

Communicating for knowledge:
pre-verbal infants actively and selectively seek information from others in epistemic uncertainty

Infants are curious learners, actively probing both non-social and social environment for information. As they navigate the world, infants may encounter epistemic uncertainty, such as when insufficient information is provided or prior knowledge is not supported by others' testimony. Pre-verbal infants' active communicative responses to epistemic uncertainty help delineate core cognitive competencies underlying epistemic development. In two studies, we show that eleven- and twelve-month-old infants initiate active, developmentally available communicative responses to epistemic violation of expectation events and selectively seek unavailable information from more knowledgeable social partners in situations of referential uncertainty. These studies support the proposition that infants in their first year show sensitivity to knowledge distribution among social partners, exhibit epistemic vigilance in social contexts, and actively communicate with interlocutors when they need epistemic input.

To study epistemic development, situations of epistemic uncertainty have proven a useful experimental paradigm. Epistemic uncertainty takes many forms; it includes the violation of expectation scenarios which span both physical and social domains, such as events that defy the natural laws of physics or false claims provided by previously reliable people, as well as general informational uncertainty, such as counterintuitive or contradicting testimony, lack of valid and timely information, or being asked questions one cannot answer. Encountering an unexpected event has been shown to elicit infants' distinct neural and behavioural responses. In addition to enhanced independent exploration following such events, infants may turn to their social partners, assessing their informative potential and tracking the claims they make, show readiness to learn from best information sources, and actively use communicative cues to obtain information. In response to epistemic uncertainty, preverbal infants' communicative cues such as pointing and social referencing have been proposed to serve an interrogative function. While pointing has been in the spotlight of rigorous experimental investigation, less is known about epistemic development in pre-verbal and pre-pointing infants. Here we focus on social referencing as an explicit communicative behaviour to solicit social input to help resolve epistemic uncertainty.

In Study 1, we investigated infants' social referencing following epistemic violation of expectation events, such as hearing a mismatching label from a trustworthy social partner – their primary caregiver. Eleven-month-olds were presented with familiar objects with caregivers providing congruent (caregiver providing a matching label to the object), incongruent (mismatching label), and no labels. Infants engaged in more social referencing in incongruent compared to both congruent and no label conditions. These results suggest that epistemic uncertainty upon detecting object-referent mismatch elicited social referencing in pre-verbal infants, indicating an epistemic function of these communicative behaviours. Such enhanced social referencing was present when caregivers were consistent in their incongruent labeling but not when they provided a mix of incongruent and congruent labels, further suggesting that infants formed a coherent representation of their caregiver as a knowledgeable interlocutor and expected reliable and congruent information from them.

In Study 2, we further probed whether infants' social referencing will be selective towards a previously knowledgeable social partner upon facing a different kind of epistemic uncertainty - referential. Twelve-month-olds were introduced to two adults, an Informant (reliably labeling objects) and a Non-Informant (equally socially engaging, but ignorant about

object labels). Upon being familiarised with the epistemic status of the available interlocutors, infants were asked to locate a novel referent among two novel objects – to make an essentially impossible referential choice (“Which one is the Modi?”). In this situation, infants selectively referenced the Informant rather than the Non-Informant, but showed no such selectivity at other phases of the procedure when no uncertainty was present. These results suggest that infants appropriately formed respective epistemic profiles of available social partners and chose to solicit information from a more knowledgeable one as a better source of information, but only when their input was in fact needed.

Overall, these studies demonstrate that pre-verbal infants are sensitive to epistemic uncertainty and actively communicate to obtain information. Specifically, they generate social looks prior to onset of language or mastery of pointing gesture as part of their developing interrogative communicative toolkit. By actively and selectively seeking information from more knowledgeable others, infants emerge as active participants in social knowledge exchange process.

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