Pragmatic reasoning in autism

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Introduction

A quarter of a century ago, Happé's review of the communicative deficits associated with Autism Spectrum Disorder (ASD) opened as follows:

> Interacting with a bright and verbal autistic child can be an eye-opening experience: one discovers one is talking in metaphors! A request to "Stick you coat down over there" is met by a serious request for glue. Ask if she will "give you a hand," and she will answer that she needs to keep both hands and cannot cut one off to give to you. Tell him that his sister is "crying her eyes out" and he will look anxiously on the floor for her eyeballs. Ask her to read a passage "out loud" and she will obligingly shout through to the end of it. These overliteral interpretations are made in all earnestness, and they tell us something important about autism and about the way in which we normally communicate. (Happé, 1995, p. 271)

Apart from usefully reminding us that much of our everyday talk is non-literal, this passage vividly illustrates the pragmatic impairments that are thought to typify ASD. As a more recent source puts it:

> [...] interpretation of an utterance demands an ability to go beyond linguistically given meaning by using and connecting relevant contextual information, with which individuals with ASD have great difficulties. (Kim, Paul, Tager-Flusberg, & Lord, 2014, p. 247)

Difficulties handling metaphor, irony, sarcasm, and other non-literal uses of language have been central to the definition of autism, from the very first descriptions to the most up-to-date nosological criteria. Kanner (1944), for example, mentioned excessive "literalness" as one of the core features of the twenty children with autism he described, and Asperger (1991) included lack of understanding of jokes among the characteristics of "autistic affect". With remarkable consistency, the latest edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-V; American Psychiatric Association, 2013, 48) includes the following characteristics among those required for an ASD diagnosis:

> [d]ifficulties understanding what is not explicitly stated (e.g. making inferences) and nonliteral or ambiguous meanings of language (e.g. idioms, humor, metaphors, multiple meanings that depend on the context for interpretation).

Of course, the autism spectrum is characterized by an enormous heterogeneity of clinical profiles, and this is especially true for linguistic abilities; in around 50% of children with ASD expressive language emerges with an important delay, and around 30% never achieve verbal communication (e.g. Kim et al., 2014). However, pragmatic deficits seem to impact utterance interpretation in autism irrespective of language level and persist even in individuals whose language skills are typical otherwise. In this chapter we survey these difficulties and explore some ways of explaining them.

One line of explanation which has been particularly influential links the pragmatic deficits in autism with the reduced ability to attribute mental states to oneself and others, an ability that is variously known as "mind reading", "theory of mind", "mentalizing", and "folk psychology" (we will use the first term). In autistic people this ability tends to be compromised to a greater or lesser extent, and this has often been taken to explain why their pragmatic abilities are compromised, as well (cf. Chapter 3). This view hinges on the assumption that mind reading is essentially involved in pragmatic interpretation, a strong version of which is held by Sperber and Wilson (2002), who go so far as to state that "pragmatic interpretation is ultimately an exercise in mind-reading" (p. 3) If this claim was correct, then we should expect pragmatic abilities in ASD to be impaired across the board, but that is not what we find. Instead, while some pragmatic skills are reduced in autism, others seem to be unaffected (Deliens, Papastamou, Ruytenbeek, Geelhand de Merxem, & Kissine, 2018; Kissine, 2012, 2016).

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The main points to be developed in this chapter are the following:

- Pragmatic competence is not a homogeneous thing, but manifests itself in the ability to deal with a broad variety of tasks, including disambiguation, establishing coherence, interpreting metaphors, and much more.

- Pragmatic deficiencies observed in people with autism are not equally severe across all these sub-tasks.

- Contrary to Sperber and Wilson's claim, which is still widely held, it is unclear whether mind reading is always involved in pragmatic reasoning, nor is it even clear how important it really is. Hence, as things currently stand, it is only a hypothesis that pragmatic deficits in autism are largely due to mind-reading deficits.

- At least some of the data that have been claimed to provide support for this hypothesis are better explained in terms of executive function deficits, which are frequently associated with ASD.

One last remark before we get going. Although communication perforce involves speakers and hearers, pragmatic theories usually take the hearer's point of view. Of course, pragmatic difficulties in autism also surface on the production side, most notably in the management of conversation dynamics and social interaction. However, most of the empirical research adopts the hearer's perspective and focuses on utterance interpretation, and therefore that is also the perspective adopted here.

What is pragmatic reasoning?

To answer this question, we first have to establish what pragmatics is, but since that is a contentious topic (which is putting it very mildly), we will proceed mainly by way of examples. It is relatively uncontentious to say that pragmatics concerns language use, i.e. communication, and that context is key to pragmatic reasoning, where "context" is a broad notion that includes not only the situation in which communication takes place, but also the local time, the previous discourse, linguistic and world knowledge shared between interlocutors, and so on. As a first stab at characterizing pragmatic reasoning, we might say that it supports the production and interpretation of language

by integrating contextual information. The following examples will serve to make this more concrete.

Referential expressions

In each of the following examples, the purpose of the italicised expressions is to refer to some entity or other:

(1) *Fred* is staring at *the moon* again.

