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Acquisition of Pragmatics

Summary

To become competent communicators, children need to learn that what a speaker means often goes beyond the literal meaning of what the speaker says. The acquisition of pragmatics as a field is the study of how children learn to bridge the gap between the semantic meaning of words and structures and the intended meaning of an utterance. Of interest is whether young children are capable of reasoning about others' intentions and how this ability develops over time.

For a long period, estimates of children's pragmatic sophistication were mostly pessimistic: early work on a number of phenomena showed that very young communicators were egocentric, oblivious to other interlocutors' intentions, and overall insensitive to subtle pragmatic aspects of interpretation. Recent years have seen major shifts in the study of children's pragmatic development. Novel methods and more fine-grained theoretical approaches have led to a reconsideration of older findings on how children acquire pragmatics across a number of phenomena and have produced a wealth of new evidence and theories.

Three areas that have generated a considerable body of developmental work on pragmatics include reference (the relation between words or phrases and entities in the world), implicature (a type of inferred meaning that arises when a speaker violates conversational rules), and metaphor (a case of figurative language). Findings from these three domains suggest that children actively use pragmatic reasoning to delimit potential referents for newly encountered words, can take into

account the perspective of a communicative partner, and are sensitive to some aspects of implicated and metaphorical meaning. Nevertheless, children's success with pragmatic communication is fragile and task-dependent.

Keywords

pragmatics, language acquisition, word learning, referential communication, implicature, metaphor

1. Overview of the field

One of the design features of human communication lies in the fact that what a speaker means often goes beyond the literal meaning of what the speaker says. Linguistic theories of meaning capture this fact by distinguishing between linguistically encoded (semantic) and inferentially derived (pragmatic) aspects of communicated meaning. According to Grice's (1975) influential theory of pragmatics, communication is a collaborative effort governed by specific rules (or "maxims"). A collaborative speaker is expected to be as informative as required by the purpose of the communicative exchange (maxim of Quantity), truthful (maxim of Quality), relevant (maxim of Relation), and clear (maxim of Manner). A collaborative listener makes inferences about the speaker's intentions based on the assumption that the speaker is being cooperative and following the conversational rules. In the Gricean model, meaning relies on reflexive intentions (i.e., the intention to induce a psychological state in a listener by means of a recognition of that very intention, Grice, 1975). The general idea that human communication involves a species of intention recognition has been widely adopted in later models of pragmatics, even though these models have often departed from the specifics of Grice's program (for reviews, see Allan & Jaszczolt, 2012; Horn & Ward, 2004; Lappin & Fox, 2015). For

instance, Sperber and Wilson's Relevance Theory (1986/1995) is based on the idea that human cognition is equipped with a module specialized for intentional communication, even though this module relies on a single, relevance-based mechanism that constraints the possible interpretations of an utterance.

A key question for linguistics, psychology and other fields of cognitive science is how pragmatics is acquired, that is, how children learn to bridge the gap between the semantic meaning of words and sentences and the intended meaning of an utterance. Of interest is whether young children are capable of reasoning about others' intentions along the broad lines suggested by Grice, and how this ability develops over time. For a long period, estimates of children's pragmatic sophistication were mostly pessimistic: early work on a number of phenomena from speech acts to figurative language showed that very young communicators were egocentric, oblivious to other interlocutors' intentions, and overall insensitive to subtle pragmatic aspects of interpretation (see, e.g., Shatz, 1980). This line of work was consistent with classic findings on children's developing Theory of Mind, according to which the ability to reason about others' beliefs—especially when those differed from one's own—was delayed until the age of 4 or 5 (Baron-Cohen, Leslie & Frith, 1985; Wimmer & Perner, 1983; see Saxe, 2013, for a review).

Recent years have seen major shifts in the study of children's pragmatic development. New experimental paradigms have revealed that children are capable of remarkably complex reasoning about the social world from infancy (see Baillargeon, Scott, & Bian, 2016; Tomasello, Carpenter, Call, Behne, & Moll, 2005, for reviews). Infants are able to attribute goals, intentions and preferences to agents (e.g., Egyed, Kiraly, & Gergely, 2013; Hamlin & Wynn, 2011; Johnson, Ok, & Luo, 2007; Király, Jovanovic, Prinz, Aschersleben, & Gergely, 2003; Kushnir,

Xu, & Wellman, 2010) and reason flexibly about other people's beliefs even when these beliefs differ from their own (e.g., Buttelmann, Carpenter, & Tomasello, 2009; Onishi & Baillargeon, 2005; Southgate, Senju, & Csibra, 2007). Even though these abilities continue to develop throughout early childhood and beyond (Saxe, 2013), rich social skills seem to underlie human interactions from the very beginning. In the study of language and communication, novel methods and more fine-grained theoretical approaches have led to a reconsideration of older findings on how children acquire pragmatics across a number of phenomena and have produced a wealth of new evidence and theories (see, e.g., Matthews, 2014, for a review). These advances have been complemented by a new wave of research on experimental pragmatics with adults (see Noveck & Sperber, 2004; Schwarz, 2015).

