The role of maltreatment experience in children's understanding of the antecedents of emotion

Susan B. Perlman

Duke University, Durham, North Carolina, USA

Charles W. Kalish and Seth D. Pollak

University of Wisconsin at Madison, Madison, WI, USA

The ability to understand the causes and likely triggers of emotions has important consequences for children's adaptation to their social environment. Yet, little is currently known about the processes that contribute to the development of emotion understanding. To assess how well children understood the antecedents of emotional reactions in others, we presented children with a variety of emotional situations that varied in outcome and equivocality. Children were told the emotional outcome and asked to rate whether a situation was a likely cause of such an outcome. We tested the effects of maltreatment experience on children's ability to map emotions to their eliciting events and their understanding of emotion–situation pairings. The present data suggest that typically developing children are able to distinguish between common elicitors of negative and positive events. In contrast, children who develop within maltreating contexts, where emotions are extreme and inconsistent, interpret positive, equivocal, and negative events as being equally plausible causes of sadness and anger. This difference in maltreated children's reasoning about emotions suggests a critical role of experience in aiding children's mastery of the structure of interpersonal discourse.

A major challenge for the developing child is learning to predict and explain people's actions and psychological states. Given that psychological states are

invisible, it must be information about situations that provides the bases for predicting what people will want, think, and feel. Often there are predictable links between situations and psychological states. If a noise occurs nearby, we expect people will hear it. If an attractive toy is offered, we expect people will want it. The focus of the current study is emotional reactions. If someone receives a present, we expect she or he will be pleased. However, it is practically impossible to achieve perfect accuracy in predicting other people's emotional reactions to different situations. Indeed, some situations are equivocal in that they elicit multiple reactions and some people's reactions appear, at times, atypical. Not surprisingly, young children master clear, canonical cases of emotional responses before understanding equivocal emotional situations or appreciating idiosyncratic emotional responses. It appears that over the course of development, children combine their knowledge of canonical emotion–situation relations with a more flexible understanding of the many-to-many mappings between emotions and situations. The following study explores the development of the ability to predict the emotional outcomes of unequivocal and equivocal situations as well as how extreme social learning experiences affect the ability to reason about emotional reactions to events.

One hypothesis about the development of emotion understanding is that children initially expect only a single reaction to be likely from a given type of event. Getting presents makes people happy (not sad). Losing a toy makes people sad (not happy). This may be because children form direct associations between events and reactions, or because they tend to attribute consistent goals to people (most people want presents and toys; see Stein & Levine, 1989). This experience allows children to form expectations about likely causes of emotional reactions and the likely emotional reactions people will have to various events. At the same time, as children accumulate more social experience, they begin to appreciate that many events have no single emotional result, and anomalous reactions are possible to even the most obvious event. Possible mechanisms for this change include increased exposure to non-canonical reactions and/or increased recognition that people's goals vary.

Extant data are consistent with this canonical-reaction hypothesis. Children first understand and predict emotions in situations that regularly lead to the same emotional reaction (Gnepp, McKee, & Domanic, 1987) and by approximately three years of age can distinguish situations that produce positive versus negative emotions (Denham, 1998). Preschool-aged children use expectations about emotion–situation pairings to make inferences about others' emotional states (Arsenio, 1988; Gnepp & Gould, 1985). When emotion–situation links are consistent with canonical expectations (being happy when one receives a gift), young children's judgements tend to be accurate and children are also quite sensitive to violations of the norms, such

as when facial expression conflicts with the usual emotional implications of a situation, and to emotions following moral transgressions (Arsenio, 1988; Gove & Keating, 1979; Gnepp, 1983; Gnepp et al., 1987; Reichenbach & Masters, 1983). These findings suggest that the regularity and predictability of emotional experiences are important for the development of emotion understanding.

Both within-person and between-person variability in emotional responses increase children's difficulty in learning about emotions, which is consistent with the idea that understanding emotions is based upon canonical expectations, An example of this type of variability is when a single individual experiences "mixed" feelings (e.g., one can feel sad having lost a race but happy that one's best friend won the race). Other situations that young children find difficult to understand are idiosyncratic emotional reactions (e.g., one can be happy to have tomatoes served with dinner if one likes tomatoes or unhappy if one dislikes tomatoes). Indeed, during the preschool years, children tend not to recognise that multiple emotional reactions are possible to a given event (Gnepp et al., 1987); that is, young children are confident they know how someone will respond to an equivocal event (Gnepp & Klayman, 1992). Yet, with increasing social experience, children begin to appreciate that an individuals' past experience might colour their responses to events and might be different from the child's own reaction (Denham & Couchoud, 1990; Gnepp, 1989; Lagattuta & Wellman, 2001). Between three and six years of age, children become more adept at understanding how individual learning histories and experiences might lead people to have a variety of mental states (including beliefs, goals, and emotions; Wellman, 1992). It is important to note that in the previous literature variability in the individual response to emotional events has been referred to as both "ambiguity" and "equivocality". For the purpose of clarity, our paper will discuss "equivocal" events as those that provoke idiosyncratic emotional reactions.

