

REVIEW

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IRINA A. SEKERINA, EVA M. FERNÁNDEZ & HARALD CLAHSEN (eds),
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Every year I teach an undergraduate class on the development of children's language processing skills. When I first started teaching it in 2004 there were very few papers that I could set as readings. Each year more papers are published and my students have a tough time synthesizing all of the findings into the short essay that examines that part of the course. Now we have a steady accumulation of research findings that contribute to a chronically under-researched area. The current volume serves to integrate these new developments and, with a twist, offers key methodological and critical insights into various on-line methods.

But why is studying children's language processing important? Language processing studies have typically been the domain of adult psycholinguistics, where explicit models predict how sentences are parsed and produced IN REAL TIME. That is, the field takes a CHRONOMETRIC approach to the study of language. On the other hand, researchers in the field of child language acquisition have typically been interested in explaining the developmental change of KNOWLEDGE STATES using larger units of time, typically months and years. Thus the two subfields of psycholinguistics have had different explanatory goals. However, as Fodor (1998) noted, children must parse their input in order to learn from it, and therefore the parser is implicated in development. At the same time, changes in knowledge states will affect the parsing process. Therefore research integrating the two fields is important.

It is in this sense that the current book is timely. Although it is rather short, it provides detailed practical information on a number of on-line methods, including behavioural reaction time methods, event-related potentials (ERPs) and eye-tracking in its various guises. The chapters all report data from experiments conducted by the respective authors, enabling the reader to ground the factual HOW TO information in experimental contexts. The main chapters are sandwiched by an introduction and discussion that provide important theoretical and historical perspectives.

Harald Clahsen provides the first content chapter on on-line behavioural methods for studying syntactic and morphological processing. The chapter provides a good bridge between earlier attempts at studying on-line processing (e.g. Tyler & Marslen-Wilson, 1981) and the current batch of studies. While Clahsen briefly reviews a range of behavioural techniques, he

concentrates on three that he and his collaborators have used in their research: self-paced listening, cross-modal priming and speeded production. Clahsen provides an overview of each technique, an illustration and associated methodological issues. While instructive, some of these methodological recommendations are not uncontroversial. For instance, in several places Clahsen reports that children perform differently on the tasks depending on their working memory abilities. However, it is not clear whether the results are artifacts of the complex experimental stimuli used in the studies. For instance, in two studies Clahsen and colleagues tested children's comprehension of the following sentences:

- (1) The doctor recognised the nurse of the pupils who were feeling very tired.
- (2) The alligator knows that the leopard with green eyes is patting himself/him on the head with a pillow.

Given the length and complexity of these test sentences it is unsurprising that working memory plays a role in children's ability to parse them. The key question, of course, is whether the same mechanisms are used when children are processing more typical language in naturalistic contexts. Given that sentences like (1) and (2) are likely to be rare in naturalistic speech, and that naturalistic speech is supported by context, it is unclear whether these correlated working memory differences are true reflections of the children's language processing ability, or whether they are simply reflections of children's differential ability to complete complex tasks. More research is needed before we accept working memory as a bona fide individual differences variable in language processing (see also MacDonald & Christiansen, 2002).

In Chapter 2 Männel and Frederici discuss the use of event-related potentials (ERPs) as a method for studying children's on-line comprehension of language. ERPs are useful because they provide a relatively non-invasive method of measuring immediate neurological responses to linguistic stimuli. Since no overt behavioural response is required, the technique can even be used with newborns. After discussing the technicalities of the technique, Männel and Frederici discuss a series of experiments conducted in Frederici's lab that have used ERPs to study language development from 0;2 to 3;0. The experiments illustrate the remarkable developmental change that occurs during this time, from children identifying word and intonational boundaries to acquiring lexical-semantic and phrase structure information. A major benefit of the technique is that it has a well-studied set of electrophysiological signatures that have been mapped onto linguistic processing in adults. Therefore the developmental data can be readily compared to the end state. Männel and Frederici also report data from children who are at risk of language impairment, showing that their language processing skills

are different from the typically developing children in their sample. Future work using this paradigm could help to elucidate whether children with language impairments are simply developmentally delayed, or whether they possess processing strategies that are qualitatively different from typically developing peers (Dick, Wulfeck, Krupa-Kwiatkowski & Bates, 2004).