In this article we review some classic and more recent findings on the acquisition of children's pragmatic abilities. We focus on three areas that have generated a considerable body of developmental work: reference, implicature and metaphor (as a case of figurative language). Our goal is to throw some light onto the nature of early pragmatic abilities, and to begin to answer the question of when, and most importantly *how*, children come to grasp the mechanics of human communication.

2. Reference

Linguistic reference is a relation that obtains between words or phrases and entities in the world that the words or phrases are used to pick out (e.g., between the Noun Phrase *the dog* and the specific dog in the world that the speaker has in mind). Reference assignment links the abstract system of language to objects, properties, events, or other entities in the world and is therefore the basis of communication. Reference assignment presents learners with a deeply

pragmatic problem, since learners need to make assumptions about what the speaker has in mind and intends to communicate in a specific context.

2.1 Word meanings and reference

For very young learners who know few words, assigning linguistic reference involves a process that often also serves to establish meanings for unfamiliar words (i.e., word learning). Infants use different types of social-pragmatic information to delimit the set of potential meanings (and referents) for an unfamiliar expression offered by a speaker (see Grassman, 2014 for a review). A first important type of information is the speaker's direction of gaze. Numerous studies have underlined the role of eye-gaze monitoring in learning new words (Baldwin, 1993a, 1993b, 1991) and long-term language development more generally (Brooks & Meltzoff, 2005; Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998). In a study by Baldwin (1991), 19-month-old infants heard an adult utter a novel word (*a toma*), while the adult was looking at an object inside a bucket; crucially, when the word was heard, infants were attending to a different object and the object inside the bucket was not visible from their position. Nevertheless, infants attached the novel word to the object in the bucket, not the object that they were attending to themselves (see also Vaish, Demir, and Baldwin, 2011 for evidence that infants consult the speaker's eye gaze in cases of ambiguous reference). In a more recent study (Yurovsky & Frank, 2015), 1- to 4-year-old children viewed short videos in which a speaker named one of two toys. During naming, children of all age groups were shown to spend most of the time looking at the speaker's face, and they used the speaker's direction of gaze to locate the correct target toy, even when the competitor was a more salient (i.e. interesting) toy. In all these studies, infants did not superficially associate novel labels to objects that happened to be present (in some sort of

prominent way) at the moment of labeling but actively sought out social-pragmatic information to determine what a novel word meant.

More complex factors such as discourse novelty and speaker intent also contribute to early word learning. Akhtar, Carpenter and Tomasello (1996) demonstrated that 2-year-old children assigned a new label to an object that was novel to their interlocutor but not to themselves. In a related study, 2-year-olds assigned labels to objects that were presented in an intentionally but not in an accidentally novel context (Diesendruck, Markson, Akhtar, & Reudor, 2004). These results show that children actively monitor their communicative exchanges with other interlocutors and use this information to interpret the referential intentions of these interlocutors. In another demonstration, children as young as 17 months of age were able to use the speaker's knowledge state to learn a new word (Southgate, Chevallier, & Csibra, 2010; see also Happé & Loth, 2002; Papafragou, Fairchild, Cohen, & Friedberg, in press; Sabbagh & Baldwin, 2001, for evidence from older children). In sum, there is mounting evidence that very young children use social-pragmatic mechanisms to attribute sense (and reference) to new words in their input.