A motivation for the present studies was to begin to examine the idea that one aspect of emotional development includes changes in children's expectations about the predictability of emotional reactions. A methodological challenge in addressing this issue is that most measures of emotion understanding rely upon categorical responses: children are asked to name an emotion that would follow a situation, or (more rarely) a situation that would evoke an emotion. However, emotions are associated with situations by matters of degree: in theory any emotion could be elicited by any situation. Therefore, it is important to evaluate the relative and continuous nature of children's judgements about emotional reactions. It is difficult to infer from categorical responses whether children think that situation–emotion pairings are likely or merely possible. Our goal was to ascertain whether young children would be able to appreciate equivocality inherent in

emotion–event pairings. In sum, it is of interest to also evaluate how children begin to appreciate multiple emotional reactions, which reactions they consider, and how children order the plausibility of noncanonical reactions.

Our first hypothesis concerned the development of the understanding of equivocal emotional situations. We tested the idea that young children would select a single emotion as most plausibly associated with a given emotionally unequivocal situation. This prediction was based upon the literature suggesting that young children typically focus on a single most plausible emotional reaction to the exclusion of others and that children first learn about canonical emotional consequences of events to anticipate others' behaviour (Arsenio & Kramer, 1992; Harris, 1985). It may be, however, that young children develop the ability to appreciate equivocal event–emotion pairings in early childhood and would be able to display this ability if given appropriate circumstances. Therefore, we also tested the hypothesis that when examined in a format that did not require "right or wrong" categorical judgements, young children will be able to demonstrate their appreciation of multiple affective responses following an equivocal situation. This prediction was based upon Denham and Couchoud's (1990) discussion of children's appreciation of non-canonical reactions.

A second motivation for these studies was to begin to understand how aspects of the child's social environment affect the development of emotion understanding. Specifically, we were interested in examining the manner by which exposure to severe emotional environments, as exemplified by child abuse, affects children's understanding of the situational determinants of emotion. We examined emotion understanding among children developing within abusive families, where emotional reactions, particularly negative emotions, are atypical and extreme. Maltreated children's emotional environments are unusual in the sense that abusive parents tend to be less expressive and talk less about emotions with children, and, most germane to the present study, display inconsistent emotional responses (Burgess & Conger, 1978; Camras, Ribordy, Hill, & Martino, 1988; Camras, Sachs-Alter, & Ribordy, 1996; Trickett, Aber, Carlson, & Cicchetti, 1991). Recent evidence suggests that abusive parents poorly convey affect in both their faces and voices (Shackman, Shackman, & Pollak, in press). Because maltreating parents, by definition, deviate from cultural norms for emotional behaviours, their children are exposed to unusual variations in the connections between events and emotions. In addition, these children experience some kinds of situation–emotion links at home that are unlike those they see in the wider culture (e.g., peers, other adults at school, etc.).

We considered two ways that we might observe an effect of an atypical learning environment on maltreated children's emotion understanding. One possibility is that inconsistent emotional environments leads to a lack of differentiation. If maltreated children have not developed expectations about

reliable, predictable emotional reactions then almost any kind of emotional response might be seen as likely from any kind of situation. A second possibility is that maltreated children form different sets of expectations. For example, Arsenio and Fleiss (1996) found that children with conduct and oppositional defiant disorders predicted different emotional reactions to situations than did their typically developing peers; but this study did not assess children's judgements of alternative responses. Several lines of research suggest that maltreated children may attend to, perceive, and process emotional information differently than their non-maltreated peers (Pollak, 2004). In particular, they are often hypersensitive to anger. Potentially, maltreated children might think people would get angry in situations that typically developing children see as leading to sadness, or view some situations as equivocal (potentially leading to anger) where typically developing children do not consider such an alternative.

We predicted that the effects of maltreatment would be especially evident in children's reasoning about negative emotional outcomes. Based upon the existing literature, it was unclear exactly how the effects of physical abuse could colour children's perception of event–emotion pairings. One hypothesis is that maltreated children understand the normative links between happiness and its eliciting events, but see negative emotions as typical reactions following a multitude of situations. On this view, maltreated children may believe the majority of situations to be equivocal in that they have the potential to evoke a negative response. A second possibility is that maltreated children simply have different appraisals (e.g., see anger rather than happiness) of events. We expected that the first hypothesis was more likely based on the rationale that maltreated children's experience is one of greater diversity and range of emotional expression, which may lead to a heightened sensitivity to the equivocality of emotional events. We also considered the second hypothesis, but did not see such a result as likely because, although maltreated children experience different situation–emotion contingencies than typically developing children, they are also exposed to corrective, culturally normative messages.