(2) Wilma went after *the thief*, but *he* got away.

(3) There's no dignity anymore and I think *that*'s very important. (Mae West)

In (1), the most likely target of the name "Fred" is some male individual named "Fred", but it depends on the common ground between speaker and hearer which Fred "Fred" refers to. The same holds for "the moon", which probably refers to Earth's natural satellite, but might in principle refer to any other moon that is currently salient. In (2), "the thief" refers to some salient thief, while "he" refers either to the aforementioned thief or, less likely, to another salient individual. Finally, though it could be in (3) that the speaker was pointing at an object while uttering the pronoun "that", it is more likely that she meant to refer either to the quality of dignity or to the fact that there is no dignity anymore.

Nearly every sentence uttered in everyday life contains one or more referential expressions, and in order to interpret a given utterance, the hearer will have to decide what these expressions refer to. As is shown by the examples in (1)-(3), the target of a referential expression is constrained but not determined by its form; context always plays a role, and pragmatic reasoning is always needed to interpret referential expressions.

Ambiguities

Each of the italicised expressions in (1)-(3) is indeterminate in the sense that, in principle, it could refer to any of a range of potential targets. But interpretative indeterminacies are not only caused by referential expressions; they also arise through various types of ambiguity. For example:

(4) The defendant drew a gun.

(5) One morning I shot an elephant in my pajamas. How he got in my pajamas, I don't know. (Groucho Marx)

Due to fact that the verb "draw", like the vast majority of words, is lexically ambiguous, (4) could mean either that the defendant pulled out a gun or produced a picture of a gun. In (5), the source of the ambiguity is syntactic: "in my pajamas" may be an adjunct either to "elephant" or to "I shot an elephant". Together with referential expressions, lexical and syntactic ambiguities infuse an utterance with considerable amounts of indeterminacy, which hearers have to resolve by means of pragmatic reasoning.

Non-literal meaning

Although there may be bags weighing 1,000 kilograms, (6) is most likely understood as a hyperbolical statement meaning that the bag in question is very heavy:

(6) That bag weighs a ton.

Likewise, though in the end it always depends on the context, the most obvious interpretation of (7) is not that Trump is an orifice, but rather that he is stupid, irritating, or contemptible, or all of the above, in which case the speaker's statement is a metaphor:

(7) Trump is an arse.

non-literal meanings come in many varieties, of which irony is perhaps the most remarkable, because it usually involves not just a shift, but a reversal of meaning. For example, if it has been raining for days, and I say:

(8) The weather is great.

then my utterance may well be understood as conveying that the weather is awful, so the conveyed meaning is the opposite from the literal meaning.

Conversational implicatures

The foregoing cases involved various hurdles that must be cleared in order to determine the meaning of an utterance. But the import of an utterance generally goes beyond its meaning:

(9) Can you close the window?

(10) A: Did you do all of your homework?
B: I did some of it.

An utterance of (9) would normally imply that the speaker is making a request, while he seems to be asking a question. Similarly, B's answer in (10) may imply that he didn't do all of his homework, but this is not part of the literal meaning of B's utterance. In this case, the pragmatic reasoning that derives the conclusion that B didn't do all of her homework might go as follows:

i. B has said that he did some of his homework.

ii. Being cooperative, he wouldn't have said this if he did all of his homework, for in that case, it would have been more cooperative to say "I did all of it".

iii. Therefore, A is entitled to infer that B didn't do all of his homework.

Such pragmatic inferences are known as "conversational implicatures". Rather than being part of the meaning of the speaker's utterance, they are derivable, and supposed to be derived, from it, and they critically depend on the assumption that the speaker is cooperative (Grice, 1975).

This quick survey should suffice to show that pragmatic reasoning is a heterogeneous phenomenon. It comes in many flavours that vary along several dimensions, of which we will discuss two. The most important distinction to be drawn is between forms of reasoning that help to pin down the contextual meaning of an utterance, on the one hand, and forms of reasoning that derive further inferences from that meaning, on the other. This distinction presupposes that interpretation is a two-stage process. During the first, "pre-propositional" stage, the utterance meaning is assembled, on the basis of which further inferences are derived during the second, "post-propositional" stage. It should be noted that this two-stage model, which is widely accepted in the field of pragmatics (e.g. Recanati, 2004), need not be viewed as a processing model, no matter how tempting it may seem to do so. For example, the fact that conversational implicatures are post-propositional inferences does not imply that they cannot be computed until the speaker has completed his utterance (Geurts, 2010, pp. 72–74). Nor need it be the case that post-propositional pragmatics is intrinsically harder than pre-propositional

pragmatics, as has often been suggested. Though it may be true that, as a matter of statistical fact, resolving pronouns tends to be easier than interpreting metaphors, for example, there is no evidence that the first type of task is necessarily simpler than the second.

