The Journal of Child Psychology and Psychiatry

Journal of Child Psychology and Psychiatry **:* (2023), pp **–** doi:10.1111/jcpp.13810

The importance and challenges of improving early identification of language abilities: a commentary on Gasparini et al. (2023)

Nicola Botting, and Helen Spicer-Cain
Language and Communication Science, City University of London, London, UK

The ability to identify which children will have a persistent language difficulty is an important issue. At present, in the UK, diagnosis of Developmental Language Disorder (DLD) is often not recommended until children are at least 4 years of age (Royal College of Speech and Language Therapists, 2020) and referrals are often later (Broomfield & Dodd, 2011) because of the wide variability in language development, and the challenges around identifying persisting difficulties versus more transient ones. Despite this, around half of all parents report noticing language problems in children with DLD before 24 months (Rannard, Lyons, & Glenn, 2004). Thus, studies that advance our ability to predict outcomes from preschool information are crucial for improving assessment, diagnosis and ultimately support for those with language difficulties (Gascoigne & Gross, 2017).

Gasparini et al.'s excellent study (Gasparini et al., 2023) explores the early factors that best predict later language outcome using a large cohort dataset (Early Language in Victoria Study; ELVS); and applies innovative machine learning techniques to help tackle some of the issues surrounding this area. They found that it was possible to identify a short set of parent report items taken at 24 and 36 months, which accurately predict 11-year language skills at an accepb level (sensitivity/specificity both >.70). The development of quick, reliable and predictive parent report scales for use at an early age represents a very important step in understanding language development and for identifying and supporting individuals with language disorder. Language difficulties affect around 10% of all children and are lifelong (Norbury et al., 2016) with associated impacts evident across friendships (Durkin & Conti-Ramsden, 2010), emotional health (Botting, Durkin, Toseeb, Pickles, & Conti-Ramsden, 2016), independence (Dubois, St-Pierre, Desmarais, & Guay, 2020), and education and employment (Conti-Ramsden, Durkin, Toseeb, Botting, & Pickles, 2018). Consequently, the findings from Gaspirini et al. are very promising to see. This commentary serves to highlight the advantages and importance of this work in the context of more general difficulties with tracking language development and difficulties over time and to raise issues within the field that need addressing in future research.

The use of machine learning and large cohort datasets

One strength of Gaspirini and colleagues' approach lies in the use of a large, relatively unbiased dataset to examine change over time. The ELVS dataset provides large amounts of data over numerous time points. Furthermore, the data is taken from a wide section of society that reflects the general population very well, including families from different SES and ethnic backgrounds. As the authors acknowledge, in previous work there have been many challenges to predicting language difficulties, not least the use of limited and selective samples (e.g., recruited from clinical populations). The ELVS dataset is also particularly comprehensive in that it includes direct measurement using robust language measures. This gives the work of Gasparini et al. an edge on studies that have used datasets where the language measures are briefer and more inconsistent (e.g., Schoon, Parsons, Rush, & Law, 2010). Nevertheless, cohort data necessarily has missing information, and in this study details around whether those children identified as having poor language outcomes at 11 had been referred or diagnosed as having a Language Disorder are not available. This added information would be particularly useful in order to unpick the possible effects of measurement error at age 11 years, and the functional value of early screening.

It is of interest that this machine-learning approach has resulted in items that may not have been those selected by hand from the literature or through clinical practice; and that the authors needed to tweak the final sets to make the final item sets more functional in real world settings. Thus, although machine learning is an important step forward, it may also create an apparent tension between items resulting from statistical prediction and clinical perception, with some items selected that might seem surprising for a parent or clinician diagnosing language impairment. For example, a

Conflict of interest statement: No conflicts declared.

question about whether the respondent was a biological parent (that had high predictive value) was dropped as it was deemed potentially insensitive by the authors; whilst another about perceived coping (which parents may find equally difficult or unexpected in the context of their child's language) remained in the final set. Accordingly, before these item sets can reach their potential as early identification tools, there is probably some translational work to be done in order to ensure uptake from practitioners. We know that when practitioners are not clear on why or how tests or interventions are developed, these are sometimes swapped out for more intuitive (but often untested) adaptations (Cycyk, De Anda, Moore, & Huerta, 2021).