In Chapter 3, John Trueswell discusses the use of eye-movement data to investigate the development of children's parsing systems. The technique is relatively new to psycholinguistics in comparison to other behavioural techniques, yet is particularly exciting for child language researchers because there is now a range of systems that enable very young children to be tested. The chapter begins with a general overview of the technique and of the systems that are child-friendly. Trueswell then describes data analysis, followed by a series of linking assumptions that need to hold true for visual world eye-tracking to be a reliable measure of children's language processing systems.

The discussion of the linking assumptions is important reading for anyone who uses the technique. The assumptions are that (i) eye position is indicative of the child's current attentional state, (ii) visual attention can be used as an indication of children's referential choices (i.e. looks to referents in space) and (iii) children's referential choices can be inferred as the outcome of the parsing process. Trueswell defends these assumptions by reviewing a wealth of research that, although it may be unfamiliar to child language researchers, is nonetheless of paramount importance to the validity of the technique. The take-home message is that researchers who use the technique must be aware of developmental changes not only in linguistic development, but also in attentional processes.

In Chapter 4, Fernald, Zangl, Portillo and Marchman discuss the 'looking-while-listening' procedure for studying infants' on-line language comprehension. The technique is based on the Intermodal Preferential Looking paradigm (Golinkoff, Hirsh-Pasek, Cauley & Gordon, 1987), but rather than simply reporting and analyzing children's aggregated looking time as a proportion of the total test trial, Fernald and colleagues report temporally fine-grained analyses of children's looks to a target and distracter picture over the whole duration of the test trials. The result looks very much like the eye-movement data reported by Trueswell, but is gathered without expensive equipment and is appropriate for children as young as 1;2. As such, the technique enables researchers to investigate the development of on-line processing even before children have productive vocabulary; consequently it enables the elucidation of the rapid manner in which infants incorporate incoming language into their parse of a sentence. In this detailed chapter, Fernald *et al.* provide very clear instructions on how to appropriately use the technique and provide snapshots of their empirical data, which have shown children under 3;0 to be remarkably

efficient language processors. The authors are meticulous in the coding and treatment of their data, making this chapter essential reading for anyone interested in using the technique.

In Chapter 5, Snedeker and Thothathiri describe three syntactic priming experiments that used a variant of the eye-tracking technique – the ‘poor man’s eye-tracker’. The technique has many benefits. Firstly, it requires minimal financial outlay, since the main equipment needed is a digital video camera. Secondly, the technique itself is very child-friendly; unlike standard eye-tracking equipment it tolerates a good amount of head movement and does not require calibration, which some children find tedious. The downside is that it requires, like Fernald and colleagues’ looking-while-listening technique, rather lengthy frame-by-frame coding.

The experiments Snedeker and Thothathiri describe aimed to investigate a central issue in child language research: abstract versus lexically specific linguistic knowledge in young children. They make a persuasive case for the use of the syntactic priming technique to investigate this process, and present some fairly convincing data to suggest that young three-year-old children have abstract linguistic knowledge. They take this as evidence against the usage-based approach to acquisition (e.g. Tomasello, 2003). What is unclear, however, is the exact nature of the initial state and the developmental process itself. The authors make some interesting and thought-provoking suggestions that address these issues. The poor man’s eye-tracker appears to be a cost-effective and sensitive technique that will therefore not only add to our knowledge about the development of children’s parsing systems, but will potentially add evidence to long-standing debates in the field.

In Chapter 6, Helen Smith Cairns provides a commentary on the themes raised in the book and in the workshop that led to the publication of this volume. The commentary is thoughtful and insightful, taking a historical perspective on child language research. Cairns traces the field back to its inception in the middle part of the last century, reminding the reader how far we have come in understanding child language acquisition. Importantly, Cairns reviews the research with respect to parallel developments that have occurred in adult psycholinguistics, identifying links between the two fields.

Overall, this volume is a very welcome addition to the literature. The main aim of the book is to provide practical instruction on a number of techniques, and it succeeds in doing so. As such, the book will appeal to current researchers and students beginning to conduct on-line studies investigating children’s language. More research elucidating children’s language processing systems is sorely needed. The organizers of the *Workshop on On-Line Methods in Children’s Language Processing* (Eva Fernández and Irina Sekerina, along with their co-editor, Harald Clahsen) are to be commended for their commitment to this line of research.

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Hopefully the volume will have the desired effect, and inspire more researchers to focus their efforts on this under-researched area.

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