CHILD DEVELOPMENT PERSPECTIVES

Common Ground and Development

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ABSTRACT—***Language and other forms of communication are inherently ambiguous and therefore require some form of common ground to specify the intended meanings of utterances. Theoretical accounts usually focus on interactions between adults and consider recursive mindreading a prerequisite to establishing common ground. Contrasting these accounts, in this article, we offer a developmental perspective on common ground. We propose that instead of using recursive mindreading, infants rely initially on the expectation that communicative partners act rationally in light of previous interactions, which serves as a starting point for common ground to develop. We describe the changing role of common ground across development. Initially, common ground constrains the meaning of ambiguous communicative acts and facilitates children's acquisition of language. Later in development, common ground makes communication efficient by helping speakers coordinate their actions and intentions, and eventually arrive at recursive mindreading.***

KEYWORDS—*common ground; language development; theory of mind*

Philosophical and psychological theories often refer to some form of *common ground* as one of the components of human communication (1, 2). Because of their inherently ambiguous nature, language and other forms of communication require inferential reasoning from both communicative partners. The common ground shared by these partners supposedly sets the boundaries in which these inferential processes occur. Developmental theories have stressed the importance of common ground for early nonverbal communication (3) as well as language acquisition (4–6). Yet what common ground is—its cognitive and motivational components—remains vague in the developmental literature. More importantly, it is unclear if and how the ability to form common ground develops. In this article, we offer a theoretical account of common ground that is cognitively and developmentally plausible, while retaining the idea that common ground constrains inference.

Almost all accounts of common ground converge on the idea that communicators use recursive mindreading to assess which epistemic states (e.g., knowledge, beliefs) communicative partners share. Although some accounts argue that the recursive process may be unlimited or reflexive (1, 7), more empirical accounts suggest it can be limited to a few recursive steps (6, 8). In this article, we propose a different approach, one that conceptualizes common ground as a property of a social interaction rather than the consequence of individual recursive mindreading (9). In this approach, common ground is something *between* two (or more) individuals communicating. Although individuals in this situation might reason recursively about each other's mental states, this reasoning is not a prerequisite to the situation. To use common ground in communication requires an expectation that one's partner acts in line with experience he or she shares with the other communicative partners. Thus, communication is risky and requires supplementary cognitive abilities to assess whether the assumption that something is part of common ground is warranted. These abilities improve during development and make children more effective and efficient communicators.

In the next section, we define basic abilities and expectations that infants need to participate in communicative interactions involving ambiguous signals and to gradually develop a more sophisticated understanding of common ground. Our aim is not to cover the full scope of common ground as discussed in the

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philosophical literature but rather to provide a developmentally plausible starting point.

DEFINING COMMON GROUND

In our view, common ground has a cognitive as well as a motivational component. *Cognitive*: Representing some X as shared with another individual P. *Motivational*: Representing something as shared entails interacting with P in a way that is rational in light of X and expecting P to act in the same way. These two components are linked inextricably because the sharedness of X in the cognitive part is defined by the expectations of the motivational part. This definition raises several questions.

What Is X?

X, the focal topic of a social interaction, could be an object, a sequence of actions, or a conversational theme. The *social* aspect distinguishes common ground from the physical context because it selects those parts that are relevant for X that also include past interactions. X is identified by the communicative partners during episodes in which both partners attend to the same topic at the same time within the broader social interaction (10). As we discuss later, successful alignment improves with the development of certain sociocognitive abilities. However, early in infancy, adults facilitate the joint encoding of a common X by tuning in to infants' focus of attention.

Who Is P?

We usually think of P as a specific individual, but P is not limited to that. P could also be conceived as a generic member of a specific social group. For example, children's early play routines might not be specific to certain individuals but are open to adults in general. Furthermore, when using language, children generalize from direct interactions and expect unfamiliar others to share a vocabulary—unless they show signs that they speak a different language (11). That is, the expectation that X is part of common ground may be rooted in the conventional use of X within a group.

What Is Acting Rational?