2.2 Referential communication

Successful referential communication relies on the ability to use and understand several means of securing reference. Pre-linguistic infants use pointing to direct others' attention to a specific referent and understand the pragmatic function of pointing around their first birthday (Liebal & Tomasello, 2009; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liebal, Behne, Carpenter, & Tomasello, 2009; see Stephens & Matthews, 2014). As children become more mature communicators, they develop the ability to produce and comprehend different types of

referring expressions such as personal pronouns (e.g., *it*), deictics (e.g., *this*, *there*), definite vs. indefinite Noun Phrases (e.g., *the cup* vs. *a cup*), and modified Noun Phrases (e.g., *the short red cup*) to pick out objects and other entities in the world. The choice and interpretation of these devices during referential communication largely depends on expectations of informativeness (Grice's maxim of Quantity), constrained by assumptions about what information is shared or not by a conversational partner (Clark & Marshal, 1981): an effective speaker chooses informationally appropriate words and phrases to refer to things in the world by taking into account what the listener is likely to know, while an effective listener identifies the right referent by interpreting the speaker's referential intentions.

Several studies have indicated that children can adjust the informational content of the referential devices they use to the needs of their addressees. For instance, O'Neill (1996) found that 2-year-old children were more likely to use pointing or verbalization to indicate the location of a hidden toy when their mother had not been present when the toy was been hidden, compared to situations where the mother had been present. O'Neill and Topolovec (2001) found that 2-year-old children who wanted to communicate to their parents which out-of-reach object contained a sticker used more verbal descriptions when pointing gestures were not enough to unambiguously identify the right object, compared to cases where pointing gestures were sufficient for the parent to retrieve the right object. Relatedly, Matthews, Lieven, Theakston and Tomasello (2006) found that 3- and 4-year-olds (but not 2-year-olds) tended to use more informative referring expressions (i.e., full Noun Phrases: "The clown is jumping") when the listener could not see the events being described, but less informative expressions (e.g., pronouns: "He is jumping") when the listener could see the events (see also Matthews, Lieven & Tomasello, 2007; Matthews, Butcher, Lieven, & Tomasello, 2012).

Flexible adaptations to the knowledge state of the interlocutor have been also shown in older children's use of adjectival modification. In one demonstration, Nadig and Sedivy (2002) used a referential communication paradigm in which a child and an adult sat on opposite sides of a grid containing four items; one of the items was always blocked from the addressee's view. The child gave instructions to the adult about how to move items in the grid. Children's production of informative descriptions (measured in terms of adjectival modifiers) was tested in three conditions. In two conditions, two of the items in the array were of the same type (e.g., two glasses) but differed on one dimension (e.g., little glass vs. big glass). Crucially, the addressee either had full visual access to these two objects, just like the child (and, therefore, a modified Noun Phrase was necessary for disambiguation between the two possible referents), or could only see one of the two identical objects in the display (and, thus, modification was redundant from the addressee's perspective). In the third condition, all items were different (and, thus, no modification was needed). It was found that 5- to 6-year-old children used modified Noun Phrases (e.g., "Pick up the little glass") to refer to one of the two competing objects more frequently when the addressee could see both of these objects than when the addressee could only see one of the objects, and almost no modification when all objects were different (see also Bahtiyar & Küntay, 2009; Nilsen & Graham, 2009, for similar findings).

Children show similar sensitivity to the perspective of their interlocutor when they have the role of the listener in referential communication. Using the same task as the production studies above, Nadig and Sedivy (2002) and Nilsen and Graham (2009) showed that 5-year-olds (and to a certain degree 3-year-olds), upon hearing an unmodified Noun Phrase (e.g., "Pick up the glass") in the presence of two potential referents, rapidly looked at the object that was visible by both themselves and the speaker and ignored the other referent that was visible only to

themselves. These results were interpreted as evidence that children are capable of rapidly integrating the perspective of the speaker in comprehension by assuming that the speaker wants to be informative—to the best of his/her knowledge. In a further study, 3- and 5-year-olds tended to respond more slowly or seek clarification after hearing underinformative instructions (e.g., “Find the orange”, when there was more than one orange in view) compared to cases where instructions were informative (Morisseau, Davies, & Matthews, 2013).

Despite these results, young children do not always successfully adopt another person’s perspective (Piaget, 1959) and in many cases tend to be egocentric both as speakers and comprehenders (Davies & Katsos, 2010; Epley, Morewedge, & Keysar, 2004; Girbau, 2001; Pechmann & Deutsch, 1982; Perner & Leekam, 1986; Sonnenschein & Whitehurst, 1984 a.o.). Davies and Katsos (2010) presented 5-year-old children with a computer display containing four objects, two of which formed a contrastive set (e.g., one fresh apple vs. one moldy apple). Children were given a booklet containing the displays where one of the objects was marked with an arrow; their task was to ask a cartoon character that appeared on the computer screen alongside the objects for the cued item. They found that children frequently produced underinformative descriptions of the target object within a contrastive set (e.g., “Give me the apple”). Similarly, on the comprehension side, Epley et al. (2004) tested 4- to 12-year-olds in a referential communication task similar to that in Nadig and Sedivy (2002) and Nilsen and Graham (2009). Unlike those studies, however, these authors found that children, upon hearing underspecified descriptions in critical trials (“Move the small truck above the glue”, when there was a third tiny truck hidden from the interlocutor’s view), tended to look first at the object that was hidden from their interlocutor’s view, as long as it satisfied the description.

