Learning the meanings of words:

The state of the art

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Learners of a second language may sympathise with the challenge faced by young word learners. Not only must children identify discrete words in continuous speech, but they must also map those words to meanings – and often there are many possible meanings for any given new word. This is known as the problem of referential ambiguity, and it is far from trivial.

Any spoken word may refer to an object that is or is not present; to ongoing, completed, or impending action; or to the qualities of an object or the manner in which an action is performed. Nevertheless, in contrast to many second language learners, children demonstrate impressive aptitude in resolving referential ambiguity. By age two, children are able to learn word-referent associations after very few exposures; a skill

termed 'fast-mapping' (Carey, 2010). In this article, we ask: what does recent research tell us about how children solve the problem of referential ambiguity, and how might this apply to clinical practice?

Ambiguity theory, old and new

Children's aptitude in resolving referential ambiguity has been attributed to (possibly innate) constraints, such as 'mutual exclusivity' (Markman and Wachtel, 1988). For instance, on hearing the phrase 'pass me the pear', children presented with a familiar apple and an unfamiliar fruit may infer that the word pear describes the latter, because they already have a name for the apple. In recent years, researchers have developed different views of what these constraints could be.

On the one hand, children could combine their prior knowledge about how words map to objects, together with the words they hear, to infer a new word's likeliest referent (eg Xu and Tenenbaum, 2007). On the other hand, children could use intention-reading skills such as gaze-following to infer which object an adult is referring to when using a new word (eg Tomasello, 2009). Here, the challenge is seen as one of inferring not what a word means in and of itself, but what the speaker intends in a given situation. An assumption common to these lines of thought is that children's rapid inferences about the referent of a word are equivalent to having successfully learned that word's meaning. However, contemporary research challenges this assumption.

Recent behavioural research, for instance, has revealed that despite successful performance in tasks that involve mapping a new word to an object, children's long-term retention of the word-object mappings may be poor (Horst and Samuelson, 2008). This is because even when referent selection in the moment is accurate, the links between words and referents remain numerous and messy (McMurray, Horst and Samuelson, 2012). Such evidence suggests that children's ability to resolve referential ambiguity in the moment is not necessarily the same as long-term word learning. Children may well solve the immediate problem of referent selection by exploiting, for instance, logical constraints or socio-pragmatic cues, but word-referent mapping takes time.

Indeed, theorists have argued that in-the-moment ambiguity resolution must be rapid, while learning must be slow. There is a socio-pragmatic requirement to make quick and dirty inferences regarding word meanings in order to achieve goals. Consider, for example, the inferences made during interactions in an unknown language while travelling. Learning, on the other hand, must be slow because many of these in-the-moment inferences are likely to be incorrect, and therefore rapidly forming hard-and-fast word-referent associations would result in a system of errors.

Radically, this means not only that solving the immediate problem of referential ambiguity does not necessarily entail learning, but also that learning does not necessarily entail solving the immediate problem of referential ambiguity. Instead, multiple word-referent associations may be formed at any given time, with these then gradually strengthened or pruned over further exposures.

Implications for caregivers and practitioners

As those working in speech and language therapy are aware, there is good reason that anyone involved in a child's development should aim to provide that child with a language-rich environment. Early vocabulary size is a significant predictor of later grammatical awareness and literacy (Lee, 2011), each of which is associated with educational outcomes (Conti-Ramsden et al, 2018).

One conclusion from recent research in ambiguity resolution is that we should be wary of interpreting successes in word recognition tasks (during assessment or intervention) as evidence of learning. Conversely, we should be mindful that poor in-the-moment word recognition does not necessarily reflect deficient long-term language knowledge, but may instead reflect specific difficulties in immediate ambiguity resolution. As Thomas, Schulz and Ryder

REFERENCES
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Strategies to support vocabulary growth

Establish joint attention through gaze and gesture

Talk about items the child is currently engaged with

Link words through active comparison (eg of colours or textures)

Play with a restricted number of toys or objects

Read storybooks (even repeatedly), particularly those without a large number of moving parts

Use recasts incorporating novel vocabulary

Harness features of baby talk, including a simplified grammar and a reduced speech rate

(2019) have argued, this makes the SLT's expertise in determining the limitations of standardised tools of assessment in a given context essential.

Recent eye-tracking work, for instance, found that despite typical initial looks towards a target image corresponding to a spoken word, children with developmental language disorder (DLD) subsequently made more looks towards competitor images than their typically developing peers (McMurray, Klein-Packard and Tomblin, 2019). One plausible interpretation of these results is that referential ambiguity resolution may be a challenge for some children with DLD even when they have the long-term language knowledge required to complete a given task.

While successful in-the-moment referent selection does not necessarily entail learning, it is also true that we cannot 'turn off' learning. For this reason, facilitating immediate referential ambiguity resolution by simplifying the learning environment may support the formation of stable word-referent associations over the long term. Restricting play to a limited number of toys and reading storybooks without a large number of moving parts have, for instance, been associated with gains in vocabulary size (Oakes, Kovack-Lesh and Horst, 2009; Horst, Scott and Pollard, 2010). Similarly, referent identification may be supported through gaze and gesture, or through building conversation around items that children are attending to (eg Goodwyn, Acredolo and Brown, 2000). Each of these approaches has been shown to improve vocabulary growth by helping children identify word referents in a socially meaningful way.

The finding that word-referent associations are fine-tuned over time suggests that experiencing the same word-object mapping in multiple situations is vital. In this way, while in one situation a word may occur in the presence of multiple objects or actions, over time that word is likely

to co-occur regularly with a specific object or action. Making comparisons between objects and actions during play or general exchanges may support such cross-situational learning (Smith et al, 2002), for instance, comparing the materials, colours, or sizes of similar toys or items of cutlery.

Cross-situational learning is in fact the only way to acquire grammatical words such as 'if' and 'when', for which there is no obvious environmental referent. This suggests that while 'baby talk' (eg raised pitch, slower speech rate) can help attract and sustain children's attention, it is important to use full grammatical sentences in conversation with children (Hoff and Naigles, 2002).

Finally, a large research literature documents the association between shared storybook reading and gains in early vocabulary size. Interestingly, research has also identified gains in vocabulary size associated with repeatedly reading the same storybook (Horst, Parsons and Bryan, 2011). This finding is consistent with the idea that stable word-referent associations take time to develop. Similar strategies (though with appropriate modifications or at a higher dosage) may support vocabulary development in children who struggle with language, such as children affected by DLD.

Whether the child we are engaging with struggles with language or not, the strategies we employ to assist that child's vocabulary development have two essential aims: to support the resolution of referential ambiguity in the short term, and to support the formation of accurate word-referent associations in the long term. ⓑ

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