PRELIMINARY STUDY

The initial study was designed to refine and validate our new procedure for assessing children's emotion understanding and to gather preliminary data bearing upon our first hypothesis. As described above, procedures used to probe children's understanding of the antecedents of emotional reactions typically query a child about how someone might feel once an emotional event has occurred (Barden, Zelko, Duncan, & Masters, 1980; Borke, 1971; Harris, 1983; Kestenbaum & Gelman, 1995). From an observed ability to

pair the event with a subsequent emotion, it is inferred that children understand the event as being causal for the emotion (Gnepp & Klayman, 1992; Gnepp, Klayman, & Trabasso, 1982). There are two potential limitations to these paradigms. First, younger children may be more likely to recognise linkage between experience and emotional reactions when the emotional reaction is explicitly described, rather than inferred: children find it easier to explain people's mental states than to predict them (Bartsch & Wellman, 1989; Lagattuta & Wellman, 2001). Second, these approaches limit children to categorical responses about the likelihood of situation–emotion pairings. Therefore, we designed a task in which children were not required to choose one emotional response or generate predictions about emotional behaviour. Rather, we asked children to evaluate the plausibility of an event as the cause of an emotional reaction through a more continuous rating system. This preliminary study served to validate the effectiveness of the stimuli as antecedents to emotional reactions as understood by young children and determine the youngest aged sample that could complete the task.

Method

Participants. Participants were 36 children (20 boys, 16 girls; 24 five-year-olds, 12 four-year-olds) recruited from preschools and day-care centres in a mid-sized Midwestern US city. Informed consent was received from the parents of all participating children. Not included in the sample of 36 were 4 children who were unable to complete the task and another 3 children whose data were lost because of a computer error.

Materials. Images were presented on a laptop computer screen. Six outcome pictures presented adults (described as moms or dads) displaying happy, sad, or angry facial expressions. Thirty-six situation pictures presented different emotion eliciting events (12 each of positive, negative, and equivocal). All pictures were coloured line drawings. Pictured characters were racially ambiguous, and equally split between male and female protagonists. A three-level, pictorial rating system involved sets of coloured stars. A picture of many large, brightly coloured stars was associated with a very plausible rating. A possible rating was linked to a few pale-coloured stars. An unlikely or implausible rating was indicated by one small, dark-coloured star. The final element of the paradigm was a depiction of a robot named Dax. Dax was introduced to children as a robot that did not understand feelings. Pretest materials included a cartoon rabbit narrator who explained task instructions. Two practice non-emotional situations were included to ensure that children understood the task. Practice situations

involved pictures of physical reactions (cold, hunger) and eliciting events (playing in snow, eating dinner).

Procedure.   Children were introduced to Dax and asked to help the robot learn about human emotions (see Figure 1). The task required children to evaluate the plausibility of various pairings of emotional outcomes with antecedent, eliciting events such as "child hugs parent" or "child draws on the wall".[1] The general structure of the task proceeded as follows. Each trial began with a cartoon of an adult displaying happiness, anger, or sadness along with an automated recording that labelled the emotion ("This Dad is feeling angry" or "This Mom is feeling sad"). Next, Dax (speaking in a synthesised voice) offered a guess about a prior situation that might have caused the emotion displayed by the parent ("I think this Dad is angry because his little boy drew on the wall with a marker" or "I think this Mom is sad because her little girl just won a race"). A cartoon depicting the situation described by the robot then appeared. Emotion stories were chosen from, or modelled after, those used in the literature (see Camras & Allison, 1985; Denham, 1986; Wismer Fries & Pollak, 2004). Children then "taught" Dax about emotions by indicating their view of the plausibility of the robot's guess. Plausibility ratings were made using a 3-level scale of rewards. The rating scale was introduced with the following instructions:

> If you think DAX's answer was right then you would give him the big prize, the big shiny stars. If you think DAX's answer was wrong then you would give him the small
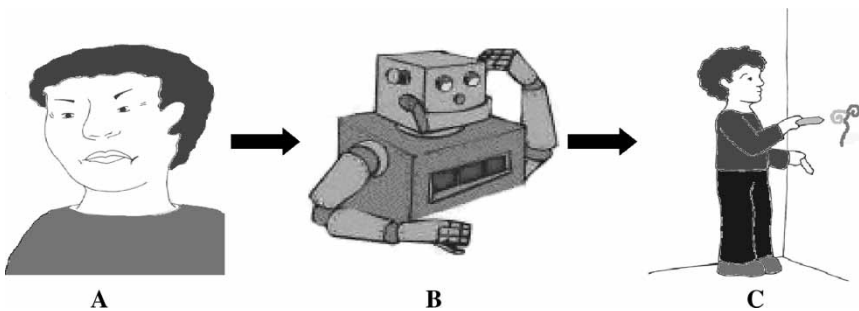

