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Informativeness in children's language use

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Abstract

Successful communication relies on the assumption that speakers strive to offer truthful and informative utterances that are relevant to the goals shared with the hearer (and are formulated clearly and succinctly). Although children can adjust the amount of information they convey in conversation depending on the characteristics or perspective of their hearer, they do not consistently offer as much information as their hearer needs until fairly late in development. In this article, we examine the developmental trajectory of children's ability to produce sufficiently informative utterances and the factors that contribute to this trajectory. Our discussion throws light onto the mechanisms underlying children's ability to integrate pragmatic principles into their communicative behavior.

Introduction

Effective communication relies on the assumption that speakers design utterances that are helpful and easy for listeners to understand. According to a highly influential model of communication (Grice 1975), speakers should follow specific conversational ('pragmatic') principles that maximize the effectiveness of the message being conveyed. More specifically, speakers should strive to produce utterances that are truthful (maxim of Quality), informative (maxim of Quantity), relevant to the goals shared with the interlocutors (maxim of Relevance) and clearly and succinctly formulated (maxim of Manner). On this model, hearers can use these principles to infer the meaning that the speaker had in mind and wanted to convey (see also Sperber & Wilson 1986/1995, for an alternative proposal). Because these pragmatic principles

underlie every aspect of human linguistic behavior, from its simplest form (e.g., identifying what entity in the world someone refers to) to its most sophisticated manifestation (e.g., interpreting metaphors in the work of Shakespeare), an essential part of acquiring language is to learn how to apply these principles to conversational exchanges with other people. In this chapter, we specifically focus on whether children are sensitive to the principle of informativeness (i.e., Grice's maxim of Quantity) so as to tailor their utterances to the informational needs of their communicative partners (for a recent review on how children apply other pragmatic principles, see Grigoroglou and Papafragou 2017a).

Much psycholinguistic research with adults has found that speakers consider any information that is shared with their conversational partner in order to plan an utterance that is as informative as required by their partner's knowledge and the purpose of the exchange (thus satisfying the Gricean principle of informativeness, as constrained by relevance). Specifically, adults adjust their utterances to accommodate their listener's informational needs given the listener's visual perspective, common experience in prior discourse, and common knowledge shared by the broader community (see Arnold 2008 for a review). Experimental evidence on children's ability to offer sufficient information in communication, however, is more nuanced. Some studies indicate that toddlers successfully take into account other people's knowledge states in their verbal and non-verbal behavior (e.g., O'Neill 1996), yet robust experimental evidence, as well as everyday experience, suggest that young children can be choosy conversationalists who frequently produce short utterances that omit what (to adults) seem critical pieces of information (e.g., Perner and Leekam 1986; Bunger, Trueswell, and Papafragou 2012).

Here we examine the developmental trajectory of children's ability to produce sufficiently informative utterances and the factors that contribute to this trajectory. Our goal is to shed some light onto the nature of children's communicative development, and to begin to address the mechanisms that allow children to become sophisticated communicators.

Informativeness in children's language production

Assessing the informational needs of other people and adjusting one's speech to such needs is a complex process that requires the co-ordination of visual, social and linguistic information. Because this process bears on virtually any communicative token, we focus here on

two specific empirical domains that have been extensively studied in the literature. A first domain involves referential communication. The act of referring to objects or actions in the world lies at the foundation of any conversational exchange. Successful referential communication requires speakers to distinguish the features that set apart the target referent from other possible referents in the context and choose referring expressions that vary in their specificity (e.g., *the red car*/*the car*/*it*) based on whether their listeners have access to the distinctive features of the target referent (e.g., whether they can see the referent, or know about it from prior discourse; see Arnold 2008, for a review). Referential communication paradigms are simple psychological "games" where participants give and take directions about how to move objects on a visual display. In critical trials, two (or more) of the objects contrast along (at least) one dimension, so that, in order to disambiguate between them, one has to use a modified description (e.g., "Pick up the big duck", in the presence of a small and a big duck). In some paradigms, one of the objects in the visual display is visible to one of the interlocutors but not the other. This creates a misalignment in the visual perspectives for the speaker and the listener, which needs to be taken into account when producing or interpreting instructions. Because the referential communication paradigm allows for well-controlled (yet very restricted) tests of conversational abilities, most of the work on children's informativeness in production has used a variation of this paradigm.