To reconcile these seemingly contradictory results, one needs to draw a distinction between *having* an appreciation of another person's perspective and *using* this ability in communication (Nilsen & Fecica, 2011; cf. Keysar, Lin, & Barr, 2003). Children appreciate the perspective of their communicative partner very early, as illustrated in several studies in this section (and in studies showing early use of social cues during word learning summarized in the previous section). However, their ability to use this information in communication depends, among others, on the cognitive demands of specific tasks. Discrepant results from comprehension studies by Nadig and Sedivy (2002) and Epley et al. (2004) can, thus, be explained in terms of small variations within the same referential communication paradigm. For instance, the former study used a simpler visual array than the latter; furthermore, in Epley et al. the underspecified descriptions applied better to the referent that was visible only by the child, such that suppressing one's own perspective was harder than in the Nadig and Sedivy study.

Divergent production data can also be explained by task differences. Closer inspection reveals that, in studies where children succeed in making addressee-specific adjustments, the addressees are either people with whom children have a genuine relation such as their parents (O'Neill, 1996; O'Neill & Topolovec, 2001), or confederates of the experimenter with an active role in the task (Bahtiyar & Küntay, 2009; Nadig & Sedivy, 2002; Nilsen & Graham, 2009). By contrast, in studies where children tend to show more egocentric behavior, children are asked to communicate with either a static (picture of an) addressee on a computer screen (Davies & Katsos, 2010) or an imaginary addressee in a pretend conversation (Girbau, 2001). This pattern suggests that success in perspective-taking depends on whether children engage in a genuine communicative (thus, inherently collaborative) interaction with a "true" interlocutor. In direct support of this possibility, a very recent study showed that children adjusted the informativeness

of their event descriptions to what their addressee could see—but only when both child and addressee were truly engaged in a collaborative ‘game’ (Grigoroglou & Papafragou, 2016).

3. Implicature

Implicatures are inferences that arise when the speaker blatantly flouts one of the conversational maxims and wants the listener to notice this violation (Grice, 1975). We focus here on two types of such inferences. *Scalar* implicatures arise when the Gricean maxim of Quantity is violated. For example, the utterance “Some of my friends went to the party” gives rise to the inference that not all of the speaker’s friends went to the party. In this example, the speaker used a weak term (*some*), as opposed to another quantifier that ranks higher in informativeness scales (e.g., *all*). The fact that the speaker opted for a weaker scalar term gives the listener reason to think that the stronger alternative (assuming that it is relevant) does not hold. In other words, if the stronger alternative is true, using a weaker scalar is pragmatically infelicitous.

Relevance implicatures arise when the Gricean maxim of Relation is violated. For example, consider a conversation between two friends where one asks “Would you like to play outside?” and the other responds “It’s too hot”. The second friend’s response gives rise to the inference that she does not want to play outside. In this example, the second friend offered a response that was seemingly unrelated to the *yes/no* question. The intended meaning arises by assuming that the second friend was cooperative and wanted to offer a response which was relevant to the topic of the conversation, and by taking into account context and world knowledge (e.g., the fact that when it’s too hot it is not a good idea to play outside).

3.1 Scalar implicature

Experimental evidence suggests that children have difficulties deriving scalar implicatures. In an early study, Noveck (2001) demonstrated that French-speaking 5-, 7- and 9-year-old children were willing to accept sentences like “Some elephants have trunks”, while adults were equivocal. In another early demonstration, Greek-speaking 5-year-olds accepted statements such as “Some of the horses jumped over the fence” as descriptions of stories where all of the horses had jumped over the fence, while adults overwhelmingly rejected them (Papafragou & Musolino, 2003). Such difficulties have been replicated and extended in later work (e.g., Barner, Brooks, & Bale, 2011; Huang & Snedeker, 2009; Pouscoulous, Noveck, Politzer, & Bastide, 2007; Guasti et al., 2005 a.o.).