Figure 1.   Schematic of emotion understanding task. Children were presented with a cartoon of an adult displaying a happy, angry, or sad facial expression (A). Next, a robot offered a guess about a situation likely to cause that emotion (B). Children watched a cartoon depicting the situation that the robot offered as an antecedent to the emotion (C). Children responded by rating the perceived likelihood of the robot's guess.

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[1] Stimulus items and child ratings are available from the authors.

black star. If you think DAX's answer may be right but some people would not agree with him then you would give him the medium prize.

Children's performance on two concrete, non-emotional pretest trials indicated that all of the children in the final sample understood the task and the reward system. Children were tested individually. The task, including instructions and practice sessions, lasted approximately 45 minutes. Following completion of the experiment all children were rewarded with stickers.

Design. In a between-subjects design, children rated 4 (randomly assigned out of 12) examples each of three different kinds of events: positive, negative, and equivocal. Equivocal stimuli, as described above, were events that elicit positive emotional reactions in some people and negative reactions in others, or that could lead to a combination of both positive and negative feelings in the same individual. Negative events were equally divided between situations that might produce sadness and anger. Each of these three event types was paired with each of three emotional outcomes (happy, angry, sad). Thus each participant rated 4 trials for each emotion × event-type combination for a total of 36 trials. For example, there were four instances of positive events paired with happy emotional outcomes, four positive events paired with angry outcomes, etc. The order of specific pairings of events and emotions were counter-balanced across participants.

Results and discussion

To quantify children's evaluations, 1 point was assigned for improbable (one-star), 2 points for possible but unlikely (two-star), and 3 points for probable (three-star) responses. These points were averaged to produce explanation ratings, which are presented in Figure 2. The task proved too difficult for most of the 4-year-old children: these younger children responded the same way for all the event–emotion pairings (no significant effects in the ANOVA). However, 5-year-olds were able to differentially rate the pairings of events and emotions. Ratings for 5-year-olds were analysed in an Event (positive, negative, equivocal) × Emotion (happy, angry, sad) ANOVA. Neither of the main effects was significant, though the Event Emotion interaction was, $F(4, 96) = 40$, $p < .001$. Of primary interest are the simple effects. The emotional outcome had a significant effect on ratings for both positive and negative events, $F(2, 46) = 46$ and 36, respectively, both $ps < .001$. The simple effect of emotion was also significant for equivocal events, $F(2, 46) = 4$, $p < .05$, though no pairwise comparisons were significant for these events (see below). Finally, the other set of simple effects were also significant. At each level of emotion (happy, angry, sad) different event types
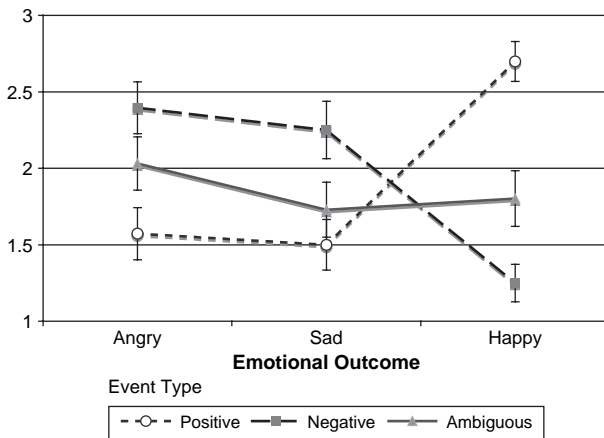
Figure 2. Mean ratings of negative, positive, and equivocal events as antecedents of happy, angry, and sad emotional reactions, preliminary study. Error bars ± one standard error.

received significantly different ratings, $F(2, 46) = 64$, 13, 10, respectively, all ps $< .001$.

Post hoc comparisons revealed that pairs clustered into three types (all comparisons $p < .05$, Tukey's HSD). Positive events paired with happy responses and negative events paired with angry and sad responses all received relatively high likelihood ratings from children (three-star ratings). Positive events paired with angry or sad responses and negative events paired with happy response all received relatively low likelihood ratings (one-star ratings). Therefore, we concluded that children as young as five were able to indicate the most likely affective response following unequivocal events using this probability rating system.

