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Who knows what's good to eat? Infants fail to match the food preferences of antisocial others

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ABSTRACT

Humans gather most of their knowledge about the world, including objectively true facts and specific cultural norms, by observing and being taught by others. Some individuals are worthy teachers and objects of imitation, having knowledge of cultural practices and positive intentions to inform. Others are better ignored because they are ignorant, because they mean us harm, or simply because we do not wish to be "like them." This study examines whether 16-month-olds are sensitive to the pro- or antisocial behavior of a source that demonstrates preference for two novel foods. Infants took the emotional reactions displayed by novel and previously prosocial sources, but not antisocial sources, into account when deciding what to eat. These results suggest that others' social behavior influences infants' likelihood to match their preferences, illustrating the influence of social evaluation on social learning.

Most of what we know comes from others. By observing and interacting with others socially, we gain a wealth of information required for successful existence, from the language and cultural practices of our social group to the workings of a particular piece of complex machinery. Humans, even in infancy, appear uniquely adapted to using others as sources of information, through such mechanisms as the reproduction of novel behaviors (Bandura, 1977; Barr, Dowden, & Hayne, 1996; Meltzoff, 2007; Tomasello, 1999; Tomasello, Kruger, & Ratner, 1993), the use of emotional reactions to appraise unfamiliar objects and events (Campos & Stenberg, 1981; Feinman, 1982; Klinnert, Campos, Sorce, Emde, & Svejda, 1983), and sensitivity to directed pedagogical interactions (Csibra & Gergely, 2006; Gergely & Csibra, 2005, 2006). Using these and other social learning mechanisms, infants rapidly

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acquire information and skills that would be difficult or impossible to learn via first person trial-and-error.

Despite the powerful influence of social sources in human development, research over the past two decades suggests that children do not take in all the information a source provides. Instead, they selectively incorporate some pieces of information and ignore others. In imitative interactions early in the second year of life, infants do not simply reproduce every action a model performs but seemingly incorporate their own analysis of the intentional and causal structure of action into their imitative acts. For example, young toddlers fail to imitate behaviors marked as accidental (Carpenter, Akhtar, & Tomasello, 1998) and reproduce only those pieces of actions that are causally related to a model's overarching goal, leaving out unnecessary or subordinate components (Brugger, Lariviere, Mumme, & Bushnell, 2007; Carpenter, Call, & Tomasello, 2005; Gergely, Bekkering, & Király, 2002; Nielsen, 2006; but see Horner & Whiten, 2005; Lyons, Young, & Keil, 2007, for evidence of faithful imitation in children). Additionally, infants sometimes go "below the surface" of observed behaviors, effecting end-states of goal-directed actions that were never actually completed and therefore must have been inferred (Bellagamba & Tomasello, 1999; Johnson, Booth, & O'Hearn, 2001; Legerstee & Markova, 2008; Meltzoff, 1995). These results suggest privileged roles for the mental and causal structures driving a source's behavior, over the physical nature of the actions themselves, as infants gather information from social others.

In addition to selecting *what* to learn from others, it is also important to select from *whom* to learn. Some individuals have information useful to infants, whereas others may not (Feinman, 1982). There are a variety of non-mutually-exclusive dimensions on which one might discriminate the value of information from potential sources. Perhaps the most basic is accuracy: whether a source's information is objectively true or false. Infants in the second year are sensitive to others' knowledge states (Liszkowski, Carpenter, & Tomasello, 2008; Onishi & Baillargeon, 2005; Tomasello & Haberl, 2003), and can identify (and sometimes attempt to correct) false statements (e.g., when a speaker labels a cup a "dog;" Koenig & Echols, 2003; Pea, 1982). A growing body of research showing impressive selectivity in preschool children (Birch & Bloom, 2002; Birch, Vauthier, & Bloom, 2008; Corriveau & Harris, 2009a; Jaswal & Neely, 2007; Koenig & Harris, 2005; Rakoczy, Warneken, & Tomasello, 2009; Sabbagh & Baldwin, 2001) suggests that sensitivity to epistemic states plays a role in how infants use others as sources of new information. For example, 16-month-olds fail to learn new words from previously inaccurate labelers (Koenig & Woodward, 2010), 14-month-olds are less likely to follow the gaze of someone who was previously unreliable (e.g., who expressed excitement while looking into an empty container; Chow, Poulin-Dubois, & Lewis, 2008), and 14-month-olds tend not to imitate the novel actions of those who incompetently performed familiar acts (e.g., put shoes on their hands; Zmyj, Buttelmann, Carpenter, & Daum, 2010). These results suggest that even in infancy, children are sensitive to past accuracy and do not learn from inaccurate sources.

However, past accuracy is not always directly available in a learning situation. Therefore, it would be beneficial to be sensitive to a source's potential for accuracy, or, in other words, that source's general expertise (Henrich & Gil-White, 2001; Lutz & Keil, 2002). Expertise may be evident from one's confidence and/or familiarity with a situation. The more confidence or familiarity an individual displays, the more likely a learner should be to select that individual to learn from. In a novel toy situation, infants as young as 12 months selectively reference an experimenter known to be familiar with a laboratory rather than their mother (unfamiliar with the lab), presumably due to an assumption that the experimenter's familiarity makes her more knowledgeable (Stenberg, 2003, 2009; Walden & Kim, 2005).

Further, some sources should be selected over others due not to their objective accuracy or expertise, but because of the potential relevance of their information to the learner. Things like linguistic forms, ritual behaviors, and food and object use may differ widely across cultures and groups and therefore should only be acquired from sources who know the forms relevant to a particular learner. Determining who has culturally relevant information is not necessarily easy, but could be facilitated by selectively attending to sources who are familiar, similar to the learner, or known to be within the learner's social group. Infants' tendency to socially reference highly familiar individuals (like mothers) versus unfamiliar individuals (like researchers) is ambiguous. Some studies have found that infants show no preference for caregivers over experimenters (Devouche, 2004; Klinnert, Emde, Butterfield,