A second way of classifying forms of pragmatic reasoning is in terms of additivity, as we will call it. Some forms of pragmatic reasoning merely add further information to what is given already. Ambiguity resolution is a case in point. Given that (4) can mean either that the defendant pulled out a gun or produced a picture of a gun, resolving the ambiguity results in a more informative interpretation which doesn't lose any of the information in the ambiguous input. By contrast, if (8) is interpreted as meaning that the weather is awful, then this implies a reversal of the standard meaning; so the pragmatic reasoning underlying irony is non-additive.

	pre-propositional	*post-propositional*
additive	reference (exs. 1-3) ambiguity resolution (exs. 4-5)	quantity implicatures (ex. 10) indirect speech acts (ex. 9)
non-additive	metaphor (exs. 7, 11) hyperbole (ex. 6)	irony (ex. 8)

Table 1: Pragmatic phenomena classified along two dimensions. Caveat: this classification is not entirely theory-neutral. For example, according to some analyses, indirect speech acts are non-additive.

Table 1 summarizes the foregoing survey by classifying pragmatic phenomena along the two dimensions we have used. Note that, although pre-propositional forms of reasoning tend to be additive while post-propositional forms need not be, the two distinctions do not coincide. In particular, whereas the derivation of non-literal meanings is generally non-additive, it need not be post-propositional. For example, in (7) the word "arse" is interpreted metaphorically, and therefore non-additively, but since the contextual meaning of the sentence is affected, the reasoning involved must be pre-propositional.

Whether pre- or post-propositional, additive or non-additive, pragmatic reasoning is a form of abduction, or "inference to the best explanation" (Geurts, 2010; Harman, 1965; Lipton, 2004). Making sense of an utterance is like diagnosing a disease or a malfunctioning toaster. An utterance is an action with a purpose, and in order to make sense of it, the hearer needs to find out what that purpose is and how it might be served by the utterance. This diagnostic procedure relies on the assumption that, up to a point at

least, speakers aim to optimize utterances for their purposes. To illustrate, consider example (4) again:

(4)   The defendant drew a gun.

Suppose this is said, in court, as part of a report on a robbery. Then it is virtually certain that this utterance serves its purpose best on the assumption that, in this context, the meaning of (4) is that the defendant pulled a gun. This holds more or less regardless of what that purpose is. Similarly, in order to save the premise that (11) is meaningful at all, it is most likely that "commit suicide" is not to be construed in its literal sense, and that a non-literal interpretation serves the utterance's purpose best:

(11)   I'm sorry I'm late: my car committed suicide on the motorway.

Since pragmatic reasoning is abductive, it is non-monotonic and lacks the absolute certainty characteristic of deductive reasoning: in principle, any conclusion established by means of pragmatic reasoning may be overruled by further evidence.

As we saw in the introduction, there is a popular notion that pragmatic reasoning is essentially an exercise in mind reading. To a large extent, this idea owes its popularity to the broader view that communication is a matter of expressing intentions, opinions, desires, etc., on the part of speaker, and grasping the expressed mental states, on the part of the hearer. Although this view has deep historical roots, in modern times it is especially associated with Grice (1957). On a Gricean account, if Barney promises Betty:

(12)   I'll walk the dog.

he thereby conveys the intention to walk the dog, and communication will have succeeded only if Betty comes to understand that Barney has the intention to walk the dog. It has been shown, notably by Bach and Harnish (1979), that this style of analysis is applicable to a sizeable class of utterance types, although it is conceded even by its proponents that it doesn't apply to all speech acts. In particular, ceremonial speech acts like, "I christen this ship the USS Stormy Daniels", don't seem to require the speaker to be in any particular mental state (Kissine, 2013b; Strawson, 1964).

Be that as it may, even if many utterances can be construed as expressing mental states, it doesn't follow that that is their primary purpose. After all, although utterances typically convey information about the speaker's gen-

der, age, and language skills, it is clearly not their primary purpose to do so. Furthermore, although the Gricean approach may be the most popular (especially outside the field of pragmatics proper), it is not the only game in town. For example, it is uncontroversial that promises create social commitments for speakers: no matter what Barney's intentions are, if he promises Betty to walk the dog, he thereby comes under obligation to walk the dog, and obligations are social facts. Similar observations can be made about questions, assertions, and other speech act types, and they raise the possibility that, in general, the primary purpose of a speech act is to undertake social commitments rather than to express psychological states (Brandom, 1994; Clark, 2006; Geurts, 2018, 2019). This is not the place to argue for this or any other account of speech acts. The point we want to make here is merely that, contrary to what is often claimed or implied, it does not go without saying that the Gricean account is correct. That is to say, it is debatable whether pragmatic interpretation is essentially an exercise in mind reading (Kissine, 2012, 2013a, 2016; Thompson, 2014).

Could it be, then, that *some* varieties of pragmatic reasoning necessarily involve mind reading? One such variety might be metaphor, as Happé (1995) and many others have suggested. Prima facie, at least, metaphors seem harder to process than lexical ambiguities, for example, and since mind reading is often considered to be hard, it might be surmised that processing metaphors requires mind reading, and that this is the reason why people with autism appear to experience difficulties with metaphorical expressions. However, this line of thinking is problematic in at least two ways. One is that it is by no means clear that mind reading must be hard (Geurts & Rubio-Fernández, 2015). The other is that, as far as we can see, there is no a priori reason for supposing that understanding metaphors requires mind reading.