As expected, equivocal situations prompted more "possible but unlikely" responses (ratings of 2) than other events: vs. positive, $t(19) = 4.8$, $p < .001$, vs. negative, $t(19) = 5.6$, $p < .001$, both 2-tailed t-tests. Although never the modal response, 22% of equivocal items received the intermediate rating, and all 5-year-olds used this rating at least once. Given the between-subjects design of the study, there are no direct measures of individual participants' acceptance of the same event for more than one emotional outcome. However, it is possible to assess the degree to which events of the same type (positive, negative, equivocal) were accepted for multiple emotions (happiness and either sadness or anger). In this analysis, a rating of 2 or 3 was considered as an indication of acceptance; the predicted emotion is at least a possible outcome. Positive events were accepted as causes of happiness 90% of the time, but acceptance of anger or sadness only 33% (the chance probability of acceptance on any trial is 2/3, of rejection 1/3). Negative

events were accepted as causes of anger or sadness 73% of the time, but of happiness only 16%. Equivocal events were accepted for both types of emotional responses equally (happiness 49%, anger/sadness 55% of trials). These results are consistent with our first hypothesis, that young children are able to understand equivocality in emotional events when presented with a continuous judgement system.

A second purpose of Study 1 was to validate the set of positive, negative, and equivocal situations. We retained situations that children viewed as unequivocally causing positive emotions if the mean Happy rating was at least 2.75, and greater than Angry and Sad ratings by at least 1; there were 3 such items. Negative unequivocal situations were retained if the mean of Angry and Sad ratings were at least 2.5, and Happy ratings were less than 1.5; there were 5 such items. To select the best equivocal situations, the sum of the absolute differences between (Happy–Sad) and (Happy–Angry) had to be less than .6 and the difference between Angry and Sad had to be small (less than .35). That left 6 items. These situations were used as stimuli in Study 2.

This preliminary study revealed several patterns of emotional appraisals, ranging from strong exclusivity (positive events only associated with positive emotions) to broad inclusivity (equivocal events associated with all emotions). At the same time, the 5-year-old children did clearly distinguish between the likely causes of positive emotions and the likely causes of negative emotions. The results suggest that children can understand and offer plausibility ratings of situation–emotional reaction pairings and that young children form differentiated expectations of both unequivocal and equivocal emotion-eliciting events.

STUDY 2

Study 2 was designed to test our hypothesis about the effects of maltreatment experience on children's understanding of the antecedents of emotion. We recruited samples of typically developing and maltreated children, who encounter unusual emotional reactions in their home environments. Based upon the results of Study 1, we recruited 5-year-old, physically abused children and a new sample of comparison children who were sociodemographically matched to the maltreated sample.

Method

Participants.   Seventeen physically abused children (7 girls, 10 boys) and 18 non-maltreated comparison children (8 girls, 10 boys) between the ages of 5 and 6 years participated in this study. Characteristics of each sample are presented in Table 1. Physically abused children were recruited by letters

TABLE 1
Mean (standard deviation) of psychodemographic characteristics of sample

	Physically abused	*Control*
Age, years	5.5 (0.3)	5.4 (0.4)
Children in family	2.5 (0.6)	2.4 (0.9)
SES	37.8 (13.7)	40.7 (10.7)
Single parent (%)	40.5	35.2

Note: There were no statistically significant group differences between any variable reported in Table1. SES (socioeconomic status) computed by Hollingshead (1975, unpublished manuscript).

forwarded by the Dane County (WI, USA) Department of Human Services and by local community mental health agencies to families with substantiated cases of child maltreatment. Non-maltreated comparison children were recruited by flyers posted in the same neighbourhoods and childcare centres from which the physically abused children were sampled. Attempts were made to match groups on child variables such as age, sex, race, and on family demographic variables, such as percentage of single parent status and number of children in the home; groups did not differ on any of these measures. All children were screened for normal or corrected-to-normal vision and hearing just prior to being tested.

Materials and design.   Based upon data from the preliminary study, we identified three events as the clearest examples of positive items (high ratings for happiness, low for sadness and anger), five negative items (with high ratings for anger and sadness and low ratings for happiness), and six equivocal situations (based on the sum of the absolute differences between the pairs of emotions). These stimuli were used in a within-subject design in Study 2. Each positive, negative, and equivocal antecedent situation was presented three times: once each with a happy, sad, and angry outcome.

Procedure.   Procedures were identical to those described in the preliminary study.

