Facing the complexity of language in autism (Response to commentators)

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1. INTRODUCTION. The diversity and the scope of the responses to my target article (Kissine 2021) demonstrate the great potential linguistic research has for the field of autism. These responses also reveal, albeit sometimes implicitly, that a chief challenge in researching language in autism lies in the complexity and the subtlety of the data. In organizing my own response under this angle, I hope to react in a constructive way to most of the criticisms and suggestions voiced in these commentaries. In the next section, I return to the relationship between socio-communicative skills and language trajectories in autism; in particular, I argue that it is crucial to distinguish between predictors of language delays and those of language outcomes. Next, I discuss the complexity of pragmatics in autism, warning against reductionist attempts to subsume all data on pragmatics in autism under a single processing model. In the third section, I turn to the more general issue of the variability of individual profiles on the autism spectrum and ask how it can be integrated in a meaningful way within research on language in autism. I conclude this brief response to commentators by issuing a plea to think of the diversity of linguistic theories and schools as an opportunity for better understanding language in autism.

2. JOINT ATTENTION AND LANGUAGE TRAJECTORIES. There is little doubt that socio-communicative skills—including but not limited to joint attention—increase the opportunity for linguistic experiences and enhance the child's access to language. When such skills are significantly below the typical range, as is the case for many young autistic children, language acquisition is very likely to be delayed. For instance, as pointed out by Arunachalam, Artis, and Luyster (2021) in their response, a robust association between response to joint attention and language levels in autistic children emerges from the meta-analysis by Bottema-Beutel (2016).[1] However, the close association between atypically low joint attention and the likelihood for an autistic child to be non- or minimally verbal (see e.g. the studies on minimally verbal autistic children by Wodka et al. 2013 or Yoder et al. 2015) does not entail that joint attention also predicts HOW LANGUAGE LEVELS WILL EVOLVE.

Not carefully distinguishing between predictors of language delays and those of language outcomes may lead to significant mischaracterizations of language trajectories in autism. Take, as a first example, the longitudinal study by Anderson et al. (2007), which, according to the response by Goldberg and Abbot-Smith (2021:e172), shows that 'joint attention IS predictive of autistic language development' (emphasis theirs). Anderson et al. followed three groups from the ages of two to nine years: autistic children, children with a diagnosis of PERVASIVE DEVELOPMENTAL DISORDERS NOT OTHERWISE SPECIFIED, and children with a nonspectrum developmental condition. At the study onset and independent of the diagnostic group, joint-attention scores correlated (along

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[1] Tellingly, Bottema-Beutel (2016) also reports that this association is stronger in autistic than in typically developing children. Given that expressive and receptive language levels are also significantly higher in typically developing children, a plausible interpretation, put forth by Bottema-Beutel, is that joint attention plays a pivotal role in triggering language acquisition, but is less determining for the continued development of linguistic skills.

with nonverbal IQ) with language levels. Crucially, however, there was no significant joint attention × age effect on language levels: joint attention did not account for the progression of language scores (nonverbal IQ did). Focusing on autistic children only, Anderson et al. brought out four clusters, based on the evolution of linguistic abilities over time: the first group consisted of mainly nonverbal children, children in the second group displayed limited phrase speech and some sentences, and the language scores of the children in the third and fourth groups were within or above the typical range. Crucially, the addition of joint-attention scores increased the likelihood to be included in the first, nonverbal group, but did not contribute to distinguishing between the other three. In other words, in the children followed by Anderson et al. (2007), low joint-attention skills were associated with a higher probability not to develop language, but growth of language skills in verbal autistic children was not systematically related to joint attention (pace Goldberg and Abbot-Smith).