Several studies in this line of work suggest that children, even at a very young age, can successfully adjust the informational content of their referential devices to the visual knowledge of their listener. One study found that 2-year-old children were more likely to name a hidden toy, mention its location or point towards it when a parent had not witnessed the toy's hiding compared to when the parent was present during hiding (O'Neill 1996). Relatedly, in a series of studies where children instructed adult partners about how to move objects in a visual array, 4- to 5-years-olds (Nilsen and Graham 2009) and 5- to 6-year-olds (Bahtiyar and Küntay 2009; Nadig and Sedivy 2002)were more likely to use an adjective to modify their object descriptions (e.g., "Pick up the *big* duck") when their adult partner could see two similar objects (e.g., small vs. big duck) than when the partner could only see one of the objects (see also Davies and Katsos 2010; Matthews et al. 2006; Rabagliati and Robertson 2017, for similar findings with a slightly different paradigm).

Children also make adjustments to their referential choices depending on the information shared with specific conversational partners in prior discourse. In one experiment, 2-, 3- and 4-year-old children watched a character's videotaped actions and were asked by an adult partner questions about the videos. The partner either knew what character was depicted in the video and asked a question that explicitly mentioned this character (e.g., "Was that the clown? Oh! What happened?") or did not know what character was depicted in the video and asked a more general question (e.g., "That sounds like fun! What happened?"). Children of all age groups tended to refer to the character in a more informative way (i.e., full Noun Phrases: "*The clown* is jumping") when the partner had not named the character in her question and in a less informative way (e.g., pronouns: "*He* is jumping") when the experimenter had previously mentioned the character in her question (Matthews et al. 2006). In a related demonstration, 3- to 5-year-old children, after being familiarized with specific labels for objects by a communicative partner during a warm-up stage, were slower to react when the same partner suddenly changed the familiar label (e.g., calling "pony" a toy previously referred to as "horse") than when an entirely new partner used the unfamiliar label (Matthews, Lieven, and Tomasello 2010).

Together, these studies suggest that children, at least since age 2, are sensitive to information available to a specific partner in a conversation and can use this information to modify their referential behavior. It should be noted, however, that these studies also reveal rampant sins of omission in children's speech: in many cases, children successfully adapt their referential productions to their partner's perspective in less than half of the critical trials (e.g., (Bahtiyar and Küntay 2009; Nilsen and Graham 2009; Nadig and Sedivy 2002). Closer inspection of the literature suggests that children frequently offer under-informative referential expressions even until the age of 8 or 9 (Deutsch and Pechmann 1982; Sonnenschein and Whitehurst 1984).

A second broad domain where addressee-dependent informativeness has been studied is event description (the ability to identify "who did what to whom"). Events involve multiple participants and the relations between them, and they take place over time and space. They can therefore be described at several different levels of granularity and with several degrees of complexity. In event description tasks, participants are asked to observe an event and explain what happened to a listener. Evidently, in this type of task, it is up to the speaker to decide how much information is appropriate to give to the listener. In simple tasks, involving a single event

participant, 3-year-olds have been shown to make addressee-specific adaptations in terms of the number of events they mention for the sake of an ignorant addressee; nevertheless, younger 3-year-olds are likely to only mention one of two events that they witnessed even when their addressee has seen neither (Perner and Leekam 1986; see also Matthews et al. 2006). Children's linguistic omissions are even more evident in elaborate tasks involving multiple event participants, some of which might be grammatically optional. In one demonstration, adults predominantly described both the manner and the path of a motion event ("The boy was skating into the net"), whereas 4-year-old learners were more likely to mention only the manner ("The boy was skating"; Bunger et al. 2012). In another study, 4- to 5-year-old children were presented with individual events involving instrumental actions (e.g., a boy using a hat to water a plant) and were asked to describe them to a conversational partner (Grigoroglou and Papafragou 2017b). Children's mention of instrument information was vanishingly rare and, unlike adults, did not increase for the sake of partners with no visual access to the events.