It would also be interesting to explore further the nature of the items chosen, and what concepts they represent. For example, the item "child says 'spoon'" is included in the final predictor set at 24 months. It is presumably not the word spoon in and of itself that is important here, so it would be valuable to know what makes this item statistically more powerful than others: Perhaps for example this is a highly consistent item across a wide range of households and therefore serves well to proxy for functional vocabulary? Notably, similar predictive power was achieved by Rudolph and Leonard (2016) using 3 more obviously relevant questions (age at combining words; family history; maternal education). Gaspirini and colleagues plan to replicate these scales with other datasets to help consolidate some of these item selections, but it would also be beneficial to include the novel scales in new prospective studies to assess whether these item sets are able to accurately determine later difficulties in new participants. This type of approach is taken in other computationally-based studies, for example where models are then retested against behavioural data (e.g. Best et al., 2015; Purser, Thomas, Snoxall, & Mareschal, 2009).

Changing classifications and co-occurring problems

Outside of the main paper aims, an interesting side note reported by Gasprini et al. is that the number of children shifting between classifications using regular assessments is high. Does this say something about our classification, about the consistency of measures, or about development itself? Probably all three are important in truly understanding pathways to successful language development. There is an urgent need to develop better language assessments (beyond vocabulary) which are valid, reliable and relevant across a wide age range and for diverse groups. This is particularly relevant for identifying low language since even rigorously normed tests have been tested on relatively few children at the lower end of the distribution (for example, only 20 children below $-2SD$ for a test using a normative sample of $n = 1{,}000$). This means that our understanding of test validity and reliability is more limited for the very children about whom we are most concerned. Gasparani and colleagues emphasise that even using this machine learning approach, very early report measures (8 and 12 month) are not yet able to predict 11-year outcomes. They comment that this might be due to the parental questionnaire format used, and the resulting variability in responses. There are currently no reliable tests of communication that would enable more objective testing in infancy, but there are promising new enquiries into the usefulness of brief, home-administered dynamic assessments at this age (Spicer-Cain, Camilleri, Hasson, & Botting, 2023). Future studies in which co-occurring issues are built into the analyses would also help to determine whether predictors are more or less sensitive when considering children with signs of other developmental challenges such as Attention Deficit Hyperactivity Disorder (ADHD), Autism or Dyslexia, all of which are known to overlap with Language Disorder (e.g. Lindgren, Folstein, Tomblin, & Tager-Flusberg, 2009; Price et al., 2022; Redmond, 2020).

Future research

Gaspirini and colleagues have created some important new tools to build upon. It would be helpful for machine-learning approaches such as these to be co-developed between parents, clinicians and researchers to ensure that resulting item sets are feasible clinical tools. Although it was not possible from the data used by Gasparini et al., there is a need for predictions of language ability and functional communication beyond childhood and into adolescence and adulthood. This obviously requires securely funded longitudinal projects that are able to directly assess children very early in life, as well as at later ages. Datasets such as that from the ELVS cohort offer an ideal opportunity to extend our understanding in this way, but it is essential that longitudinal studies receive continued funding to include long term in-depth direct measurement for this to be possible.

Correspondence

Nicola Botting, Language and Communication Science, School of Health and Psychological Sciences, City University of London, Northampton Square, London EC1V0HB, UK; Email: nicola.botting.1@city.ac.uk

References

Best, W., Fedor, A., Hughes, L., Kapikian, A., Masterson, J., Roncoli, S., … & Thomas, M. (2015). Intervening to alleviate word-finding difficulties in children: Case series data and a computational modelling foundation. *Cognitive Neuropsychology*, *32*, 133–168.

Botting, N., Durkin, K., Toseeb, U., Pickles, A., & Conti-Ramsden, G. (2016). Emotional health, support, and self-efficacy in young adults with a history of language impairment. *British Journal of Developmental Psychology*, *34*, 538–554.

Broomfield, J., & Dodd, B. (2011). Children with speech and language disability: Caseload characteristics. *International Journal of Language and Communication Disorders*, *39*, 303–324.

