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A constellation of continua: Reconceptualising bilingualism, autism and language research

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The scoping review of bilingual language development in autism by Prévost and Tuller (2022, henceforth P&T) is a welcome contribution to the young field of bilingualism in developmental conditions. Informed by a critical review of the state-of-the-art, they set out a necessary research agenda: (a) embracing heterogeneity of both bilingualism and autism in participant sampling; (b) comparing autistic bilingual (Bi-ASD) groups systematically with typically developing bilingual (Bi-TD) groups - with or without late language emergence and with or without language impairment; (c) creating domain-specific and autism-friendly linguistic tasks; (d) increasing collaborations between labs and with practitioners. In this commentary we discuss the operationalisation of heterogeneity in autistic bilinguals and how to make research more inclusive.

Heterogeneity of bilingualism and autism

The use of discrete comparison groups presupposes *representativity* of these groups. This is particularly challenging when both groups of interest (here: bilingual children and children with autism) are highly heterogeneous, as noted by P&T. How bilingual should the bilinguals be? Which aspects of bilingualism are most relevant to ensure group comparability? There is as yet no consensus on these points (Marian & Hayakawa, 2020; Kremin & Byers-Heinlein, 2021; Kašćelan et al., 2021). Similarly, while language used around autism often suggests diversity across a single, linear spectrum (e.g., low- vs. high-functioning or less vs. more autistic), lived experiences seem to be more adequately captured by a constellation of features (Fletcher-Watson & Happé, 2019, pp. 39-41).

P&T identify four broad aspects to include in the comparisons: ASD, cognition, language impairment and bilingualism. Each is in fact a latent construct defined by several dimensions. We believe they should be conceptualised as a constellation of features:

(i) ASD-specific features, which can be identified by unpacking diagnostic approaches such as DSM-5 (American Psychiatric Association, 2013): social communication/interaction skills, degrees of restricted interests, intensity/frequency of repetitive behaviours.

(ii) Cognitive features commonly documented in autistic population: general IQ, Theory of Mind, executive functions.

(iii) Language abilities (i.e., strengths and difficulties) in one or several areas of competence: phonology, vocabulary, morphosyntax, various aspects of pragmatics.

(iv) Bilingualism features: including language experience (operationalised as language exposure and use, taking quantity and quality into account) as well as language proficiency.

(v) In addition to the aspects above, other features characteristic of comorbid conditions might need to be included, such as attention/hyperactivity deficits, anxiety, etc.

Most importantly, we believe, each of these features should be operationalised as a *continuum*, so that the significant thresholds of strengths and difficulties can be identified empirically (depending on the outcome variable under investigation). Indeed, as noted in P&T's review, studies on autism show variable language and cognitive profiles which are not adequately captured through a categorical lens. Implementing the constellation of continua approach would enable incorporation of autistic individuals with a variety of difficulties *and* strengths, and go beyond the overdue inclusion of nonverbal/minimally verbal individuals in research studies. This approach is somewhat in the spirit of the Research Domain Criteria (RDoC) Initiative (Sanislow, 2020) and it follows recent calls for transdiagnostic rather than core-deficit approaches (e.g., Astle & Fletcher-Watson, 2020). The RDoC framework is a research strategy implemented as a matrix of domains, with a set of constructs within each domain that can be studied along a continuum of functionality. In work on autism, RDoC has not yet been widely adopted, but it offers an opportunity to address some of the issues associated with the categorical approach (Mandy, 2018; Ibrahim & Sukhodolsky, 2018). Along these lines, we believe that the constellation of continua approach will help capture the heterogeneity of the autistic bilingual population. Additionally, where pre-assigned categorical diagnosis is not at the basis of participant recruitment/characterisation, research will likely mitigate cultural differences in the autism diagnosis and potential bias in the diagnosis of bilinguals (for a short discussion on a likely diagnostic bias in bilinguals see Kašćelan et al., 2019). This approach will also reduce a common methodological risk of super-controls, where neurotypicals tend to be recruited from homogeneous contexts, while the net needs to be cast wide to recruit an equal number of autistic participants. By recruiting participants from different points across a constellation of continua, research in bilingualism and autism offers an opportunity to improve common methodological difficulties concerning representation.

Open science and inclusivity

The *constellation of continua* approach advocated above might come across as unrealistic. Autistic bilinguals are indeed notoriously difficult to recruit, and studies are often unintentionally underpowered as a result. In response to this, P&T rightly call for collaborations between labs and with practitioners. We believe the approach needs to be not only collaborative, but also driven by open science principles. There needs to be a common set of research questions, hypotheses and methodologies, defined through cross-lab, cross-sector collaborations. The materials should be open source so they can be adapted (e.g., in terms of task demands and communicative style) to enable a wider range of autistic individuals to perform at their best. That way, research would be able to be more inclusive and more representative of the diversity of experiences, as called for in the bilingualism and the autism literatures. Importantly, we find that bringing the autistic community to the table is vital to identify the research topics that should be prioritised, as well as to improve on practices which have been constructed strictly from the neurotypical perspective.

Analytical methods too could be made more inclusive. We fully agree with P&T on the need for focused testing of structural aspects of language, as well as for the use of autism-friendly tools. As they rightfully highlight, global measures of language (i.e., one score for language as a construct) are insufficient to identify areas of difficulties (or strengths). In fact, even domain-specific tasks (e.g., focusing on pragmatics or on structural language specifically) stand a risk of masking the nature of language skills in autism. A common example in autism literature is a tendency of autistic individuals

to interpret figurative language literally, implying deficiencies in pragmatics. However, what we perceive as "incorrect" interpretations of figurative language by autistic individuals might contain completely unrelated meanings or even be original interpretations rather than strictly the literal ones. In addition to creating autism-friendly and more domain specific tasks, two further instances of good practice could help elucidate our misconceptions.

First, using a mixed method approach could benefit data interpretation in a nuanced way. Rather than only quantifying what is pre-designated as a correct answer, qualitative analysis could enrich our understanding of language in autism (for an example of an inclusive and a qualitative approach see Howard et al., 2019). However, this approach is potentially restricted only to verbal individuals. Second, within each domain (e.g., pragmatics, syntax, phonology), gradients of complexities and types of language are necessary to discriminate across linguistic tasks. For instance, drawing conclusions about pragmatic language skills based on a scalar implicature task is likely to cause oversimplifications as it will not tap into areas of pragmatics of different complexities and nature. This applies to research beyond autism, as bilingualism as well as child language development research in general faces similar limitations. Again, turning to the addition of qualitative research (ideally with perspectives from within the autistic community) could help build such tasks. While a lot of early work on autism, including that on autistic bilinguals, started as case studies, this approach was soon dropped in favour of more quantitative-only studies for presumably better generalisability. Most reviews to date have excluded case studies. However, as illustrated in the introduction of P&T's review, it is exactly these anecdotal reports that pointed to diverse bilingual language development in autism. Using a case study approach as a complementary one to quantitative research could improve our understanding of language in autism, as well as contribute to the inclusion and detailed examination of heterogeneous autistic profiles.

P&T's scoping review paves the way for a new programme of research on autism and bilingualism, which will allow significant advances in knowledge and benefit the communities in question. We hope that our commentary contributes to that endeavour.

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