Let us belabour this point a bit by way of example (11). If someone tells you that her car "committed suicide", then you will infer that her car broke down. How? Well, to begin with, if the expression "commit suicide" is taken literally, then the speaker's statement doesn't make sense. Since it is quite common for expressions to be used non-literally, hearers have a general strategy for dealing with this kind of situation, which is to look for more plausible meanings that are saliently associated with the literal meaning. So you ask yourself what concepts are associated with suicide that would make sense in this particular context, and realizing that suicide entails the end of proper functioning, you infer that, in the context of (11), the meaning of "commit suicide" is "break down". This chain of inferences does

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not refer to the speaker's mental state at any point. True, you might go on to conclude that this meaning was intended by the speaker, but that doesn't seem to be a prerequisite for interpreting her utterance. Hence, a theoretical analysis of metaphor doesn't require the require the assumption that an utterance expresses a communicative intention that must be grasped by the hearer in order for communication to succeed. More generally, as things currently stand, it is an open question how much mind reading is involved in communication.

In the last paragraph we went through a somewhat protracted argument to the effect that, in the context of (11), "commit suicide" probably means something like "break down". This type of argument is quite common in pragmatics, though opinions diverge on how it is to be formalized. It bears emphasising, however, that the principal purpose of this style of analysis is to show why it is *reasonable* for the hearer to adopt this interpretation rather than another. There is nothing in the analysis to imply that, in order to get to this interpretation, hearers have to go through the same chain of reasoning. The key point here is that, as a rule, pragmatic theories are not processing theories. A pragmatic theory may impose constraints on possible processing models, but such constraints rarely follow straightforwardly from the theory (Geurts & Rubio-Fernández, 2015).

Giving this issue its due would take us way beyond the scope of the present chapter, but there is one phenomenon that should be mentioned in this connection: pragmatic inferences have a way of becoming conventional. For example, the original sense of "arse" was anatomical, and the pejorative sense developed out of it. In the meantime the latter has conventionalized, and is now probably more common than the former, but nevertheless the pejorative sense remains recognizably metaphorical. In all likelihood, this will have consequences for how the word is processed, but such consequences do not fall into the province of pragmatic theory.

Pragmatic abilities in ASD

Contrary to what is suggested by the quote at the beginning of this chapter, two decades of increasingly sophisticated experimental studies have shown that pragmatic impairments in autism are neither global nor uniform. In the remainder of this chapter we review a representative sample of these studies.

Referential expressions

Let us start with two instances of additive pre-propositional reasoning. Studies on reference processing in ASD are relatively scarce, and mostly focus on production (see Malkin, Abbot-Smith, & Williams, 2018, for a recent meta-analysis). A robust result of this literature is that individuals with ASD may use fewer referential expressions, such as pronouns, which can make it hard for their addressees to understand what they want to say (Arnold, Bennetto, & Diehl, 2009; Colle, Baron-Cohen, Wheelwright, & van der Lely, 2008; de Villiers, 2011). However, while the production of referential expressions is not always optimally tuned to the hearer's perspective, there is no evidence that ASD is generally associated with a reduced ability to understand referential expressions. For example, using act-out tasks, Hobson, Lee, and Hobson (2010) showed that adolescents with ASD correctly understand personal pronouns; likewise, a story retelling task yielded no indication that children with ASD have problems with reference resolution (Novogrodsky, 2013).

Ambiguities

Another variety of pragmatic reasoning that is additive and pre-propositional is involved in the resolution of lexical ambiguity. Difficulties in integrating global linguistic context to resolve linguistic ambiguity have been amongst the main arguments for Weak Coherence accounts of autism, according to which cognitive processing in ASD is atypically focused on local properties of the stimulus, at the expense of the global context (Frith, 1989; Happé & Frith, 2006). If this is correct, one should expect individuals with ASD to experience difficulties in using global, contextual information to cancel a common meaning of an ambiguous word in favour of a less common one. The bulk of evidence here comes from homograph tasks, in which participants have to read aloud sentences that favour either more frequent or rarer pronunciations of words with distinct meanings that happen to share the same spelling. For example, whereas the sentence in (13) favours the more common pronunciation of *lead* as [liːd], in (14) it is the less common [lɛd] that makes more sense.

(13) Mary wanted to take the dog for a walk, so she went to the cupboard and took the *lead*.

(14) The scrap metal man first took the copper and iron and then he took the *lead*. (from Jolliffe & Baron-Cohen, 1999)

Several studies using this paradigm found that children and adults with ASD have difficulties inhibiting frequent but contextually inappropriate pronunciations of homographs (Frith & Snowling, 1983; Jolliffe & Baron-Cohen, 1999). However, what homograph tasks tap is not the pragmatic competence to use context in order to select the appropriate lexical meaning, but rather the capacity to inhibit the most salient pronunciation of the homograph and switch to the less frequent one. Such inhibition and flexibility skills belong to the domain of executive functions, viz. of cognitive skills required for (short-term) management and control of behaviour. Since there is evidence that executive dysfunction, especially with respect to flexibility, is part of the ASD cognitive profile, it makes more sense to explain findings with the homograph paradigm along these lines (Hill, 2004; Ozonoff, South, & Provencal, 2005; Russell & Hughes, 1994; Zelazo, Jacques, Burack, & Frye, 2002).