Despite these difficulties, children appear sensitive to the pragmatic reasoning required for implicature generation. Early studies found that adding training in detecting pragmatic infelicity and/or a strong supporting context to binary acceptability judgment tasks (Papafragou & Musolino, 2003; Guasti et al., 2005; Foppolo, Guasti, & Chierchia, 2012) made children more likely to compute scalar implicatures. Furthermore, offering more response options within judgment tasks revealed children’s sensitivity to implicature. In Katsos and Bishop (2011), 5-year-old children accepted true but infelicitous *some*-statements in a binary judgment task—unlike adults who rejected such statements. However, when children were asked to use one of three strawberries (small, medium, large) to reward a speaker based on how well he answered questions about a story, children—just like adults—rewarded the speaker with a small strawberry for false responses, a large strawberry for true and felicitous responses and, critically, a medium-size strawberry for true but pragmatically infelicitous *some*-responses. Thus, a more sensitive, 3-

point scale revealed children's pragmatic competence that was masked in the standard, binary version of the task.

Other studies that did not use acceptability judgments to assess children's pragmatic competence showed successful implicature generation. In Papafragou and Tantalou (2004), Greek-speaking 5-year-olds were shown scenarios in which an animal had to perform an action (e.g., color 5 stars) off-stage. The animal was asked a question about whether it had performed the action (e.g., "Did you color the stars?"). In critical trials the animal responded with a weak scalar term (e.g., "I colored some of them"). Children were asked to give an award to the animals who had successfully completed the task. Children were remarkably successful in deriving scalar inferences (i.e., withholding the prize from the animals that used *some*). Similarly, in Pouscoulous et al. (2007), French-speaking 4-, 5- and 7-year-old children were highly successful in deriving scalar inferences when asked to perform an action-based task (i.e., remove items from boxes or add items to boxes to make them conform to statements such as "Some of the turtles are in the boxes"); interestingly, even 9-year-old children provided massively logical responses to the same statements in a version of this study that was administered as a standard (binary) judgment task. More recently, in a study using a referential communication paradigm (Stiller, Goodman, & Frank, 2015), children as young as 4 were successful in using scalar inference to correctly select a referent in a display.

At present, the exact contribution of task demands to children's failures with scalar implicatures is a topic of active investigation (see Papafragou & Skordos, 2016, for a review). Children's pragmatic difficulties cannot be entirely attributed to binary judgment tasks since difficulties with scalar inferences have also been found in eye-tracking tasks that simply involved following spoken instructions (e.g., Huang & Snedeker, 2009). One possibility is that

children fail to derive scalar inferences across many different tasks because they have problems generating the stronger scalar alternative (e.g., they cannot access *all* when hearing *some*; Chierchia, Crain, Guasti, Gualmini, & Meroni, 2001; Barner & Bachrach, 2010; Barner et al., 2011). Evidence for this possibility comes from the fact that, even though children fail to reject pragmatically infelicitous sentences with a weak scalar term in a binary task, they correctly prefer the stronger, more felicitous statement if presented with both the strong and the weak alternative (Chierchia et al., 2001; see also Ozturk & Papafragou, 2015). Thus children are sensitive to the relative informativeness of the two scalar terms but cannot spontaneously recover the stronger scalar alternative when needed for a scalar inference (see also Barner et al., 2011). More recent developments suggest a somewhat different possibility: although children's access to the stronger scalar alternative is important for implicature generation, the mere presence of the stronger alternative is not sufficient for deriving an implicature; crucially, this alternative needs to be relevant to the goals of the conversation (Skordos & Papafragou, 2016). Supporting evidence comes from a (binary) acceptability judgment task in which 5-year-olds rejected pragmatically infelicitous sentences with a weak scalar term (*some*) only when the stronger alternative (*all*) had been made accessible and *quantity* in the stimuli was at issue. By contrast, when the stronger alternative was available from prior context but was irrelevant to the topic in question, children were less likely to compute an implicature (ibid.). If this line of reasoning is correct, the reason children typically fail in binary acceptability judgment tasks might not lie in the nature of the task per se, but rather in the fact that children may not realize that the stronger scalar alternative is relevant (cf. Papafragou & Musolino, 2003).