Nevertheless, in the same study, 4- to 5-year-olds did adjust their communicative behavior to include event information that was unpredictable, and hence noteworthy, given general knowledge about the world. Specifically, children were more likely to mention unusual instruments ("A boy is watering flowers with a hat") compared to canonical instruments ("A boy is watering flowers with a watering can"; cf. also Köymen, Mammen, and Tomasello 2016; Papafragou, Massey, and Gleitman 2006). These adaptations were not made for the sake of a specific addressee since they did not depend on whether the child's interlocutor could see the events or not; rather they appeared to be adaptations that would benefit any generic listener (see also Bannard, Rosner, and Matthews 2017; Grigoroglou and Papafragou 2016 for similar results).

Choosing how much to say: Factors affecting children's informativeness

As mentioned, producing utterances that are informative for speakers is a remarkably involved process that requires speakers to use a wide range of abilities and combine different sources of information. More specifically, speakers have to attend to visual stimuli and construct a mental representation of a scene. Additionally, they have to assess the informational needs of their communicative partners, including what information is or is not shared with them. Finally, all these representations have to be mapped onto language. Given the complexity of this

prossess, there are several possibile explanations of children's linguistic under-informativeness that connect it to different production sub-processes.

According to one possibility, children's under-informativeness may be linked to attentional deficits while inspecting a scene before speaking: if children do not attend to critical aspects of the visual context (e.g., the differences between the object they want to describe and other, similar objects in view), they will be less likely to mention this information in their descriptions (e.g., see Bunger et al. 2012; Deutsch & Pechmann 1982, for discussion). However, studies that have assessed both children's eye movements and production show a weak link between paying attention to aspects of the visual scene and mentioning those aspects in speech (Bunger, Trueswell, and Papafragou 2012; Davies and Kreysa 2018; cf. Rabagliati and Robertson 2017).

A second, more promising possibility is that children fail at being informative because they do not understand how mentioning properties of an object or aspects of an event can be helpful (i.e., relevant) to the listener's goals. Within referential communication tasks more specifically, children may fail to connect relevant contrasts in the conversational setting (e.g., contrasts between two objects in a display and the corresponding linguistic alternatives) to listeners' needs. This perspective explains why children seem to be more informative in referential communication tasks that involve clearly stated listener goals (e.g., move an object, find a hidden toy) and a relatively restricted set of contrastive linguistic options (e.g., Nadig and Sedivy 2002) but have difficulty with open-ended description tasks that involve implicit communicative goals and a greater range of available linguistic alternatives to choose from (e.g., Bunger et al. 2012). For instance, a study similar to the instrumental events description study summarized earlier where the instruments were the disambiguating feature of a target event within an event pair (as in the standard referential communication task; Grigoroglou and Papafragou 2016) found higher rates of instrument inclusion compared to the study where the events were presented individually (as in a standard description task; Grigoroglou and Papafragou 2017b). In further support of this possibility, in studies where the listener provided children with specific feedback on how their referential attempts failed (by either asking a clarification question or choosing the wrong referent), children offered informative repairs of their original under-informative descriptions at overwhelmingly high rates (above 90% for children over age 4; Deutsch and Pechmann 1982; Matthews, Lieven, and Tomasello 2007;

Matthews et al. 2012; Nilsen and Mangal 2012). By contrast, more general feedback that did not highlight the role of contrastive features in disambiguation did not result in informative repairs (Matthews et al. 2012).

According to an additional, not mutually exclusive possibility, children's failure to make informative contributions to a conversation may be due to specific linguistic or cognitive factors (e.g., Deutsch and Pechmann 1982). For example, Ford and Olson (1975) suggested that knowledge of the syntactic rule of adjective ordering enables older children to be more informative in their complex referential descriptions than younger children. More recent studies find a correlation between receptive vocabulary and informativeness in reference production (Nilsen and Graham 2009; Davies and Kreysa 2018).