This view is supported by studies using finer-grained tasks that assessed the *activation* of contextually appropriate meanings without relying on pronunciation found no specific impairments in autism. For example, Brock, Norbury, Einav, and Nation (2008) used the Visual World paradigm to compare anticipatory fixations on representations of a target word (e.g. "hamster") as compared to a phonological competitor (e.g. "hammer"). When the verb primed the target, as in (15), the rate of anticipatory fixations on the competitor was lower than after verbs whose meaning was neutral in this respect, as in (16).

(15)   John stroked the hamster quietly.

(16)   John chose the hamster reluctantly.

Crucially, Brock et al. (2008) did not find a specific effect of ASD diagnosis, even though language level did play a role. These results, which are consistent with other studies (Hahn, Snedeker, & Rabagliati, 2015; Norbury, 2005a), strongly suggest that autism is not, or at least not uniformly, characterized by a reduced ability to recruit contextual information for the purpose of disambiguation.

Metaphor

Impaired comprehension of metaphors is one of the official diagnostic criteria for ASD (DSM-V; American Psychiatric Association, 2013, 48), and this diagnostic was supported already by one of the first studies on pragmatics

and ASD, which found that both children and adults with ASD had difficulties understanding metaphors (Chapter 5; Happé, 1993). In Happé's Exp. 1, participants had to complete sentences by selecting one out of six words. Only one of these words was appropriate, but it required a metaphorical interpretation of the sentence, as illustrated by the word "volcano" in (17):

(17)   Father was very very cross. He really was a ...

Happé found that participants with ASD were significantly less likely to select the appropriate word than participants without ASD. This difference was weaker in sentences like (18) that made the analogical relation explicit.

(18)   Father was very very cross. He was like a ...

Happé reported a further finding that she argued to be relevant for the nexus between pragmatics and mind reading. She measured to what extent participants were able to reason about other people's beliefs by using various tasks that required participants to attribute false beliefs (e.g. "Sally wrongly believes the marble is in the box"), and found that participants with ASD who passed these mind-reading tasks performed equally well on the metaphor task as participants without ASD, and significantly better than participants with ASD who failed at these mind-reading tasks. Based on these findings, Happé concluded that pragmatic skills and mind-reading skills are closely related, a conclusion that was widely accepted in the literature.

However, Norbury (2005b) present data that undermine Happé's conclusions. Using a metaphor task similar to Happé's, she tested mind-reading abilities in a similar way. In addition, she measured the semantic knowledge of participants using the Test of Word Knowledge, which measures how well participants understand the meanings of words by asking them, e.g. to provide synonyms and explain lexical ambiguities (Wiig & Secord, 1992). Norbury found that semantic knowledge, rather than mind-reading abilities, modulates performance on the metaphor task: once differences in semantic knowledge are controlled for, individuals with ASD understand metaphors just as well as individuals without ASD (cf. also Kalandadze, Norbury, Nærland, & Næss, 2018; Kasirer & Mashal, 2014). These data argue against the idea that autism is characterized by problems with metaphor comprehension, as well as against the hypothesis that pragmatic competence always requires mind reading.

Chouinard and Cummine (2016) report data suggesting that individuals with ASD may *process* metaphors differently from individuals without ASD, even if they ultimately arrive at the same interpretation. In this study, participants had to indicate whether metaphorical sentences like (19) were literally true or false:

(19)   Some hearts are ice.

Participants with and without ASD were slower to respond that metaphorical sentences were literally false when compared to non-metaphorical sentences, which suggests that both groups of participants derived the metaphorical interpretation of (18). However, this slowdown was greater for participants with ASD, who were also more likely to make errors on metaphorical sentences than on non-metaphorical controls. These results suggest that participants with ASD had problems inhibiting the unintended interpretation of these sentences.

Indirect speech acts

Indirect speech acts are clear cases of post-propositional inferences. It has often been claimed in the literature that individuals with ASD experience difficulties interpreting (20) or (21) as requests to close the door:

(20)   Could you close the door?
(21)   I'd like you to close the door.

As the syntactic structures of (20) and (21) are prototypically associated with questions and assertions, respectively, it was thought that individuals with ASD should have difficulties overriding these structural cues in order to derive contextually appropriate interpretations. However, there is no clear-cut experimental evidence to support this hypothesis. Paul and Cohen (1985) report that, in a spontaneous drawing task, adults with ASD sometimes failed to follow an experimenter's suggestion to colour a part of the drawing blue (instead of red), when this request was conveyed indirectly, e.g. as "Why colour this house red?" or "Doesn't it need blue?" (Participants did comply with suggestions like "Why not colour this blue?" or "It needs blue.") These results were interpreted as indicating a deficit in pragmatic processing, but the failure to comply with such convoluted requests hardly counts as evidence for a deficient understanding of indirect requests. When Kissine,

De Brabanter, and Leybaert (2012) analysed an extensive video corpus of low-functioning children with ASD, they found that these children are as likely to comply with direct requests, like (22), as with indirect ones, such as (23):

(22)   Pour the milk.