A new direction in the developmental study of scalar implicature explores whether children can integrate speaker knowledge when they compute implicatures (in accordance with a

fully Gricean model; see Bergen and Grodner, 2012; Breheny, Ferguson, and Katsos, 2013 for evidence from adults). Recent work has shown that 5-year-old children take into account the epistemic state of the speaker by attributing informationally strong statements to knowledgeable speakers and informationally weak statements to partially informed speakers, but 4-year-olds have difficulties doing so (Hochstein, Bale, Fox, & Barner, 2014; Papafragou, Cohen & Friedberg, in press). It remains open whether different tasks might reveal earlier sensitivity to speaker knowledge for purposes of implicature computation.

3.2 Relevance implicature

Numerous studies report that children are not able to generate relevance implicatures before the age of 6 (Bucciarelli et al., 2003; de Villiers, de Villiers, Coles-White, & Carpenter, 2009; Loukusa, Leinonen, & Ryder, 2007; Verbuk & Shultz, 2010). In one study (Bucciarelli et al., 2003), 2- to 7-year-old children were asked to choose a possible ending for a conversational exchange (e.g., in one exchange, two siblings stop in front of a toy shop. “Brother: Would you get me that game?”, “Sister: We don’t have any money”). Only 6- to 7-year-old children provided endings that gave evidence of implicature calculation (e.g., “The girl cannot get her brother that game”). In a similar study (de Villiers et al., 2009), children were presented with short interactions (e.g., “Dad: What happened to the ham?”, “Boy: The dog looks happy!”) and were asked to explain what a speaker meant (e.g., “What did the boy mean? Why did he say that?”). Only after age 6 did children invoke a relevance implicature in their answers (e.g., “The dog ate the ham”).

Several methodological factors can account for these findings. First, the studies reporting children’s difficulty with relevance implicatures typically asked children to explicitly reflect on a

conversational exchange and, thus, relied on metalinguistic skills. Since such skills develop throughout the school years (Ackerman, 1981; Bernicot, Laval, & Chaminaud, 2007), it is unsurprising that young children's performance was poor. Second, these studies did not always establish that children had the world knowledge required for computing the target implicatures. For instance, in Bucciarelli et al. (2003), computing the inference in the brother-sister exchange requires the background knowledge that products cost money and without money people cannot buy them.

Research addressing these issues has come to different conclusions about children's ability to compute relevance implicatures. This research focused on cases in which a question or assertion is used to make an indirect request (Searle, 1975), especially in novel, non-conventional ways (see also Ervin-Tripp, Strage, Lampert, & Bell, 1987; Reeder, 1980; Shatz, 1978). In a recent study (Tribushinina, 2012), the experimenter used either a positive or a negative adjective (e.g., "These trousers are pretty/ugly") to express her preference towards an item in a picture that the child was pretending to try to sell to her. Children had to place the picture in one of two baskets, based on whether they thought the experimenter wanted to buy it or not. Even 3-year-olds could calculate the implicature (i.e., they could infer whether the experimenter wanted to buy the item or not), and 5-year-olds' performance was adult-like. Similar results were reported by Schulze, Grassmann, and Tomasello (2013). In their study, 3-year-old children interacted with two experimenters. The first experimenter asked the second experimenter if she wanted the child to hand her a toy (e.g., "Should [name of the child] give you the elephant?"). The second experimenter replied by stating her attitude towards the toy (e.g., "I find elephants good"). Children successfully interpreted this statement as indicating whether the second experimenter should be given the toy.

Even though these results are promising, it remains unclear whether children in these studies truly computed a relevance implicature (i.e., understood that the speaker meant to convey an indirect request by using a statement) or simply drew a justified inference about what should happen or what the speaker wanted given the speaker's stated preferences. As early work on children's comprehension of indirect requests recognized (Ervin-Tripp et al., 1987), children may comply with an indirect request without having necessarily computed a speaker's intention, simply because the context made the required action sufficiently clear (e.g., to open the door when the mother is carrying groceries and is asking if the door is open). Notice that studies where children had to rely more on speaker intent to comprehend a relevance implicature have typically led to more pessimistic estimates of children's abilities (e.g., Bucciarelli et al., 2003; but see caveats above). Recall also from the previous section that preschool children might not be able to flexibly recover relevance when computing scalar alternatives (Skordos & Papafragou, 2016). At present, additional research is needed to test children's considerations of relevance in implicature calculation.

4. Metaphor

Metaphor is a type of figurative or non-literal meaning in which one thing or idea is understood in terms of another (Pouscoulous, 2014). For instance, when a speaker utters "John is a cold person", it is understood that the utterance is not meant as a comment about John's temperature but about John's behavior. In Gricean terms, metaphor is another form of implicature, generated by the violation of the maxim of Quality. In many theories, metaphor comprehension involves a meaningful comparison between two different domains (see Glucksberg, 2003, for a review).