It is worth noting that Goldberg and Abbot-Smith (2021) explicitly ground their interpretation of Anderson et al. 2007 on the following quote from the abstract: 'Nonverbal IQ and joint attention emerged as strong positive predictors of verbal outcome'. As the summary above shows, the actual data on language trajectories in autism presented in the article are more complex than this statement in the abstract suggests. Likewise, Goldberg and Abbot-Smith claim that I wrongly include Ellis Weismer & Kover 2015 among the (high-powered) longitudinal studies that do not show a systematic relationship between language and joint attention. Again, Goldberg and Abbot-Smith quote from Ellis Weismer and Kover's abstract: 'cognition, maternal education, and response to joint attention correctly classified over 80% of total cases of the highest and lowest language performers'. It is instructive to also review the findings of this article. Ellis Weismer and Kover (2015) followed a large sample of autistic children, between two and a half and five years old. At the study onset, response to joint attention significantly correlated with expressive (but not receptive) language. However, joint attention did not predict expressive or receptive language outcomes by the end of the study (Ellis Weismer & Kover 2015, tables 2 and 3). This pattern is strikingly similar to the results reported by Anderson et al. (2007): those autistic children in Ellis Weismer and Kover's sample who exhibited low joint attention around the age of two were also more likely to exhibit low language skills at the same age, but joint attention was not related to language growth by the age of five. Now, Ellis Weismer and Kover also focused on the 15% highest and lowest ends of the language-scores distribution at the study outset (fifteen and sixteen children, respectively). Joint attention, maternal education, and cognition correctly classified 92.3% of these two groups, but cognition alone correctly predicted 85.7% of these cases. Accordingly, there was much overlap in response to joint attention between the highest and lowest verbal groups, but not in cognition (Ellis Weismer & Kover 2015, figures 1A and C).

In sum, the heterogeneity of language trajectories in autism does not warrant the assumption that joint attention systematically predicts phrase and sentence speech, even though low joint-attention skills clearly increase the risk for an autistic child to exhibit a delayed speech onset. This is why the idea of an alternative path to language, less dependent on interactional skills, deserves to be seriously explored in order to better understand multiple types of linguistic trajectories in autism.

3. MULTIPLE FACETS OF PRAGMATIC PROCESSING. Let us turn now to the complexity of the data on pragmatics in autism. Different aspects of pragmatic processing are notoriously difficult to disentangle, and perhaps even more so in autism, which is still too

often associated with a coarsely defined 'pragmatic impairment'. However, it is crucial to carefully characterize the actual skills tapped by experimental studies and to avoid lapsing into an equally misleading idea that pragmatics is intact in autism.

I proposed (Kissine 2021) that pragmatic difficulties in autism arise in situations where grasping the utterance meaning requires adopting the speaker's perspective (see also Kissine 2012, 2016 and Geurts et al. 2020); this position is also endorsed in the responses by Mognon et al. (2021) and Katsos and Andrés-Roqueta (2021). Irony is the paradigmatic case when utterance interpretation heavily relies on perspective taking (e.g. Bryant 2012, Spotorno & Noveck 2014), and, as expected, understanding irony is particularly challenging for autistic individuals (Deliens et al. 2018). It is possible, of course, to increase an autistic individual's detection of irony by decreasing the need to genuinely integrate the speaker's perspective, for instance, by using forced-choice paradigms with clearly contrasted ironic and literal items (e.g. Chevallier et al. 2011, Pexman et al. 2011, Glenwright & Agbayewa 2012). I concur with Mognon et al. (2021) that in such settings the correct response may be reached without resorting to mind reading, paralleling other studies in which nonautistic participants engage in perspective taking while autistic participants rely on alternative, egocentric strategies (Ostashchenko et al. 2020, van Tiel et al. 2021). It is important to keep in mind, however, that such compensatory interpretative strategies may not always be felicitous in real-life situations, where intonational or facial cues may be misleading and failure to truly grasp other people's perspectives may result in communication breakdowns.

The idea that pragmatics in autism is characterized by difficulties in adopting other people's perspectives should not be automatically recast as an account of autism in terms of a THEORY-OF-MIND deficit. The former is an observation about communicative difficulties autistic individuals may face; the latter rests on a theoretical concept whose very definition has grown murkier over the years, and whose relationship with traditional 'theory of mind' tasks has long been questioned (e.g. Nichols & Stich 2003, Kulke et al. 2019).

