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Editorial: Variability in language predictions: assessing the influence of speaker, text and experimental method

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Editorial on the Research Topic
Variability in language predictions: assessing the influence of speaker, text and experimental method

A central question in cognitive science is which mechanisms enable humans to filter relevant input from the environment, process it and then respond quickly and accurately. One important mechanism for information processing is prediction (or related concepts such as anticipation and expectation), which enables speculative information processing in advance of perception (cf. Friston, 2005, 2010; Clark, 2013). In language processing, the benefits of prediction typically appear as faster and more precise behavioral responses or altered neural responses (cf. Federmeier, 2007; Huettig, 2015; Tavano and Scharinger, 2015 for overviews).

However, the exact status and form of prediction in language processing remains controversial (e.g., Pickering and Garrod, 2013; Dell and Chang, 2014; Huettig, 2015; Bornkessel-Schlesewsky and Schlesewsky, 2019). For example, there is converging evidence that comprehenders predict lexical-conceptual units in sentences and beyond (e.g., Kutas and Hillyard, 1984; Altmann and Kamide, 1999; Metusalem et al., 2012; Hosemann et al., 2013). Form-based/sub-lexical information types (phonetic/phonological, orthographic, morphological), meanwhile, show varying effects depending on the specifics of the experimental protocol, e.g., the experimental method, participant sample or text characteristics (e.g., Balota et al., 1985; DeLong et al., 2005; Mishra et al., 2012; Freunberger and Roehm, 2016; Ito et al., 2016; Nieuwland, 2019).

We propose that the nature and strength of prediction in language are shaped by the same variables that influence language processing in general. This Research Topic presents a collection of articles that focus on the extent to which linguistic predictions depend on three main sources of variability in language processing: individual differences, variation in text type and modality, and differences in methodological approaches.

The first group of articles address the relationship between individual differences and prediction.

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Hestvik et al. examine differences between children with typical development and children with Developmental Language Disorder (DLD) in a classical filler-gap ERP paradigm. They find that children with DLD do not show an early anterior negativity that that children with typical development do, indicating reduced prediction in DLD.

In their opinion article, Scholten et al. propose that differences in communicative behavior in individuals with autism spectrum disorder (ASD) may be explained by a reduced ability to predict upcoming information of all sorts. They review empirical findings showing that autistic individuals are "less surprised when their predictions are being violated" compared with controls.

Together, Hestvik et al. and Scholten et al. present evidence that inter-individual differences influence prediction strength, with weaker predictions in the two disorders investigated than assumed for the general population.

Theimann et al. investigate prediction strength and intra-individual differences in a sample of typically developing bilingual toddlers. Using the visual-world paradigm, they report that toddlers predict nouns faster following constraining verbs in their dominant language. This finding suggests that the effect of language dominance on prediction converges with the effects from other aspects of language experience in a typically developing participant sample (e.g., Mani and Huettig, 2014).

A second group of articles emphasize text-based and modality-based influences on predictions. Using corpus-based analyses, Egetenmeyer investigates tense-aspect-mood (TAM) forms in German and French football language. His analyses reveal that TAM forms in spoken football reports shift temporal reference across both languages compared with other genres. Moreover, listeners can use script knowledge to predict this shift, supporting experimental evidence for script knowledge as a basis for predictions (Metusalem et al., 2012).

Henrich and Scharinger tested whether metered speech influences the prediction of phonological stress. Using pseudowords in an omission mismatch negativity (oMMN) paradigm, they omitted a syllable of a trochee or iamb. Their results showed that omissions in the first syllable elicited larger and earlier oMMNs for trochees, i.e., the preferred foot in German, while omissions in the second syllable elicited larger oMMNs for iambs without a latency effect. Thus, predictive processing seems to play a particular role in metered speech, especially for the preferred foot type (cf. Wiese and Speyer, 2015).

Danner et al. and Krause and Kawamoto are both concerned with how movement is affected by prediction at turn transitions in dyadic communication. Danner et al. examined co-speech gestures in conversation and nursery rhymes using electromagnetic articulography. They found that brow and head movements are denser as speakers approach overlapping turn exchanges (as opposed to non-overlapping ones), with greater movement density on non-rhyme related speech content. Moreover, listeners generally produced more co-speech movement than speakers. Although the role of co-speech gesture in facilitating turn-end prediction is unclear, speakers' and listeners' co-speech movements pattern jointly in conversational interaction.

Krause and Kawamoto examined anticipatory postures for speech in the lip area before a turn transition using video motion tracking. The authors detected preparatory lip shapes indicating labiality (e.g., labial consonants and rounded vowels) before the acoustic onset of speech and considerably earlier than in less ecologically valid tasks. The authors propose that speakers can initiate articulation from ongoing prediction of the next speech opportunity and that planning and articulation can flexibly overlap in conversational contexts.

Finally, McConnell and Blumenthal-Dramé and Bornkessel-Schlesewsky et al. show that individual differences in language experience and the dynamics of variability in other language users (i.e., capacity and biology) can have profound impacts on language processing strategy, including the use of prediction.

McConnell and Blumenthal-Dramé examine the impact of language experience on processing of bigrams in a self-paced reading task in English, focusing on forward and backward transition probabilities estimated from a large corpus. They find that age and language experience influence the impact of transition probability on reading times, thus suggesting that prediction strategies vary strongly based on individual experience.

Bornkessel-Schlesewsky et al. used both electrophysiological and behavioral measures to study individual differences in listener adaption to speaker idiosyncrasies, thus capturing the impact of variability at two levels. They find that individuals with a steep aperiodic slope and low individual alpha frequency adapt most quickly to speaker idiosyncrasies as shown by changing N400 attunement over the course of the experiment.

Overall, the present collection of articles present further evidence for the importance of prediction and for the need to further investigate its interaction with varying experimental approaches.

Author contributions

FK wrote the first draft of the manuscript. PA, MG, and IB added and edited sections. All authors contributed to the Research Topic as Topic Editors, manuscript revision, read, and approved the submitted version.

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Conflict of interest

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