Here we follow Grice's (12) original suggestion that communication is a form of rational action. Acting rationally means producing one's communicative acts in light of X and expecting P to do the same. Acting in light of X combined with the assumption that the other's acts are based on X ensures that common ground narrows the potential interpretations of ambiguous acts. Based on this assumption, the interpretation of the utterance is the one that follows from X. For example, in one study (13), children played two games, each with a different adult but involving the same toys. Later, when one of the adults ambiguously pointed to one of the toys, children resumed playing the game they played previously with that adult. The pointing gesture alone, even in the same physical context, could have been interpreted in many other ways (e.g., a request for the object, a desire to share interest). Based on our account, children continued playing the game they played before because they assumed that P (the adult) produced this gesture in light of X (the previous game), and within X, the object was part of a specific game. This assumption provided children with a straightforward interpretation of an otherwise ambiguous gesture. As most social interactions, especially those of young infants, are cooperative, the expectation that others communicate rationally also implies that others communicate in a way that is cooperative, informative, and relevant. This expectation, reminiscent of Grice's cooperative principle (12), is fundamental to human communication (1, 2, 6, 14).

What Is the Basis for Representing Something as Shared?

On a behavioral level, the basis for representing something as shared is direct social interaction, at least in early development. The consequence of direct social interaction is that both partners have a similar representation of the interaction and its topic and so they *share* this representation (the cognitive component of common ground). This interaction creates the tendency to interact with P in light of X in the future, as well as the expectation that P will do the same (the motivational component of common ground). We argue that infants act based on this assumption, but they need not represent the recursive structure of the situation (see 15 for a similar argument regarding self-conscious thoughts). Early in development, this is sufficient because infants communicate mostly with adults who actively scaffold the communicative interactions by correctly interpreting children's actions and intentions, and by making their actions and intentions transparent and easy for children to interpret.

However, active scaffolding by adults decreases over time and is virtually absent in interactions with peers. Given a certain level of social understanding and experience with communicative interactions (which is typically reached around age 3) and because peers are less accommodating than adults, early peer interactions provide a rich context for children to experience failures in communication and practice fixing these failures. As a consequence, children learn about the constitutive conditions (which we discuss later) that must hold for another individual to form a specific representation that matches their own. Furthermore, once linguistic abilities advance, children also learn about what others experience without interacting with them directly. Taken together, this requires the gradual development of insight into others' minds, which could progress along the following lines: P must have interacted with me around X in the same way before, P must have been present at a certain time and place, P must have attended to X, P must know or believe that X, P must believe that I believe that X, P must believe that I believe that P believes that X, and so on.

In traditional accounts, recursive mindreading is a necessary precondition for common ground. Yet the corresponding explicit theory-of-mind abilities develop only around 6 years (16). Thus, our account addresses this mismatch and argues that these

simple expectations can constrain inferences in a way that characterizes common ground.

COMMON GROUND IN DEVELOPMENT

In this section, we describe the changing role of common ground in children's communicative development. We present three main functions of common ground: It clarifies ambiguous communicative acts (gestures and early words) in infancy, constrains the potential meanings of novel words and facilitates the acquisition of language, and makes communication efficient by constraining if or how something needs to be communicated explicitly and how something is referred to.

Ambiguous Communicative Acts

Infants' earliest communicative interactions are restricted naturally by the limited size of their communicative repertoire. The elements of this repertoire—gestures and single words—are reused for different purposes and partners must rely on common ground to infer their meaning.

From 12 months, infants produce and interpret ambiguous communicative acts in light of common ground. They interpret a person's ambiguous verbal requests for an object based on how they interacted with that person previously (17). Furthermore, 17-month-olds interpret an ambiguous request for *the ball* as referring to the ball that they and the requester played with previously (18; see also 13). Direct social interaction around the object seems crucial for infants to make this kind of inference and form the expectation for the partner to act in line with their shared experience (19). Direct interaction even leads children to overestimate their common ground with others. In one study (20), 2-year-olds expected their partner to know about an object when they conversed with the partner while looking at the object, even though the partner never saw the object. Infants also use common ground in their production (21, 22). For example, 12-month-olds requested absent objects by pointing to the location in which they and the experimenter had seen the object previously (23, 24). The referential connection between the location and the absent object was established during an earlier interaction and children expected their partner to act based on it.