Results and discussion

Figure 3 provides the mean ratings for the three emotion outcomes included in the task. Children's explanation ratings were submitted to a repeated-measures analysis of variance (ANOVA) with Group (maltreated, comparison) as a between-subjects factor and Event (negative, positive, equivocal) and Emotion (angry, happy, sad) as within-subject factors. The question of primary interest was whether the interaction between Event and Emotion observed in the preliminary study would hold for the within-subjects design
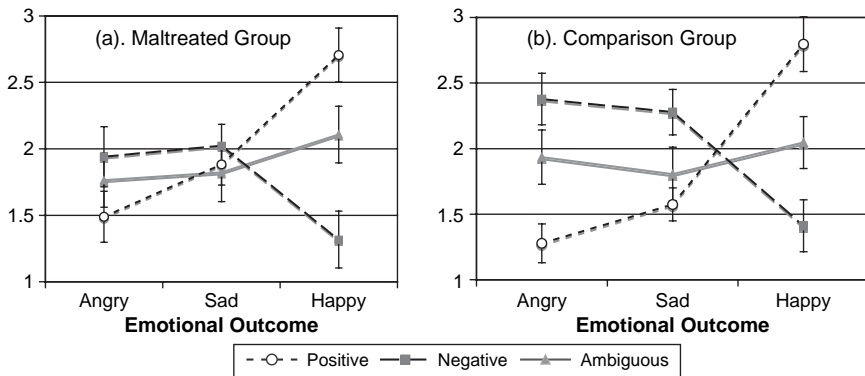
Figure 3.   Mean ratings of negative, positive, and equivocal events as antecedents of happy, angry, and sad emotional reactions, Study 2. Maltreated children (3a) and comparison group children (3b). Error bars±one standard error.

in Study 2 and for both maltreated and comparison group children. To address these questions we analysed the simple effects of Event and Emotion for both groups of children.

For non-maltreated comparison children, the pattern of results largely mirrored that of the preliminary study. The emotion observed did affect the ratings for both positive and negative events, $F(2, 34) = 40, 14$, respectively, $p < .001$. Positive events were rated more highly as causes of happiness than anger or sadness, $F(2, 34) = 13.7$, $p < .001$. Ratings for negative events showed the reverse pattern, anger/sadness > happiness, $F(2, 34) = 40.2$, $p < .001$. However, equivocal events received the same rating for all emotional responses, $F(2, 34) = 2$, *ns*. For each of the three emotions, ratings differed depending on the kind of situation proposed. Thus positive events were more plausible causes of happiness than were negative or equivocal events, $F(2, 34) = 42$, $p < .001$ (pairwise comparisons, $p < 05$; Newman–Keuls). Events differed in their plausibility of causes of anger, $F(2, 34) = 17$, and sadness, $F(2, 34) = 6$, both ps < .005. Negative events were more plausible causes of anger than were positive or equivocal. For sadness, only the pairwise comparison between positive and negative events was significant.

Maltreated children did distinguish between the different emotional outcomes; negative events were more likely causes of anger or sadness than happiness, $F(2, 32) = 11$, $p < .001$. Positive events were more likely causes of happiness than anger or sadness, $F(2, 32) = 23$, $p < .001$. Ratings for equivocal events also varied by emotion, $F(2, 32) = 4$, $p < .05$. These events were seen as more plausible causes of happiness than anger (Newman–Keuls, $p < .05$). Maltreated children generally agreed with the

comparison group children in ratings for causes of happiness reaction. The effect of event type was significant for judgements of happiness, $F(2, 32) = 31$, $p < .001$. Pairwise comparisons revealed that positive events were rated as more likely causes of happiness than were negative causes, $p < .01$ (Newman–Keuls). It was in ratings of possible antecedents of negative emotions (anger, sadness) that maltreated children differed from the comparison group. When asked to rate explanations of anger and sadness, maltreated children did not distinguish between the different types of events, $F(2, 32) = 2$ and 0.6, respectively. All events were judged to be about equally plausible causes of negative emotional reactions.

Maltreated and non-maltreated children did not differ in their overall ratings for antecedents of happiness, $F(1, 33) = 0.12$. Nor was there any group × event interaction, $F(2, 66) = 0.97$. To look at negative emotions, ratings for anger and sadness were combined to create a single rating for negative emotion outcomes because no differences were observed between these emotions in either study. There was no significant group difference in overall ratings of events for negative outcomes, $F(1, 33) = 0.75$. However, there was a significant group × event interaction, $F(2, 66) = 3.3.$, $p < .05$. Maltreated children gave lower ratings than comparison children for equivocal and negative events as causes of negative emotions, but higher ratings to positive events (all comparisons $p < .05$, Newman–Keuls).

