



Preschoolers use emotional reactions to infer relations: The case of ownership[☆]



Madison L. Pesowski^{*}, Ori Friedman

Department of Psychology, University of Waterloo, Canada

ARTICLE INFO

Article history:

Received 17 November 2015

Received in revised form 7 June 2016

Accepted 23 August 2016

Keywords:

Emotions

Ownership

Relations

Inferences

Cognitive development

ABSTRACT

In three experiments, we examined whether young children use emotional reactions to infer relations, focusing on their inferences of ownership relations. In Experiment 1, children aged three to five years ($N = 108$) inferred ownership from emotional reactions to a positive event, in which a broken object became fixed. In Experiment 2, children aged three to six years ($N = 138$) inferred ownership from emotional reactions to a negative event in which an object became broken. Finally, in Experiment 3, children aged four and five ($N = 68$) again used sad emotional reactions to a negative event to infer ownership, but they did not use these reactions to infer who likes an object. These findings reveal that children use emotional reactions to infer one kind of relation between people and objects.

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Introduction

From early in development, children use others' emotional reactions to make inferences about ambiguous and non-obvious aspects of the world. Children sometimes use emotional reactions to make inferences about objects in their environments. From 12 months, infants use others' emotional reactions to infer whether novel objects and people are safe to approach, or should instead be avoided (e.g., Hornik, Risenhoover, & Gunnar, 1987; Moses, Baldwin, Rosicky, & Tidball, 2001; for a review see Vaish, Grossmann, & Woodward, 2008). Likewise, children aged three years and older can use others' emotional reactions to infer the events that might have elicited these reactions (e.g., Fabes, Eisenberg, Nyman, & Mischealieu, 1991; Kayyal & Widen, 2015; Russell & Widen, 2002; Strayer, 1986; Widen & Russell, 2004).

Children also use emotional reactions to infer people's mental states, including their perceptions, desires, beliefs, and thoughts. At age two, children use emotional reactions to infer what another person perceives (Wellman, Phillips, Rodriguez, 2000). At age three, children use happy and sad emotional reactions to infer people's desires (Wellman & Banerjee, 1991), and at age four, they use reactions of surprise, curiosity, and fear to infer people's beliefs (Bartsch, Campbell, & Troseth, 2007; Rieffe, Terwogt, & Cowan, 2005; Wellman & Banerjee, 1991; Wellman & Bartsch, 1988). From age three, children also use people's emotional reactions to infer what they are remembering. For instance, they infer that a character is sad during a pleasant interaction with a spotted dog because it reminds her of a dog that previously chased away her pet rabbit (Lagattuta & Wellman, 2001; Lagattuta, Wellman, & Flavell, 1997).

Another way that children may use emotional reactions is to infer *relations*. Suppose a group of people see a car with a smashed window, and one man reacts with surprise and anger. The man's emotional reaction could be used to infer prior

[☆] Research was supported by a grant from the Social Sciences and Humanities Research Council of Canada awarded to O.F.

^{*} Corresponding author at: Department of Psychology, University of Waterloo, 200 University Avenue W, Waterloo, Ontario, N2L 3G1, Canada.
E-mail address: mlpesowski@uwaterloo.ca (M.L. Pesowski).

events in the world (someone else probably broke the window) and to infer the man's mental states (he did not want the car window to be broken). But his emotional reaction also suggests that he may have a specific relation to the car. For instance, he may be especially upset because he *owns* the car. Relations like ownership are similar to mental states because they are nonobvious (Snare, 1972), but such relations are not themselves mental states. For instance, merely believing that something is yours does not make it yours, and you can own an object even if you do not like it, and even young children appear to grasp these facts (Flavell, Mumme, Greene, & Flavell, 1992; Noles & Gelman, 2014). However, no research has investigated whether children use emotional reactions to draw inferences about relations like ownership.