(23)   You forgot the water in your bag. [Intended meaning: "Go and fetch the water from your bag."]

Though it seems that children and adults with ASD are able to comply with indirect requests, one may still wonder whether their pragmatic understanding of such requests is standard in all respects. MacKay and Shaw (2005) presented children diagnosed with Asperger syndrome or high-functioning autism with illustrated short stories, in some of which a protagonist made an indirect request, such as (24):

(24)   These crisps look lovely.

Although children with ASD correctly understood the directive meaning of such indirect requests equally often as a typically-developing comparison group, they often failed to correctly explain why the speaker used the indirect form. Difficulties pertaining to the understanding of the *reasons* why the speaker opted for this or that form are certainly telling about these children's interactional deficits. This issue, however, is orthogonal to the assessment of the capacity to *obtain* pragmatic interpretations in ASD. A plausible implication of MacKay and Shaw's (2005) results is that the correct interpretation of at least some indirect speech acts can be achieved without making assumptions about the speaker's beliefs and intentions; this is in line with the experimental evidence on metaphor in ASD.

This line of thought is supported by two further studies which strongly suggest that in spite of well-documented difficulties in mental state attribution, individuals with ASD are capable of deriving indirectly conveyed meanings. Kissine et al. (2015) had children with ASD play with several Mr. Potato Heads, in the presence of two experimenters: one who played with the child while the other was ostensibly withdrawn from the interaction, her back to the child, and reading a magazine. In the first context, when the first experimenter uttered (25), children accurately responded to her utterance by looking for a hat to put on a Mr. Potato Head.

(25) Oh! He has no hat.

But when the second speaker produced the same utterance later on, this time meant as a comment on the magazine she was reading, almost none of the children in the ASD group seemed to interpret her utterance as a request or a suggestion to put a hat on the other Mr. Potato Head they were playing with at that moment. Hence this study showed that children with ASD are flexible about the interpretations they assign to an utterance, and that their interpretations are not determined solely by linguistic form. In Deliens, Papastamou, et al. (2018, Exp. 1), adults with ASD were provided with a touchscreen displaying a grid with geometrical figures and YES and NO buttons. Participants were instructed to follow pre-recorded audio instructions. Some instructions, such as (26), could only be complied with by moving a shape on the grid; some others, such as (27), unambiguously were questions, to be answered by touching the YES or the NO button.

(26) Move the green triangle on the right of the red square.

(27) Is the green triangle on the right of the red square?

Other instructions, however, were ambiguous and could be interpreted either as questions (to which the answer was "yes") or requests:

(28) Can you move the green triangle on the right of the red square?

(29) Is it possible to move the green triangle on the right of the red square?

Participants with ASD responded by moving a shape in the grid equally often as neuro-typical controls. Analyses of reaction times and eye-movements did not reveal any significant group differences, either. Importantly, replicating an earlier study with neurotypical participants (Ruytenbeek, Ostaschenko, & Kissine, 2017), these results showed that when participants opted for a "request" interpretation of an ambiguous instruction, they did not respond more slowly than to unambiguous, imperative requests, and did not look at the YES and NO buttons (which would have been indicative of hesitation between a "question" and a "request" response).

Scalar implicatures

Like indirect requests, the interpretation of scalar expressions, such as "some" and "or", involves additive and post-propositional pragmatic reasoning (Geurts,

2010; van Tiel, 2014). It is commonly assumed that the literal meaning of "some" and "or" can be paraphrased as "at least some and possibly all" and "or and possibly and". Someone who utters (30), however, may imply that not all dogs are mammals, and someone who utters (31) that zebras do not have black and white stripes. These *scalar inferences* are usually explained as a variety of conversational implicature. Thus someone who says (30) could have been more informative, hence more cooperative, by saying "All dogs are mammals." Why didn't she? Presumably because she believes not all dogs are mammals. Thus, (30) and (31) are true when interpreted literally, but false if their respective scalar inferences are derived.

(30)   Some dogs are mammals.

(31)   Zebras have black or white stripes.

Pijnacker, Hagoort, Buitelaar, Teunisse, and Geurts (2009) were the first to test whether individuals with ASD were less likely to derive scalar inferences than individuals without ASD. In their study, participants had to indicate whether they considered sentences such as (30) and (31) to be true or false. Participants who derived the scalar inferences were predicted to answer "false", while participants who interpreted the sentences literally were predicted to answer "true". Pijnacker et al. found no difference in the rates of "false" responses between participants with and without ASD. Moreover, within the group of participants with ASD, Pijnacker et al. observed a significant effect of language competence, such that individuals with greater language competence were more likely to derive scalar inferences. Both of these findings were confirmed in later studies on children and adolescents with ASD (Chevallier, Wilson, Happé, & Noveck, 2010; Su & Su, 2015; van Tiel & Kissine, in press).

