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We cooperated so… now what? Infants expect cooperative partners to share resources

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ABSTRACT

Research has demonstrated that an understanding of and engagement in cooperative activities emerges early in life. However, little is known about the expectations infants hold about the consequences of cooperative action. We demonstrate that 14-month-old infants expect that cooperative partners will share the recently attained cooperative goal instead of keeping it for themselves. Interestingly, this prediction does not hold if infants saw the two individuals work towards individual goals. These findings contribute to the growing body of literature suggesting that infants possess at least a basic understanding of cooperation well before their second birthday.

Cooperation is fundamental to our everyday lives and allows humans to function successfully in their social group (Tomasello, 1999; Tomasello, Kruger, & Ratner, 1993). Provided that we readily rely on our abilities to coordinate with others on some level or another, it is no surprise that early in life, infants not only engage in cooperative activities (e.g., Ashley & Tomasello, 1998; Brownell & Carriger, 1990, 1991; Ross & Lollis, 1987; Warneken & Tomasello, 2007; Warneken, Chen, & Tomasello, 2006), but also understand the shared goal nature underlying cooperative interactions. Infants' understanding of cooperation has been demonstrated in observational (e.g., Warneken & Tomasello, 2007; Warneken et al., 2006 Warneken, Gräfenhain, & Tomasello, 2012) and visual attention (e.g., Fawcett & Gredebäck, 2013; Henderson & Woodward, 2011; Henderson, Wang, Matz, & Woodward, 2013) paradigms. For instance, after habituating 14-month-old infants to an event in which two actors worked together to remove a toy from inside a box, Henderson and Woodward (2011) found that infants interpreted the actions of both actors as being directed towards the attainment of a shared goal (i.e., the toy). Thus, research has demonstrated that by their second birthdays, infants can identify cooperative goals and correctly ascribe them to cooperative partners when their actions are causally related, however little is known about the extent to which they can form predictions surrounding the consequences of cooperative action. The present research begins to fill this gap by examining whether infants predict cooperative partners to share their goal after it has been attained.

Mutually beneficial cooperation is predicated on the idea that individuals work together to attain a shared goal and subsequently share the spoils of the cooperative interaction (Cosmides, Tooby, & Barkow, 1992; Henrich & Henrich, 2007; Tomasello, 2009; Tomasello, Melis, Tennie, Wyman, & Herrmann, 2012). This possibility has been argued by theorists (e.g., André & Baumard, 2011a, 2011b; Baumard, André, & Sperber, 2013; Chiang, 2010; Cosmides et al., 1992; Henrich & Henrich, 2007; Tomasello, 2009; Tomasello et al., 2012) who posited that humans evolved to hunt and forage in group situations, these collaborative activities required the need for the spoils to be shared between group members. Given that attaining a shared goal is the key purpose of cooperative action, cooperative partners should be able to assume that any cooperatively earned resource will be shared with their partner after each completes their role in the interaction (Tomasello, 2009). Evidence that 2- and 3-year-old children share resources fairly with their cooperative partner (Hamann, Bender, & Tomasello, 2014; Melis, Altrichter, & Tomasello, 2013; Ulber, Hamann, &

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Tomasello, 2015; Warneken, Lohse, Melis, & Tomasello, 2011; see also Corbit, McAuliffe, Callaghan, Blake, & Warneken, 2017) suggests this expectation emerges early in life. An open question is whether this expectation develops in infancy, as might be expected given the important role cooperation and sharing of collaboratively attained resources has played in our evolutionary history.

Although no studies have examined whether infants as young as 14 months of age predict cooperatively attained resources to be shared, infants' early sensitivity to sharing behaviour raises the possibility that they may. By 12 months of age, infants share their food and toys with parents and familiar adults (Hay, 1979; Hay & Murray, 1982; Rheingold, Hay, & West, 1976). Infants also expect that resources should be shared fairly between two people by a third-party observer (Geraci & Surian, 2011; Meristo, Strid, & Surian, 2016; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012; Sommerville, Schmidt, Yun, & Burns, 2013; Ziv & Sommerville, 2017). Given that infants engage in and understand both sharing and cooperative activities, it is reasonable to suspect that an expectation of sharing cooperatively earned resources may also be present in infancy.