Arunachalam, Artis, and Luyster (2021), Katsos and Andrés-Roqueta (2021), and Mognon et al. (2021) rightly observe in their responses that autistic individuals' performance on such tasks is highly variable (and increasingly so; see Rødgaard et al. 2019 and below). This variability brings into question the overall explanatory adequacy of theory-of-mind models and their relevance for the independently motivated distinction between allocentric and egocentric pragmatic processing. Fortunately, there is already a rich body of evidence that allows us to model pragmatics in autism without making a commitment as to how mind reading in autism should be assessed or conceptualized. As things stand today, much of the experimental data indicate that pragmatic disability in autism specifically concerns those processes that require perspective taking. For instance, interpreting irony remains challenging for highly verbal autistic individuals (Deliens et al. 2018), while metaphor comprehension is predicted by verbal ability (Norbury 2005); quantity implicatures are processed in a similar way by autistic and nonautistic participants, except in cases where it is necessary to build a model of the speaker's mental state (Hochstein et al. 2018, van Tiel & Kissine 2018, Andrés-Roqueta & Katsos 2020); and autistic children tend to disregard speakers who are blatantly mistaken, but do not use speakers' doxastic states to assess their reliability (Ostashchenko et al. 2020).

Modular accounts of pragmatics, of the kind advocated by RELEVANCE THEORY (Sperber & Wilson 2002) and defended by Mazzarella and Noveck (2021) in their response, concede that mind reading may not be required for pragmatic processing, but still posit

the existence of a pragmatic module, dedicated to the interpretation of communicative stimuli. They also hold that, independent of the type of contextual information this module feeds on, its output is necessarily a metarepresentation of communicative and informative intentions. In other words, even in the clearest cases where pragmatic processing by autistic individuals does not involve their interlocutor's perspective, the interpretation of communicative stimuli would be, appearances notwithstanding, mentalistic and metarepresentational. While there may be independent reasons for favoring modular conceptions of pragmatics (I do have my reservations; see Kissine 2016), this debate is of little heuristic consequence for experimental pragmatics in autism. Mazzarella and Noveck displace my distinction between allocentric and egocentric pragmatic processes to the level of inputs available to the pragmatic module, but in practice we clearly classify pragmatic phenomena in the same way. (There may be occasional disagreements as to whether the results of this or that pragmatic task, say, comprehending indirect requests, indicate that (autistic) participants engage in perspective taking,[2] but such disagreements are orthogonal to whether all pragmatic interpretation is by definition metarepresentational.) Furthermore, because it isolates the pragmatic module from general theory of mind, the modular conception of pragmatics has to remain silent about the extent to which language in autism depends on mind-reading skills. All that being said, a priori defining communication in metarepresentational terms is also very difficult to falsify, because it precludes the very possibility of finding evidence for an interpretation output that would not be metarepresentational.

Let me also stress that by no means do difficulties in adopting one's (neurotypical) interlocutor's perspective entail lack of willingness to interact (van Tiel & Kissine 2018, Kissine 2019). At the same time, that an autistic individual is actively taking part in a conversation should not be taken as evidence for perspective taking and joint attention, contrary to what Goldberg and Abbot-Smith (2021) seem to infer from the semi-structured conversations analyzed in Kissine et al. 2019. Detailed conversation analysis makes it clear that autistic individuals engage their conversational partners. However, they often do so in a way centered on their special interests; furthermore, inadequate use of referential devices and discourse markers, as well as low conversational coherence, may render their communicative intentions difficult to grasp (Muskett et al. 2010, de Villiers 2011; see also Geelhand et al. 2020, 2021b). For instance, Bauminger-Zviely et al. (2014) report that while autistic preschoolers engage in spontaneous conversation with their peers, their conversational behavior is consistently atypical and is characterized, inter alia, by lower responsiveness to the interlocutor and higher rates of out-of-sync content.

