding of the early-age precursors of children's hostile attributional bias.

4.4 | STRENGTHS, LIMITATIONS, AND PRACTICAL IMPLICATIONS

Our research design allowed us to investigate the independent effects of intent and outcome information on children's attributions. We found that children's use of intent information was linked to their false-belief understanding whereas children's use of outcome information was linked to their hostile attributional bias. If we had only used accidental harm scenarios, and not included intended harm, failed harm, and no harm scenarios, we would have confounded some children's heightened sensitivity for negative outcomes with an inability to use intent information.

Some aspects of our research design limit the conclusions that can be drawn. Firstly, the studies were conducted with typically developing children. Additional research is required to determine to what extent our findings generalize to children with aggressive behavior problems. Secondly, we manipulated intent information explicitly (e.g., 'the boy wants to bully you') because we were interested in children's ability to integrate intent information into their attributions, rather than their ability to detect intent information. Thus, our conclusions are limited to children's ability to base

their attributions on explicit intent information, and do not speak to the role of more advanced attribution skills. Thirdly, our research used a cross-sectional design. Future work may investigate longitudinal linkages between children's intent attribution skills and hostile attributional bias.

The present research may have implications for early intervention efforts to decrease children's hostile attributional bias and aggressive behavior. Our results suggest that children with high levels of hostile attributional bias do not have impaired intent attribution skills. Accordingly, we expect little gain from interventions that seek to train these skills. Instead, our results suggest that helping children to base their attributions less on negative outcomes may be an effective approach to reduce their hostile attributional bias. This may be attained by techniques that children may practice under conditions of negative emotional strain, such as self-talk, arousal modulation, or cognitive restructuring (e.g., Sukhodolsky, Golub, Stone, & Orban, 2006).

4.5 | CONCLUSION

'Was it meant to be mean?' Aggressive children are likely to answer this question affirmatively, even if the other person's intentions were unclear. Our research suggests that such a hostile attributional bias does not depend on young children's intent attribution skills. Rather, when a negative outcome occurs, children may focus, in the heat of the moment, on the negative outcome and conclude that the other person meant to be mean. Research on children's heightened sensitivity for negative outcomes and its early-age precursors could be an important next step in helping children overcome their hostile attributional bias.

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