As noted earlier, one of the hallmarks of pragmatic inferences is that they are defeasible, i.e. they can be overruled by further evidence. Thus, while (32) will normally imply that not all of the boxes contain strawberries, this inference need not be warranted if it is given that the speaker didn't inspect all the boxes, because, in that case, the reason the speaker didn't say "All of the boxes have strawberries" is that she lacks the requisite knowledge:

(32)   Some of the boxes have strawberries.

Hochstein, Bale, and Barner (2018) showed that, indeed, whereas neurotypical participants vary their interpretation of sentences like (32) based on the

speaker's knowledge, participants with ASD interpreted them with a scalar implicature irrespective of whether the speaker knew what was in all of the boxes. This finding suggests that mind-reading deficits may affect the pragmatic understanding of scalar expressions in individuals with ASD. However, an alternative explanation would be that individuals with ASD have problems inhibiting the scalar inference, which may be relatively salient, much like individuals with ASD have problems inhibiting the most salient pronunciation of homographs, as we have seen.

In any case, the observation that individuals with and without ASD are equally likely to derive scalar inferences should not be construed as implying that they are equally adept at reasoning about the speaker's reasons for being underinformative. Thus, van Tiel and Kissine (in press) investigated whether the probability of deriving various underinformativity-based inferences varies with the degree to which one has autistic traits, as measured by the autism spectrum quotient questionnaire (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). In line with previous research, van Tiel and Kissine found no effect of autistic traits on the probability of deriving scalar inferences; however, they did find that participants with more autistic traits were less likely to derive so-called *distributivity inferences*, which belong to the same pragmatic family as scalar inferences (Geurts, 2010). Distributivity inferences are licensed when "or" is embedded under a universal quantifier, as in (33).

(33)   Each of the shapes is red or green.

Someone who utters this sentence may imply that there are both red shapes and green shapes. The pragmatic reasoning that underlies these distributivity inferences may be spelled out as follows:

- *i.* The speaker has said that each of the shapes is red or green.
- *ii.* Being cooperative, he wouldn't have said this if all of the shapes are red and none are green, for in that case, it would have been more cooperative to say "Each of the shapes is red."
- *iii.* He also wouldn't said this if all of the shapes are green and none are red, for in that case, it would have been more cooperative to say "Each of the shapes is green."
- *iv.* Therefore, the hearer is entitled to infer that there are both red shapes and green shapes.

The observation that the probability of deriving distributivity inferences but not scalar inferences varies with the degree to which one has autistic traits shows that the pragmatic skills of people with ASD may vary even within the same class of pragmatic inferences.

Irony

Irony may be one of the most complex pragmatic phenomena, as it is defined by a conflict between literal and conveyed meaning, in some respect or other. In some cases at least, reversing the literal interpretation and getting to the ironic meaning requires that the speaker's intentions be taken into account. For instance, a speaker who volunteers (34) as a comment on a long and confused conference presentation, may be mistaken, insincere, or ironic:

(34)   This talk was great.

If mistaken, the speaker says something she wrongly believes to be true; if insincere, she says something she takes to be false without wanting her hearers to realize that; and if she is being ironic, she says something she takes to be false, and does want her hearers to realize. The most reliable route to rule out the first two possibilities in the favour of the third is to assume that the speaker cannot possibly have liked the talk, and, furthermore, that she believes that this is also obvious to her addressee (see, e.g. Bryant, 2012; Deliens, Antoniou, Clin, Ostaschenko, & Kissine, 2018). It doesn't come a surprise, therefore, that experimental studies indicate that the capacity to understand irony strongly correlates with mind-reading competence (e.g. Akimoto, Miyazawa, & Muramoto, 2012; Filippova & Astington, 2008; Spotorno & Noveck, 2014). These findings make it plausible that the robustly attested mind-reading deficits in ASD should cause difficulties in irony comprehension. Given the central role mind reading plays in irony comprehension, one should expect these difficulties to be more severe relative to the other types of pragmatic phenomena surveyed in the foregoing, including metaphor (Andrés-Roqueta & Katsos, 2017; Kissine, 2012, 2013a, 2016).

Some studies report difficulties in understanding irony in adults with ASD, as tapped by story completion or interpretation tasks (Happé, 1993; Kaland et al., 2002; Martin & McDonald, 2004), but this pattern is not entirely consistent with other studies. Somewhat surprisingly, in a recent meta-analysis of non-literal language in autism, Kalandadze et al. (2018) found

that, overall, group differences between individuals with ASD and neurotypicals are stronger in the comprehension of metaphor than of irony. A closer look reveals, however, that irony comprehension in autism may have been over-estimated due to methodological factors. Since these factors have important theoretical implications, it is worth looking in some detail at studies that report intact irony comprehension in ASD. In Chevallier, Noveck, Happé, and Wilson (2011), ironic items were uttered with a marked prosody, while non-ironic items were uttered in a neutral tone of voice. Participants had then to choose between two options: a literal one and an ironic one, the latter being explicitly incongruent with the target literal meaning.