In the present study, we investigate whether infants understand the consequences of cooperative activities; do infants expect a cooperative partner to share the jointly attained goal with her partner, or keep it for herself? To investigate this question, 14-month-olds were habituated to a video sequence in which two actors either, worked together to remove a toy block from a box (cooperation condition), or worked independently to attain individual goals (no-cooperation condition) (paradigm modified from Henderson & Woodward, 2011). Infants were then shown two test events in which the actor who grasped the toy during habituation reached for the toy and placed it either in front of herself (keep test trial), or in front of her partner (share test trial). Given that infants are sensitive to fair sharing behaviour (e.g., Sommerville et al., 2013; Sloane et al., 2012) and structure the actions of cooperative partners in terms of a shared-goal (Henderson & Woodward, 2011), we hypothesized that infants would predict that the toy-getter would share the toy when they had previously worked with the other person towards a shared goal (cooperation condition), but not when they worked towards individual goals (no-cooperation condition). This experiment is one of the first investigations of the predictions that infants form about the consequences of cooperation.

Forty full-term 14-month-old infants exposed to English at least 50% of the time participated in this study. Twenty 14-month-old infants (10 males, *mean age* = 14 months and 8 days, *range* = 13 months and 11 days to 14 months and 28 days) participated in the cooperation condition. Twenty additional infants (9 males, *mean age* = 14 months and 5 days; range = 13 months, 10 days to 15 months, 3 days) participated in the no-cooperation condition. Participants were recruited from a database of families whom registered their interest in infant development studies. Parents reported their infants as belonging to the following ethnic groups: New Zealand European (n = 23), Asian (n = 4), or New Zealand European and one other ethnic group (n = 13). Thirteen additional infants were tested but excluded from the final sample due to infants looking less than 0.5 s on test trials (n = 5), more than 2 min elapsed between test trials (n = 1), technical error (n = 3), experimenter error (n = 3) or because the total duration of time the infant looked towards the test trials was greater than three standard deviations above the sample mean (n = 1). Parents received a $10 gift voucher, a parking exit ticket, and infants received a small toy as reimbursement for their participation.

After informed consent was conducted and infants had sufficient time "warming-up" to the experimenter, infants were taken to the experimental room where they were seated comfortably on their parent's lap. A 42-in LCD TV screen was positioned on a TV stand approximately 150 cm away from the infant. A concealed Canon Legria HV40 video camcorder was placed below the TV. Video feed from the camcorder of the infant's face was projected via an HDMI cable on a 20-in Dell monitor located in an adjacent room. A coder who was blind to all trials used this monitor to code the session; infants' visual attention was calculated using the software jHab (Casstevens, 2007).

To introduce the actors in the video, infants viewed two female actors playing with some toys. Infants in the cooperation

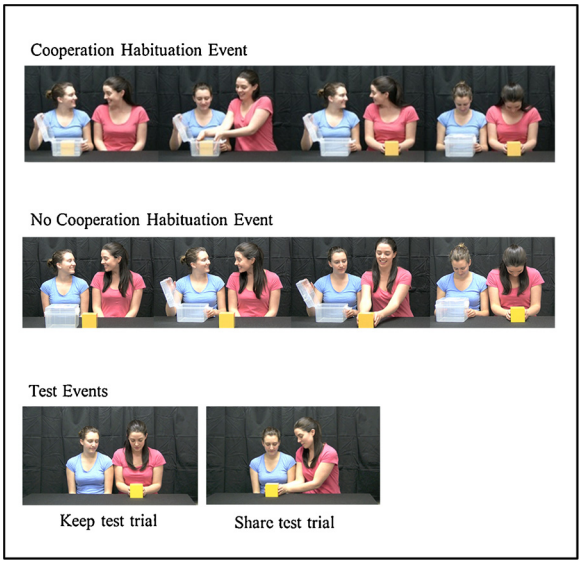

Fig. 1. Habituation event for each condition and test events for both conditions.

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