Learning Language

In learning novel words, children have to infer the intended referent. The assumption that the speaker communicates based on common ground limits the potential referents of the novel word, thereby allowing children to complete the mapping successfully. For example, if a parent and a child have been naming objects based on their color and the adult introduces a novel object, the child might interpret a novel word as referring to the object's color and not some other property. Evidence from research on word learning supports this. At 17 months, children expect speakers to refer to the object they played with previously, even if the speaker later has a false belief about the object's location (25). From age 2, children expect novel words to refer to objects that played a special role in a previous social interaction, such as those that were novel (26), preferred (27), or familiar (28). For example, in one study, when an adult expressed preference for an object during an interaction at one time, children expected a novel label uttered by the same person at a later time to refer to the previously preferred object (27). In sum, by expecting communicative partners to act rationally in light of a previous interaction, children can infer the intended referent of the novel word.

Efficient Communication

Around age 2, children rely on various communicative strategies, such as using demonstratives (e.g., "Look at that!") or repeating what they hear to build common ground with their conversational partners (5). However, in these conversations, the adult still does most of the work, such as tailoring the conversation around objects to which children attend. Around ages 2 and 3, children begin to use common ground to achieve social goals, especially with peers. For these interactions to be smooth and successful, children often need to have a joint goal (e.g., "How do we play this game?") and to coordinate their actions and intentions to solve problems together. Reaching joint decisions or solving problems with partners is a difficult cooperative task because it requires accommodating the needs of those partners (e.g., desires, intentions, knowledge states), which are anchored in common ground. Children not only monitor their partners' actions, intentions, and knowledge states in their interactional history, but they also have expectations for how their partners *should* act based on the common ground they share.

From age 3, children coordinate their language and agree jointly on some ad hoc conventions, or referential pacts, with their partners (29). For example, once they refer to a toy as a *pony*, children consistently refer to that referent as *pony* and expect their conversational partners to do the same (30). This binding character of common ground becomes especially apparent in pretend play in which children assign pretend identities to objects. For instance, in one study (31), after preschoolers agreed to pretend that a pen was a toothbrush, they expected their play partners (and not others who did not share this common ground) to treat the pen as a toothbrush and corrected their partners' use of an incorrect pretend identity for the pen by using normative language ("No, this has to be the toothbrush"). Children's protests when conventions are violated show that they expect partners to act based on common ground because it is the correct and rational thing to do.

Beyond their choices of words, children also appeal to common ground by using more complex language, such as when they explain something (32). In one study, when 3- and 5-year-old peers were asked to decorate a zoo together, children adjusted the informative nature of the justifications of their proposals depending on the common ground they shared with their

partners (33, 34). In another study (35), preschoolers played a sorting game with a peer who either did not know the game or had learned about the game from others but played it incorrectly. When playing with a naïve partner, 3-year-olds used normative explanations, which were more informative (e.g., "One must put the flower with the flower"); however, when playing with a partner who violated the rule knowingly, children relied on their common ground and used less informative statements in their interventions (e.g., "No, that goes here!"). Thus, preschoolers actively use and modify common ground to coordinate their actions and intentions with peer partners. In these studies, direct social engagement is key to establishing common ground. It leads children to not only act in accordance with their common ground, but also form specific expectations about how their partners *should* act to achieve their social goals.

With advanced linguistic and sociocognitive abilities, children make inferences about what other people know and how they will behave based on their knowledge states without interacting with them directly. In one study (36), peer dyads were asked to individually deposit their marbles in 1 of 4 boxes, and if both children placed their marbles in the same box, they both got a reward. Three boxes featured the same picture; one had a different picture. Five- and 6-year-olds guessed correctly which box would be more salient to their peers and which box their peers would think would be salient to them without interacting directly with one another (see also 37). Six-year-olds were successful even when one child had a false belief about their peer partner's belief (38). In this study, the child who placed his or her marble first was told that, accidentally, one of the less salient boxes contained a bigger reward. The second child secretly watched how the first child received this information, but the children never shared it. When placing their marbles, the children who went second reasoned that, because the first child did not know that the second child also knew where the bigger reward was, the first child most likely chose the more salient option and therefore, they also chose the more salient option. Thus, around age 6, children can use recursive mindreading to figure out common ground and use this skill to coordinate their actions to achieve joint goals.

CONCLUSION

In this article, we argued that recursive mindreading is not a prerequisite to figuring out common ground. Children can enter the world of communication by acting rationally in light of previous social interactions and expecting others to do the same. Together with accounts about the intentional structure of human communication (39, 40), our argument emphasizes the social and interactional nature of human communication while making fewer demands on the cognitive abilities involved, thereby offering a truly developmental perspective.

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