Relatedly, the cognitive load associated with specific addressee-oriented adjustments affects the likelihood of children making these adjustments. For instance, information about the listener's visual perspective requires constant monitoring and updating and may be more costly to incorporate than information shared between interlocutors in prior discourse or within a community (Arnold 2008). Support for this possibility comes from the finding that, when describing events, children seem to make generic adjustments to what is considered noteworthy within the community (e.g., by mentioning atypical instruments more often than typical ones) even though they do not tailor these adjustments to whether their particular conversational partner can see the events or not (Grigoroglou and Papafragou 2016, 2017b; cf. Matthews et al. 2006). Similarly, adjustments to the knowledge of a listener that require inhibiting one's own knowledge (as in typical referential communication tasks) seem to be costlier to implement than adjustments where the knowledge of the speaker and the listener are aligned (see Moll and Kadipasaoglu 2013). In direct support of this position, in a study mentioned earlier, Matthews et al. (2006) found that 2- , 3- and 4-year-old children successfully modified their referential expressions (i.e., from pronouns to full Noun Phrases) to match information that was mutually shared with a listener in prior discourse but only after the age of 3 could children make the same adjustment to match their listener's visual perspective when it differed from their own. Finally, individual differences in higher-order cognitive abilities may affect how costly communicative tasks are for each child. Available evidence suggests that children with stronger executive functioning (e.g., working memory, inhibitory control) and better mentalizing skills (e.g., Theory

of Mind) are more likely to produce informative utterances (see Nilsen and Graham 2009; Nilsen et al. 2015; Resches and Pereira 2007; Roberts and Patterson 1983; Wardlow and Heyman 2016).

Finally, the nature of the conversational exchange itself may affect how much children say (see Grigoroglou and Papafragou, 2016; Varghese and Nilsen 2013). Children seem more likely to produce informative utterances in studies where they communicate with 'real' partners, whether familiar (Köymen et al. 2016; O'Neill 1996) or unfamiliar to them (Bahtiyar and Küntay, 2009; Nadig and Sedivy, 2002; Nilsen and Graham, 2009), compared to pictured or imaginary interlocutors (Davies and Katsos, 2010; Girbau 2001). In a more direct test of the role of the listener, a recent study has demonstrated that 4- and 5-year-old children's informativeness (specifically, their mention of instruments for actions in contrastive contexts) increases when children communicate with an interactive, collaborative partner compared to a more passive listener (Grigoroglou and Papafragou, 2016). Relatedly, children seem to also offer more informative utterances in tasks that are highly motivating. For instance, in one study, 6- to 7-year-olds (but not younger children) have been shown to become more informative when they receive monetary incentives (e.g., stickers) for communication (Varghese and Nilsen, 2013; see also Bahtiyar and Küntay, 2009, for similar findings with social incentives). Given that producing an utterance involves a cost to the speaker (Bannard et al. 2017), it is possible that children are more willing to incur this cost for active conversational partners who have genuine needs for information or in conversational exchanges where the benefits of communication justify the cost.

Conclusion

Current developmental evidence suggests that children are sensitive to the pragmatic principle of informativeness and adjust the informational content of what they say to others' knowledge in accordance with shared conversational goals as early as age 2. Nevertheless, children's ability to co-ordinate linguistic and non-linguistic (e.g., visual, social) information to implement the demands of informativeness in language production, especially across different linguistic phenomena, is still developing until late childhood. Assessing what is worth mentioning for complex stimuli (e.g., dynamic events) when the listener's goals may need to be inferred from context seems to be particularly difficult.

Existing evidence suggests that children's choices of how much to say for the sake of their conversational partner depend on their own developing linguistic and cognitive abilities but also on their expectations about how much information listeners need. Crucially, unlike adults, children require very clearly stated conversational goals, highly transparent listener needs and engaging paradigms with a favorable balance between communication costs and benefits. Future research needs to build on these observations to develop a single, unified theory of the development of children's pragmatic informativeness that generalizes to other production phenomena such as question-answering (Salomo, Lieven, And Tomasello 2013) and extends to language comprehension (e.g., Skordos and Papafragou 2016) and non-linguistic communication (e.g., Gweon et al. 2014).

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