Similarity, analogy and development in radical exemplar theory: A commentary on Ambridge (2020)

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Abstract
During language acquisition children generalise at multiple layers of granularity. Ambridge argues that abstraction-based accounts suffer from lumping (over-general abstractions) or splitting (over-precise abstractions). Ambridge argues that the only way to overcome this conundrum is in a purely exemplar/analogy-based system in which generalisations are based on similarity to individual exemplars. However, to move our understanding forward, radical exemplar theory must include clearly specified mechanisms for analogy and similarity computation, and must account for changes in children’s generalisations across development.

Keywords
Analogy, competition, computational models, development, exemplar models, generalisation, mechanism

A central issue in psycholinguistic research is how we can comprehend and produce words and utterances that we have never heard before. Ambridge (2020) is right to point out that existing theories have tended to use ‘abstraction’ as a catch-all term to describe
the fact that at different periods during their development of language, children show the ability to generalise more or less broadly over phonological, morphological, semantic, syntactic and pragmatic stimuli. He is also right to say that we have tended to call this process of generalisation ‘abstraction’. In critiquing the idea of abstraction, he points to two problems. The first is ‘lumping’: if the abstracted category is too general it does not account for behaviour that reflects sensitivity to detailed differences between stimuli. The second is ‘splitting’: if every detail creates a new category, we end up with an infinitely large number of categories which cannot account for the often more overarching nature of the actual generalisations that we see people make (an observation not dissimilar to the critiques offered of Pinker’s [1989] narrow and broad range rules for argument structure overgeneralisation; e.g. Naigles, 1991). Ambridge’s solution is that generalisation takes place ‘on the fly’ on the basis of analogy to what is already in memory. For this to work he suggests that every utterance and every aspect of it is stored in memory. While Ambridge does a good job of pointing out the problems involved in trying to specify the mechanisms for generalisation, we are less sure that his radical exemplar theory moves us very much further forward. We identify three issues: first, how do we identify the characteristics over which an analogy takes place at any given point in time? Second, if the basis for the analogy is made on the fly and not stored, where does similarity come from (Demuth & Johnson, 2020, raise the issue of similarity in their commentary too)? And third, how do we capture how the underlying representational system is altered by the process of analogy? It may be possible to get some traction on these questions, but we believe this would require the addition of a developmental perspective.

What children generalise over changes with development. For example, during the first year infants show changes in their ability to discriminate and generalise the sounds of language both in terms of suprasegmental prosodic properties and at the phonemic level (Werker & Tees, 1984). Similar shifts in generalisation behaviours hold in other areas of language learning such as children’s early noun generalisations (Landau et al., 1988), and sensitivity to case marking vs word order (Akhtar & Tomasello, 1997), or to animacy vs syntax in determining the meaning of utterances (for a review, see Buckle et al., 2017). Of course, the language the child is hearing drives these changes in generalisation but why should they unfold in a particular order of trajectory? Presumably, the answer has something to do with the frequency, salience and informativeness of what the child is hearing and changes over time in the level at which and/or how input information is processed. But this then involves the system registering a repeated pattern of activation, aka storage of a representation. So when the child hears an utterance, exactly what details of the utterance are stored, and why should the child be able to make some generalisations before others? Ambridge suggests that every detail of an incoming utterance is stored including speaker characteristics and that this then allows for an analogy to be made on the basis of different aspects of the stored memory depending on the nature of the task. Whilst this makes sense in terms of providing an explanation for context-based differences in speaker and listener responses, it is not entirely clear how this would work in practice. Presumably the idea is that as more exemplars are encoded, the structure of the network in which the memory is stored changes, thus changing the basis on which analogies are made. But if all of the possible characteristics that could be registered are stored, how does the appropriate similarity metric for any particular task demand emerge?
If, to solve a task, an analogy is made ‘on the fly’, what then happens? How does the listener choose which particular features to generalise across ‘on the fly’? Does each new analogy change memory? If the memory decays, how do we characterise what part of it decays? If only part of the event is remembered, is this the part that is more similar to a previous analogy or, perhaps, less similar (Brooks & Kempe, 2020, also raise issues regarding memory in their commentary)? Or are different elements of an utterance-event pairing more salient and better encoded on different occasions, leading to different representations from which subsequent analogies can be drawn? Although, as Ambridge notes, a connectionist network model with changing weights is probably the only psychologically plausible model which stands a chance of capturing this radical exemplar approach to language acquisition, it seems clear to us that it will have to be combined with a representational system in which similarity is flexibly computed, and with a developmental perspective.

There should be novel predictions that arise from the idea that every instance is stored and that analogies are ‘one-time generalisations’. For example, would this make understanding or producing a sentence as an adult L2 learner faster because there are so many routes for analogising? Or would it make it slower because there are so many exemplars and possible routes of analogy? From a developmental perspective, would specific patterns of ‘one-time generalisation’ errors be predicted at different stages of language acquisition or in children learning different languages? Ambridge clearly identifies the difficulties with our current theories of generalisation and abstraction but does not speculate on the processes by which generalisation might occur in this new radical exemplar account. Without a clearly-specified mechanism for how analogies are drawn and similarity computed, generating testable predictions remains a challenge. Nonetheless, the key strength of this approach is its emphasis on the task demands that the speaker or listener faces at a particular moment, i.e. analogies are driven by what people are trying to do in a given context. However the question is whether the radical exemplar approach gets us any further in explaining how this works or instead simply restates the problem. In terms of empirical research, does it send us in a direction of investigation that is different to what we currently do? One possibility is that it will drive us to design tasks or to analyse results we already have in terms of the precise differences between task demands that appear to lead to successful performance. Different task demands, for example the difference between comprehension and production, will give rise to a range of very different exemplars that could be analogised to, and this might provide a beginning framework for doing developing novel perspectives on experimental design. It will require detailed designs that focus on precisely specified task demands and possible outcomes with predictions about the course of analogy involved. Overall, however, while the radical exemplar approach neatly accounts for a wide range of existing phenomena in language processing, it remains to be seen whether explicit mechanisms of similarity computation and analogy can be proposed that offer equally parsimonious accounts of language in development.

Funding
The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the ESRC International Centre for Language and Communicative Development (LuCiD). The support of the Economic and Social Research Council (ES/S007113/1 and ES/L008955/1) is gratefully acknowledged.
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