Finally, I fully agree with McCracken (2021) and Katsos and Andrés-Roqueta (2021) in their responses that when autistic and nonautistic individuals interact, the source of potential communication breakdowns should be ascribed not solely to atypical pragmatic functioning in autism, but also to failures by neurotypicals to adapt to their autistic interlocutors' neurocognitive specificities. This 'double empathy' perspective (Milton 2012) is very compelling and is not incompatible with the view of pragmatics in autism I defended in my target article (Kissine 2021). To give an illustration from my lab, we re-

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[2] Mazzarella and Noveck suggest that indirect speech acts require perspective taking. One good reason for believing that indirect requests can be understood from an entirely egocentric perspective is that even minimally verbal autistic children may perfectly grasp them (Kissine et al. 2012, Kissine et al. 2015); another is that even nonconventional indirect requests appear to directly trigger their directive interpretation (Ruytenbeek et al. 2017).

cently used excerpts from semi-structured interactions involving autistic and neurotypical adults and asked other autistics and neurotypicals to rate these excerpts on dimensions targeting conversational adequacy, such as response appropriateness or conversation flow (Geelhand et al. 2021a). (The raters were, of course, blind to the diagnosis of the speakers in the rated excerpts.) Interestingly, autistic speakers received significantly lower scores from both autistic and nonautistic raters, indicating that atypicalities in autistic speech are partly independent of neurotypical norms. However, in neurotypical but not autistic raters lower ratings of conversational adequacy cooccurred with an overall more negative impression of autistic speakers; this finding suggests that atypical pragmatic functioning may cause implicit negative biases against even highly verbal autistic adults (Geelhand et al. 2021a, appendix D).

4. FACING THE HETEROGENEITY OF THE AUTISM SPECTRUM. Much of the criticism of the picture of pragmatics in autism I put forth comes from pointing out that pragmatic skills are variable in autism. In the previous section, I argued that distinct patterns of performance across different types of pragmatic tasks can nevertheless be helpful to better delineate the pragmatic disabilities that constitute one of the main diagnostic criteria of autism. In this section, I would like to discuss, in more general terms, how the issue of spectrum heterogeneity relates to research on language in autism.

A vast proportion of existing studies on autism compare autistic participants with groups of nonautistic participants, and significant group effects are often cast as generalizations about autism. This practice may have to come to an end soon. Autism has always been characterized by a great heterogeneity of neurocognitive, behavioral, and linguistic profiles, but in the last years better public awareness and policies, and new diagnostic criteria, have dramatically increased both the prevalence of autism and the heterogeneity of autistic profiles (Mottron & Bzdok 2020). Growing variability has also drastically lowered the size of group differences, even in domains, such as performance on theory-of-mind tasks, where robust effects have previously been attested (Rødgaard et al. 2019).

This, however, does not mean that no more useful generalizations can be made about language in autism. Heterogeneity in autism does not necessarily reduce to random variation across individuals but likely hides the existence of subgroups, within which autism manifests and evolves in qualitatively different but internally consistent ways (Agelink van Rentergem et al. 2021). As already discussed in §2, the diversity of linguistic trajectories in autism is well attested, both in the timing of speech onset and in the subsequent growth of linguistic skills. Determining whether these trajectories correspond to different subtypes of autism would have indisputable clinical value and help diversify intervention techniques (see Arunachalam, Artis, & Luyster 2021).

A first step in the direction of external validation of linguistic subgroups would be to determine the extent to which different types of linguistic trajectories relate to skills required to acquire language. Beside standardized scores of cognitive development and autism severity, most longitudinal and prospective studies of language in autism currently center on socio-communicative constructs. Acknowledging that language outcomes are not necessarily mediated by socio-communicative skills or, more specifically, joint attention leaves room for formulating new hypotheses about noninteractional predictors of language in autism, such as statistical learning, multimodal integration, or environmental factors.

Moreover, the characterization of linguistic trajectories is currently achieved with standardized scores, sometimes from psychometric language assessment tools, and some-

times from subcomponents of parental questionnaires designed to complement an autism diagnosis or to assess the child's adaptive level. It is highly desirable to enrich such methods with finer-grained, qualitative analyses of the way language is being acquired.

Under this perspective, it makes perfect sense to investigate the hypothesis that in some autistic children a learning path more centered on language-internal structural properties than on intersubjective communication may lead to the acquisition of language from noninteractional sources (as well as to an intense interest in foreign languages or in writing systems; Vulchanova et al. 2012, Ostrolenk et al. 2017, Kissine et al. 2019).