Early developmental studies suggested that children's understanding of metaphor is a very late achievement (e.g., Asch & Nerlove, 1960; Winner, Rosenstiel, & Gardner, 1976). For instance, Winner et al. (1976) presented 6- to 12-year-old children with psychological-physical metaphors (e.g., "The prison guard was a hard rock") and cross-sensory metaphors (e.g., "Her perfume was bright sunshine"). Children either had to tell the experimenter what they thought the metaphorical sentence meant or choose between four interpretations in a multiple choice task. Results showed that children were not able to understand metaphorical statements before age 10, and even 10-year-olds' understanding of metaphor was not entirely accurate. Specifically, for the metaphorical statement "The prison guard was a hard rock", 6- and 7-year-olds tended to give either literal interpretations that involved magic ("The king had a magic rock and he turned the guard into another rock") or interpretations that modified the literal meaning of the sentence ("The guard worked in a prison that had hard rock walls"). Eight-year-olds gave "primitive metaphoric" interpretations by extending the attribute *hard* to another physical domain (e.g., "The guard had hard, tough muscles") instead of the intended abstract domain.

Similarly to other pragmatic phenomena, there are reasons to think that children's difficulties with metaphor comprehension in these early studies could at least partly be attributed to task-related factors (see Pouscoulous, 2001, 2014; Vosniadou, Ortony, Reynolds, & Wilson, 1984; Vosniadou & Ortony, 1983). First, children do not seem to have conceptual difficulties with performing the underlying comparisons necessary for metaphor comprehension. In one study, Vosniadou and Ortony (1983) found that even 3-year-olds were able to distinguish meaningful comparisons (literal or metaphorical, e.g., "Rain is like snow/tears") from nonsensical comparisons (e.g., "Rain is like a dog"); furthermore, after age 4, children understood the difference between literal and metaphorical comparisons, thus exhibiting

rudimentary metaphorical abilities (cf. also Pearson, 1990). Second, children's comprehension of metaphor depends on their familiarity with a conceptual domain (Vosniadou & Ortony, 1983), and metaphors used in prior studies may have tapped on world knowledge that children lacked (cf. "The prison guard was a hard rock"; Winner et al., 1976). Other work has shown that, once children comprehend a metaphor within a certain conceptual domain, they can interpret other metaphors from the same domain (Keil, 1986; Özçalışkan, 2005).

Third, many of the early studies mentioned above had a very heavy metalinguistic load, and presented metaphors completely out of context. Later studies that used act-out methods or simple questions and/or embedded metaphors in stories (Vosniadou et al., 1984; Waggoner, Messe, & Palermo, 1985; Waggoner & Palermo, 1989; Özçalışkan, 2005, 2007) demonstrated better metaphor comprehension in preschool children. For instance, Waggoner and Palermo (1989) presented 5-, 7- and 9-year-old children with stories and, at the end of each story, asked children to choose between two metaphors describing the character's feelings (e.g., to say whether a girl was a "bouncing bubble" or a "sinking boat" to indicate whether she was happy or sad). Even 5-year-olds were very successful in this forced choice task, even though only the oldest children could explain their choice. Similarly, Özçalışkan (2005, 2007) presented children with stories containing metaphorical extensions of motion terms to abstract domains (e.g., "A lot of ideas wander in Lucy's mind") and later asked a question related to the meaning of the metaphor (e.g., "Why didn't Lucy buy the groceries her mom wanted?"). Two puppets answered the question, one in accordance with the intended meaning of the metaphor ("Because she forgot what her mom told her to buy"), the other somewhat arbitrarily ("Because she bought candies with the money"), and children had to choose which puppet gave a correct response. Children chose correctly in the forced-choice task at age 4, and could explain their answers at age 5.

As with the study of implicature, a question for the next stages of research is to specify whether success in these tasks in which metaphors are paraphrased reflects genuine understanding of metaphorical meaning or a justified inference on the basis on what the child considers the most likely answer to a question (see also Vosniadou et al., 1984, for evidence that children appear more successful with comprehension of a metaphor at the end of a story when the story ending—hence, the meaning of the metaphor—is more, as opposed to less, predictable). The field of children’s metaphor comprehension is ripe for more extensive exploration.