Conti-Ramsden, G., Durkin, K., Toseeb, U., Botting, N., & Pickles, A. (2018). Education and employment outcomes of young adults with a history of developmental language disorder. *International Journal of Language and Communication Disorders*, *53*, 237–255.

Cycyk, L.M., De Anda, S., Moore, H., & Huerta, L. (2021). Cultural and linguistic adaptations of early language interventions: Recommendations for advancing research and practice. *American Journal of Speech-Language Pathology*, *30*, 1224–1246.

Dubois, P., St-Pierre, M.C., Desmarais, C., & Guay, F. (2020). Young adults with developmental language disorder: A systematic review of education, employment, and independent living outcomes. *Journal of Speech, Language, and Hearing Research*, *63*, 3786–3800.

Durkin, K., & Conti-Ramsden, G. (2010). Young people with specific language impairment: A review of social and emotional functioning in adolescence. *Child Language Teaching and Therapy*, *26*, 105–121.

Gascoigne, M., & Gross, J. (2017). Talking About a Generation: Current policy, evidence and practice for speech, language and communication. The Communication Trust. Available from: http://www.thecommunicationtrust.org.uk/resources/resources/resources-for-practitioners/talking-about-ageneration/ [last accessed 18 January 2023].

Gasparini, L., Shepherd, D.A., Bavin, E.L., Eadie, P., Reilly, S., Morgan, A.T., & Wake, M. (2023). Using machine-learning methods to identify early-life predictors of 11-year language outcome. *Journal of Child Psychology and Psychiatry*. https://doi.org/10.1111/jcpp.13733

Lindgren, K., Folstein, S., Tomblin, B., & Tager-Flusberg, H. (2009). Language and reading abilities of children with autism spectrum disorders and specific language impairment and their first-degree relatives. *Autism Research*, *2*, 22–38.

Norbury, C., Gooch, D., Wray, C., Baird, G., Charman, T., Simonoff, E., … & Pickles, A. (2016). The impact of nonverbal ability on prevalence and clinical presentation of language disorder: Evidence from a population study. *Journal of Child Psychology and Psychiatry*, *57*, 1247–1257.

Price, K., Wigg, K., Misener, V., Clarke, A., Yeung, N., Blokland, K., … & Barr, C. (2022). Language difficulties in school-age children with developmental dyslexia. *Journal of Learning Disabilities*, *55*, 200–212.

Purser, H., Thomas, M., Snoxall, S., & Mareschal, D. (2009). The development of similarity: Testing the prediction of a computational model of metaphor comprehension. *Language and Cognitive Processes*, *24*, 1406–1430.

Rannard, A., Lyons, C., & Glenn, S. (2004). Children with specific language impairment: Parental accounts of the early years. *Journal of Child Health Care*, *8*, 165–176.

Redmond, S. (2020). Clinical intersections among idiopathic language disorder, social (pragmatic) communication disorder and attention-deficit/hyperactivity disorder. *Journal of Speech, Language and Hearing Research*, *63*, 3263–3276.

Royal College of Speech and Language Therapists. (2020). RCSLT briefing paper on language disorder with a specific focus on Developmental Language Disorder. Available from: https://www.rcslt.org/wp-content/uploads/media/docs/Covid/language-disorder-briefing-paper-with-edit.pdf?la=en&hash=98B6A1E60824DEE9D52CCDFFACCE5EE6D67749D9 [last accessed 19 January 2023].

Rudolph, J., & Leonard, L. (2016). Early language milestones and specific language impairment. *Journal of Early Intervention*, *38*, 41–58.

Schoon, I., Parsons, S., Rush, R., & Law, J. (2010). Children's language ability and psychosocial development: A 29-year follow-up study. *Pediatrics*, *126*, e73–e80.

Spicer-Cain, H., Camilleri, B., Hasson, N., & Botting, N. (2023). Early identification of children at risk of communication disorders: Introducing a novel battery of dynamic assessments for infants. *American Journal of Speech-Language Pathology*, *32*, 523–544.

Accepted for publication: 11 April 2023