The same pattern of results was apparent in the frequencies with which children assessed the likelihood of different emotions following positive and negative situations. Children were considered to have endorsed a situation–outcome pairing if they rated the robot's selection as possible (two-star response) or probable (three-star response).[2] The mean frequencies of endorsements are presented in Table 2. The key result is that maltreated children accepted all events as equally likely antecedents of negative emotions, $F(2, 66) = 1.1$, *ns*. Comparison group children were more likely to accept some events than others, $F(2, 66) = 15.8$, $p < .001$. Negative events were accepted most often, followed by equivocal events, and positive events

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[2] This analysis assumes that there is a categorical (rather than continuous) difference between the one-star, rejection, response and the other response options. Some evidence for this interpretation is that two-star ratings were very rare for predictions of happy responses to negative situations (12% of responses for comparison group children, 10% for maltreated). These items reliably evoked a one-star rating (73% for comparison group, 78% for maltreated). In contrast, two-star ratings were relatively infrequent for predictions of happiness following positive events. These predictions generally received three-star ratings (for comparison group, 9% vs. 85%; for maltreated group, 6% vs. 83%). These data, especially when combined with the results from the preliminary study, suggest that participants were interpreting the intermediate rating as intended. This analysis focused on ratings of predictions of happiness because the control and maltreated group children generally agreed on these items. Group differences appeared in ratings of judgements of anger and sadness.

TABLE 2
Mean frequencies of endorsement of emotional outcomes

Situation:	Positive		Equivocal		Negative	
Outcome:	Angry/Sad	Happy	Angry/Sad	Happy	Angry/Sad	Happy
Comparison group	0.25 (0.32)	0.94 (0.13)	0.56 (0.20)	0.65 (0.25)	0.77 (0.21)	0.27 (0.33)
Maltreated group	0.44 (0.35)	0.88 (0.26)	0.51 (0.21)	0.64 (0.24)	0.58 (0.30)	0.21 (0.30)

were least frequently accepted as antecedents of negative emotions (all comparisons $p < .05$, Newman–Keuls).

As a second level of analysis we considered the frequencies with which individual participants accepted the same event as a cause of both happiness and either anger or sadness. On average, comparison group children accepted equivocal events for multiple emotions 45% of the time but did so only 24% for negative events and 27% for positive.[3] The rate of acceptance for equivocal events is significantly higher than for either positive or negative events, $t(17) = 2.5$ and 3.7, respectively, both $ps < .05$. Maltreated children also showed a relatively high probability of accepting equivocal events as causes of multiple emotions, 42% of the time, and rarely did so for negative events, only 20%, a significant difference, $t(16) = 2.4$, $p < .05$. However, they also accepted positive events as causes of multiple emotions 43% of the time. The maltreated children did not distinguish positive events from equivocal ones, $t(16) = -0.2$, ns.

GENERAL DISCUSSION

The typically developing 5-year-olds in our studies distinguished between equivocal and non-equivocal events. Some situations were plausible causes of positive, but not negative, emotional reactions. Others were likely causes of negative but not positive reactions. These children also appreciated a set of equivocal events that could potentially provoke either positive or negative reactions. These data suggest that preschool-aged children do have the cognitive ability to appreciate that the same event might lead to different outcomes. At the same time, these children have formed reliable intuitions about canonical or expected event–emotion linkages. Though they see cases in which emotional reactions are somewhat unpredictable (multiple possible outcomes) they also appreciate that in many cases it is possible to be fairly confident that one outcome will occur rather than another. These data are

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[3] This analysis does not include the rare instances in which an event was rejected as a cause of any emotion.

consistent with our first hypothesis, that children as young as 5-years-old are able to indicate an understanding of event–emotion links in both non-equivocal and equivocal situations.

To further explore the role of social experience in the development of this domain, we examined how a history of living with an abusive parent is associated with children's reasoning about the antecedents of emotion. Much of the extant research on the development of emotion understanding has involved children from relatively normative environments, making it difficult to discern the potential role of environmental influences on these processes. Yet, there is evidence that even within non-clinical family environments, the range of family interactions relates to children's understanding of emotions (Denham, Zoller, & Couchoud, 1994; Dunn, 2003).

We found that typically developing and maltreated children differ in their appraisals of the links between events and emotions. Physically abused children differed from non-maltreated children in their reasoning about negative (angry and sad) emotional outcomes. It is noteworthy that maltreated children's reasoning differed only with regard to the types of emotions that are most salient in an abusive situation—the groups did not differ in their expectations about causes of happiness. Both maltreated and comparison group children judged positive but not negative events to be plausible cause of happiness. In sum, non-maltreated children distinguished among plausible and implausible causes of anger and sadness, but maltreated children did not. Rather, the abused children saw anger and sadness as possible emotional outcomes following positive events such as winning a prize in school, or helping around the house. These results are consistent with our second hypothesis, that the social experiences of maltreated children influence their understanding of the links between positive situations and emotions and also see negative emotions as resulting from all types of situations.