5. Conclusion

The acquisition of pragmatics is a very active area of current research in linguistics, psychology and related fields. The present review found strong evidence for the early presence of pragmatic-communicative skills in children, as demonstrated in word learning (Section 2.1), referential communication (Section 2.2), and comprehension of certain types of implicature (Section 3) and metaphor (Section 4). Nevertheless, children’s pragmatic sensitivity seems to be extremely fragile and task-dependent. Frequently, studies of the same pragmatic phenomenon have yielded different results because of variation in paradigms across studies (e.g., Noveck, 2001; Papafragou & Musolino, 2003, on scalar implicature), or variation in task demands within the same paradigm (e.g., Epley et al., 2004; Nadig & Sedivy, 2002, on reference resolution). In sum, although children are attuned to pragmatic information from a very young age, the implementation of pragmatic knowledge is not effortless and frequently leads to non-adult behavior.

Several methodological, empirical and theoretical issues remain open for future work. Methodologically, the field needs to create simpler, more naturalistic experimental techniques to

be used to investigate young children's pragmatic communication. Relatedly, there is a need for increased empirical coverage of the acquisition of pragmatic phenomena and the semantics-pragmatics interface. There is currently a growing body of developmental work on topics such as presupposition (e.g., Berger & Höhle, 2012), speech acts (e.g., Rakoczy & Tomasello, 2009; Snow et al., 1996), the given-new distinction (e.g., Junge, Theakston, & Lieven, 2015; Matthews, Lieven, Theakston, & Tomasello, 2006), irony (e.g., Ackerman, 1983; Filippova & Astington, 2008), as well as the semantics-pragmatics of specific terms such as (in)definites (Barner, Chow, & Yang, 2009; Maratsos, 1976; Lidz & Musolino, 2006), gradable adjectives (e.g., Huang & Snedeker, 2013; Syrett, Kennedy, & Lidz, 2009), aspectuals (e.g., Papafragou, 2006; Wagner, 2009), numbers and quantifiers (e.g., Brooks, Pogue, & Barner, 2011; Musolino & Lidz, 2006, Syrett & Lidz 2010), negation (e.g., Nordmeyer & Frank, 2014), modals (Noveck, Ho, & Sera, 1996; Ozturk & Papafragou, 2015), and spatial expressions (Landau, Johannes, Skordos, & Papafragou, in press; Papafragou, Massey, & Gleitman, 2006).

Theoretically, the current state of the field raises two key issues. A first issue is to understand the precise mechanisms that underlie pragmatic development and the way these mechanisms interface with linguistic semantics. An important step in this direction would be to explore how the same pragmatic principles apply to different pragmatic phenomena. For instance, children's sensitivity to the principle of informativeness has been studied in the context of referential communication (e.g., Davies & Katsos, 2010; Matthews et al., 2006, 2007, 2012; Morisseau et al., 2013) and scalar implicature (e.g., Noveck, 2001) but without explicit connections between the two contexts. Similarly, children's sensitivity to the speaker's epistemic stance has been studied to different degrees and with different methods in the context of word learning (e.g., Southgate et al., 2010), referential communication (e.g., O'Neill, 1996),

and scalar implicature (Hochstein et al., 2014; Papafragou et al., in press). A broader account of pragmatic development should provide a unified account of how general pragmatic considerations apply across a variety of linguistic phenomena (and might extend beyond language to other forms of communication; see Gweon, Pelton, Konopka, and Schulz, 2014; Papafragou et al., in press).

A second issue is to examine how developmental phenomena bear on more specific theoretical proposals about the nature and the mechanisms underlying the computation of pragmatic inferences. According to certain neo-Gricean theories, certain types of implicature should be reanalyzed as grammatical processes contributing to the truth conditions of an utterance (Chierchia, Fox, & Spector, 2009) or generated by default (Levinson, 2000). On these views, the computation of at least some pragmatic meaning does not require a rich Gricean representation of the speaker's mental state. According to other, contextualist theories, the derivation of all pragmatic inferences takes into account contextual information and requires the representation of a speaker's intentions (see Carston, 1998; Geurts, 2010; Noveck & Sperber, 2007; Sperber & Wilson, 1986). In this and other theoretical debates, developmental data could be used to test competing pragmatic accounts and tease apart specific contributions of semantic and pragmatic processes to the computation of linguistic meaning. Thus, the acquisition of semantics and pragmatics can be a source of evidence for the nature of the adult linguistic system (cf. Barner & Bachrach, 2010; Papafragou & Musolino, 2003).

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