1. Emotional reactions and ownership relations

Ownership is an apt domain for exploring children's ability to infer relations from emotional reactions. Preschoolers have myriad ways of inferring ownership relations (for a review see Nancekivell, Van de Vondervoort, & Friedman, 2013). They infer *whether* objects are owned by considering how they are physically arranged (Rossano, Fiedler, & Tomasello, 2015) and whether they are human-made (Neary, Van de Vondervoort, & Friedman, 2012). Likewise, they judge *who* owns an object by considering factors such as who has possessed or modified it (Blake & Harris, 2009; Friedman & Neary, 2008; Gelman, Manczak, Was, & Noles, 2016; Kanngiesser, Gjerroe, & Hood, 2010; Kanngiesser, Rossano, Tomasello, 2015). Given that young children use many kinds of information to infer ownership relations, they might also base these inferences on emotional reactions. Inferring ownership this way would be useful as it requires minimal information, and does not even require children to know who previously interacted with an object.

It is especially plausible that children might use people's emotional reactions to infer ownership because toddlers and preschoolers appear to understand that ownership can impact emotions (Pesowski & Friedman, 2015). For instance, they predict that owners will react negatively when others use their property without permission. Preschoolers also sometimes refer to ownership when explaining emotions (e.g., "He's mad because she took his toy"; Fabes et al., 1991; Widen & Russell, 2004), though it is unknown how often they give such explanations. Children's understanding of how ownership influences emotions suggests that they have the causal knowledge necessary to draw inferences in the opposite direction, and to use emotional reaction to infer ownership.

However, such inferences could be challenging for young children. The ability to draw inferences in one direction does not always guarantee the ability to draw inferences in the reverse direction (Gelman, Collman, & Maccoby, 1986; Legare, Wellman, & Gelman, 2009; Legare, Zhu, & Wellman, 2013). For instance, whereas 3–4-year-olds readily explain that one of two agents became sick because the agent ate contaminated food, they fail to use information about contamination to predict which of two agents will become ill (Legare et al., 2009, 2013). Previous research on ownership suggests similar asymmetries. Whereas 3-year-olds use information about ownership to make judgments about how objects should be used or who should control them (e.g. McEwan, Pesowski, & Friedman, 2016; Neary & Friedman, 2012; Rossano, Rakoczy, & Tomasello, 2011; Schmidt, Rakoczy, & Tomasello, 2013), they sometimes have difficulty inferring ownership from these consequences (Nancekivell & Friedman, *in press*; Neary, Friedman, & Burnstein, 2009).

One plausible reason that young children could have difficulty inferring ownership from its consequences (including emotional reactions) is that other potential explanations for these consequences might occur more readily to them. For instance, suppose an agent becomes upset when a toy breaks. Although the agent might be sad because she owns the toy, it is also possible that she is sad because she wanted to play with it. Younger children readily make desire-based inferences (e.g., Wellman & Banerjee, 1991; Wellman & Woolley, 1990), and this could prevent them from seeing that emotional reactions stem from ownership. As such, it is uncertain whether young children infer ownership from emotional reactions.

We explored whether children infer ownership from emotional reactions in three experiments. In the first two experiments, children watched vignettes in which two characters stood beside an object. Then something happened to the object, and one of the characters reacted emotionally to this event, while the other did not. We examined whether children chose the character who responded emotionally as the owner of the object. We anticipated that if children infer ownership from emotional reactions, they should be more likely to choose this character if their emotional reaction is appropriate for an owner, compared with if it is inappropriate. To examine whether children's inferences from emotion show specificity to ownership, the third experiment features a similar design, but compares their inferences of ownership with their inferences of liking.

2. Experiment 1: emotional reactions to positive events

This experiment examined whether children infer ownership from emotional reactions to positive events involving objects. To discover whether there are developmental changes in children's ability to infer ownership from emotional reactions, we tested children age three to five.

2.1. Methods

2.1.1. Participants

The participants were 36 three-year-olds ($M = 3;7$, range = 3;1–3;11, 13 females), 36 four-year-olds ($M = 4;5$, range = 4;0–4;11, 15 females), 36 five-year-olds ($M = 5;5$, range = 5;0–5;11, 17 females). In all experiments, participants were tested in

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