The research strategy just outlined is at least as fecund as trying to explain away the phenomena specific to autistic language acquisition as not really being different from typical language development. Take the acquisition of Modern Standard Arabic (MSA) from passive exposure to screens by five Tunisian autistic boys we reported in Kissine et al. 2019. Of course, many (albeit probably not all) of the videos repeatedly watched by these autistic children feature characters who interact between them. Goldberg and Abbot-Smith (2021:e174) assert that the autistic children in our study 'needed to understand the cartoon character's attention and infer its intentions as it produced MSA'. Although this interpretation of our data is purely hypothetical, it cannot be ruled out a priori; note, however, that it also entails that all autistic children who become verbal should demonstrate the ability to infer other people's intentions and attentional focus at least from a third-person perspective. This empirical prediction strikes me as exceedingly strong, and it would force a drastic reinterpretation of the abundant evidence for an atypical processing of social cues in autism.[3]

Goldberg and Abbot-Smith (2021), Katsos and Andrés-Roqueta (2021), and Mognon et al. (2021) also propose that the autistic children documented in Kissine et al. 2019 have necessarily acquired MSA as a second language. There is nothing in our data that allows this conclusion, and there is no principled reason to believe that in all cases where autistic children use a language different from the one used around them, the acquisition of the former language is subsequent to that of the latter. At least, this is not what we observe in the ongoing case studies of autistic children who use English in an entirely French-speaking environment, briefly evoked in the target article. In any event, that noninteractive language learning in autism is not restricted to L2 is a valid scientific hypothesis that deserves to be empirically tested, rather than being rejected a priori.

5. By way of a conclusion: going beyond theoretical divides. The foregoing discussion makes it clear, I hope, that suspending the constructionist assumption that joint attention is a prerequisite to language development widens perspectives on how language may be acquired in autism. I agree with McCracken and with Katsos and Andrés-Roqueta that some autistic individuals may learn (their first) language in ways considerably different from what has been observed in typically developing children— although there should still be a significant overlap in the neurocognitive mechanisms involved. This neurodiversity perspective on linguistic trajectories should compel us not to exclude research hypotheses because they are incompatible with a tenet of our favorite framework. Decades of research on statistical learning have shown that important structural properties of the linguistic input may be (implicitly) learned from passive exposure

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[3] For instance, we recently found that, independent of their language profile, young autistic children do not distinguish between incidental and intentional pointing and pay overall low attention to pointing gestures (Maes et al. 2021).

to the regularities in the linguistic input (see e.g. Siegelman 2020 and Arunachalam, Artis, & Luyster 2021). The extent to which such mechanisms underlie language acquisition in autism is an exciting research question. In investigating the diversity of pathways to language, it also makes perfect sense to explore the nativist hypothesis that a language-specific predisposition narrows down the space of possible language structures—and thus complements other domain-general cognitive mechanisms. To be sure, it may turn out that domain-general processing suffices to account for every case where an autistic child becomes verbal, including those in which the role of intersubjective communication and joint attention does not appear to be central. But given how little we still know about language in autism, I see no justification for dismissing nativist frameworks from the outset.

Keeping an open mind is all the more important as the connection between linguistics and the field of autism is by no means limited to hypothetical theorizing. Mazzarella and Noveck's (2021) crisp genealogy of the relationship between Gricean pragmatics and theory-of-mind models of autism is a timely reminder that theoretical positions in linguistics not only have significant and lasting consequences for conceptual models of autism, but also contribute to diagnostic criteria and intervention programs.

Constructionist models played, without doubt, a determining role in bringing to light the cascading effects early-onset atypicalities in social orientation are likely to have on language in autism. These models of language also influenced many intervention programs that seek to improve language outcomes in young autistic children by enhancing socio-communicative skills. Interestingly, a burning issue in current autism research is the extent to which the effects of such intervention techniques generalize across the spectrum and beyond proximal effects (Rogers et al. 2019, Sandbank et al. 2020a,b).

Linguistics is an extraordinarily fertile field, and there is no doubt that linguists' growing interest in autism can yield original and fine-grained insights. In turn, studying language in autism will likely bring to light previously underinvestigated phenomena; however unusual such data may appear at the first glance, I am confident that they will be thought of as opportunities to develop new models, and not as threats to be explained away.

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