The current data suggest that the experience of maltreatment does not result in global advances or delays in emotion understanding, but rather differences in children's thinking about emotion. Although it is possible that maltreated children are only delayed in their understanding of negative situation–emotion links, we see this as an unlikely possibility. Both maltreated and non-maltreated children understood the basic structure of the task; both groups agreed on plausible and implausible causes of happiness. Moreover, it is not that maltreated children are disposed to predict anger and sadness for all events: they were somewhat less likely to endorse events as plausible causes of anger and sadness than controls. Maltreated children generally agreed with children in the comparison group as to which emotion was the most likely or plausible reaction to a given event. Where the two groups differed was in judgements about additional possibilities. Maltreated children, unlike children in the

comparison group, saw anger and sadness as possible outcomes from positive situations.

The maltreated children's less differentiated predictions of negative emotions is surprising given research suggesting that these children are exquisitely sensitive to facial and vocal cues of anger. For example, relative to non-abused children, abused children perceive angry faces as highly salient relative to other emotions (Pollak, Cicchetti, Hornung, & Reed, 2000), display broader perceptual category boundaries for perceiving anger (Pollak & Kistler, 2002), and require less visual information to detect the presence of angry facial expressions (Pollak & Sinha, 2002). Electrophysiological studies reveal that attention to anger distinguishes abused children's neural processing of faces (Pollak, Cicchetti, Klorman, & Brumaghim, 1997; Pollak, Klorman, Thatcher, & Cicchetti, 2001; Pollak & Tolley-Schell, 2003) and voices (Shackman & Pollak, 2005) in ways that influence children's abilities to regulate their arousal and behaviour (Pollak, Vardi, Bechner, & Curtin, 2005; Wismer Fries, Shirtcliff, & Pollak, 2005). Yet, these studies focused on children's perception of emotion in ways that required little in the way of interpretive processes. In fact, when physically abused children were asked to match facial expressions to protagonists in short stories, they did not perform better than controls in recognising anger, and for some negative emotions such as sadness, performed worse than controls (Pollak et al., 2000, Experiment 1). One possibility is that when direct facial or vocal cues are absent, less intense, or conflicting, abused children have difficulty reasoning about emotional communications. Such a hypothesis is consistent with social information processing studies indicating that abused aggressive children have biases in the early stages of emotion processing (Dodge, Lochman, Harnish, Bates, & Pettit, 1997; Dodge, Pettit, Bates, & Valente, 1995).

Combined with the results of previous research, the current studies suggest that maltreated children may be adept at identifying negative emotional reactions, but poor at predicting or explaining them. Typically developing children have a set of expectations about the kinds of events that make people angry or sad. When they encounter a negative reaction, they can infer what might, or might not, have caused the reaction. When they experience an event they can predict when a negative reaction likely will, and likely will not, be the result. Our data suggest that the experience of maltreatment leaves children with less clear expectations. Most strikingly, maltreated children did not distinguish plausible from implausible causes of negative reactions.

Of course, there are some important caveats to the conclusions about maltreated children. The study included only a limited range of events occurring in a neutral context. It may be, for example, that maltreated children have clear and differentiated expectations about the causes of their

own parents' or family members' negative emotional reactions. Or, it may be that the kinds of events expected to exclusively cause negative events are just different from those recognised by typically developing children. The effects of context (e.g., familiar vs. unfamiliar agents) and event type are important directions for future research. However, it is also important to understand that maltreated children may have non-normative intuitions about event–emotion links. Outside the context of maltreatment (e.g., family), children interact with others who have normative expectations (e.g., teachers, peers). Predicting and explaining the emotional states of non-maltreating others is an important and frequent problem. The results of the current study indicate some specific differences in maltreated children's expectations about the causes of negative emotional reactions. When placed in contexts in which the normative expectations are dominant, maltreated children may have difficulties engaging in successful social interactions.

In a sense, the abused children were paradoxically mature in appreciating more equivocality in event–emotion links than their typically developing peers. In fact, one can never make perfect predictions about others' emotional responses. But functionally, treating too many situations as emotionally equivocal makes the task of planning behaviour extremely difficult (and perhaps more stressful). True it is possible that a child's winning a prize in school may, somehow, make his or her parents angry, but it is normative to expect this not to be the case, and to realise that a child's stealing is much more likely to lead to a negative reaction. It may be adaptive for children living in abusive environments to see beyond one-to-one mappings of situation to emotion. Indeed, as we mature, we come to understand that there is some degree of equivocality (or lack of perfect predictability) in human emotional responses. But early in development less may be more and attempts to integrate such equivocality may delay children's ability to assess and respond appropriately to interpersonal situations. A child's ability to reason about and understand the underlying structure of emotions has consequences for the regulatory processes that facilitate adaptation to social environments. Yet relatively little is known about the underlying processes driving developmental change in this domain. Better understanding the factors affecting reasoning about the relations between events and emotions is likely to inform interventions for children at risk for social difficulties.

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