(35)   Context: Glenn tells Phil that he decided to come by plane rather than by train.
       Ben says: How clever of you! [target]
       Option 1: Ben really thinks that Glenn's decision was right because the trains are always late. [admiration]
       Option 2: Ben actually thinks that Glenn is silly because the plane takes longer than the train. [irony]

Chevallier et al.'s participants with ASD seemed to have no trouble correctly choosing the ironic option in this task. Wang, Lee, Sigman, and Dapretto (2006), Colich et al. (2012) and Pexman et al. (2011) also report above-chance performance in ASD in a forced-choice discrimination task in which ironic items were associated with contextual incongruence and marked prosody.[1]

In *all* these cases, participants could rely on prosodic cues and evident incongruence with the literal meaning to help them choose between two interpretations. However, in real life cues to irony are not nearly as systematic, and therefore the interpreter's task is much harder. Deliens, Antoniou, et al. (2018) showed that, in a forced-choice task, participants correctly classified marked prosodic contours and facial expressions as ironic or non-ironic. However, the same cues caused poor performance in an act-out task, in which participants had to figure out, based on an utterance, which of two available objects the speaker really wanted. In each trial of this task, participants watched a short video with two protagonists sitting in front of two objects, e.g. a cup of tea and a glass of milk. One protagonist offered one of these two objects to the second one, asking "Would you like a cup of tea?", for example.

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[1]Interestingly, in Wang et al. (2006) and Colich et al. (2012) neural activation patterns differed between ASD and neurotypical groups.

After that the second protagonist reacted in a positive or negative way, uttering the target sentence, e.g. "Yes, you know how much I love tea" or "No, I don't like tea." In some trials, this target sentence was ironic. Participants had to select the item that the second protagonist really wanted.

Crucially, in this design, ironic stimuli were not systematically associated with distinctive prosody, contextual incongruence, or facial expression, as sometimes only one or two of these cues were available. For example, in some but not all trials the first protagonist provided background information about the second protagonist's preferences, e.g. by saying "I know that you like tea for your breakfast." Moreover, only some ironic targets were associated with a distinctively ironic intonation and/or facial expression, and non-ironic stimuli were also associated with marked but non-ironic prosody or facial expressions. In brief, this design did not associate irony with a distinctive pattern of stimuli, and participants with ASD performed significantly worse than neurotypical controls (Deliens, Papastamou, et al., 2018, Exp. 2).[2] It appears, therefore, that in adults with ASD the capacity to detect irony requires special circumstances that are usually not given in everyday life. Therefore, it seems fair to say that the positive results reported in earlier studies overestimate the pragmatic competence of adults with ASD.

Conclusion

Engaging in everyday communication continually requires pragmatic reasoning in order to deal with various types of reference, ambiguity, non-literal meaning, implicatures, indirect speech acts, and so on. It is well established that people with ASD exhibit pragmatic deficiencies, but contrary to popular opinion it is not the case that, in ASD, pragmatic competence is impaired across the board. Instead, the experimental record suggests a motley pattern of local deficiences, which fail to align with any of the divisions standardly made by pragmatic theories. For instance, although it has been claimed that the understanding of metaphor is uniformly impaired in ASD, this idea is not borne out by experimental evidence, and the same holds for the claim that people with ASD always have problems with the post-propositional reasoning required for understanding indirect speech acts or irony.

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[2]These were the same participants who, in Deliens, Papastamou, et al. (2018, Exp. 1), produced the same rates of indirect requests as the comparison group.

It is well established that people with ASD tend to have problems adopting other people's perspective. Therefore, the existence of intact pragmatic processing in ASD speaks against the notion that all pragmatic processing requires mind reading. This conclusion is confirmed by theoretical analysis, for as things stand it is an open question when and to what extent communication relies on mind reading. As a consequence, there is currently no support for the view that pragmatic reasoning which *does* require mind reading is uniformly impaired in ASD, simply because we do not know yet which forms of pragmatic reasoning require mind reading, and which don't. Be that as it may, it is unlikely that mind-reading deficits are the only causal factor underlying impaired pragmatic reasoning in ASD, if only because it is in the nature of pragmatic reasoning, as a form of inference to the best explanation, that it requires executive abilities such as inhibition and flexibility, which tend to be compromised in people with ASD. Therefore, we should expect pragmatic reasoning in ASD to be impaired for this reason, too, and as we have seen at several points in this chapter, there is experimental evidence confirming that expectation.

Pragmatic theories make various distinctions between types of communicative skills and sub-skills, and there is a certain amount of consensus on what the key distinctions are. This chapter started out from typological distinctions that we take to be fairly uncontroversial, and used them as a backdrop for discussing pragmatic impairments associated with ASD. This was the most obvious procedure to adopt, but it has led us to the conclusion that this may not be the best way of approaching pragmatic reasoning in ASD. Instead, it seems more advisable to focus on the types of *processing* involved in pragmatic reasoning, and consider in each case if and how it might be compromised in ASD. Typologies offered by pragmatic theories might still be useful as a heuristic point of departure for such an approach, but mental processes are not bound to respect any typology of pragmatic reasoning, understood as a set of communicative skills.

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