Children's filler-gap dependency processing in the absence of revision

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Previous research has suggested that during real-time comprehension, 5-year-olds incrementally assign interpretations to partial sentence input [1-3], but a recent Visual World eye-tracking study [4] suggests that 5-year-olds may not incrementally process filler-gap dependencies like (1a). Conversely, adults demonstrate active gap filling [5]: *what* (the filler) was actively associated with the verb *eat*, and temporarily interpreted as the direct object. There is evidence that this ability begins to emerge by age six [4]. Given that children at this age are known to have difficulties with (fully) revising their initial incremental interpretation if a sentence is disambiguated toward an alternative meaning [1,6-7], 5-year-olds' lack of active gap filling could reflect a hesitancy to commit to an interpretation in the presence of uncertainty. In other words, children may have a high "threshold" for active dependency completion to protect against misinterpretations as a result of their poor revision abilities. The current study tests this hypothesis by manipulating the potential need for revision. If the filler-gap dependency only has a single possible gap location as dictated by the given event description, then there should be no chance that active gap filling leads to a need for revision. Under these conditions, children may incrementally process these dependencies in the same way as adults.

Method. Five- (N=24, mean=5;6, range=5;0-5;11) and six-year-olds (N=20 [target=24], mean=6;4, range=6;0-6;6;8) participated in a Visual world eye-tracking experiment modeled after [4], which used a question-after-story design [8]. The study consisted of 20 trials (16 targets, 4 fillers). Each trial had an animated short story followed by either a *wh*- (1a/2a) or *yes-no* (1b/2b) question, accompanied by displays with five pictures (Fig1). There were two critical events in each story, distinguished by the number of items involved in the action. For example, in Fig1 the *eating* event (Obj+Inst) involves both a direct object (cake) and an instrument (fork). In contrast, the *cleaning* event (Only Obj) involves only a direct object (dishes). Questions about Obj+Inst events (1a/b) had prepositional object (PO) gaps, such that the correct answer was the instrument; these conditions are identical to [4] and are included to attempt to replicate children's lack of active gap filling behaviour. Questions about Only Obj events (2a/b) had direct object (DO) gaps, such that the correct answer was the object. Crucially, these events had a single possible structural position for a gap following *what*: the direct object. Thus, these events were unambiguous given the context and there was no possible need for revision.

Results. The eye movement data (Fig2) shows different patterns based on age group and were analyzed using empirical logit transformations [9]. 5-year-olds demonstrated a continued lack of active gap filling in both event types (question type: β= -0.07, p>0.1 ; event by question-type interaction: β= -0.31, p>0.1), replicating [4]. While there appears to be a visual difference between question types for 6-year-olds for Obj+Inst events, this effect is only trending toward significance (Only Obj: β=0.20, p>0.1 ; Obj+Inst: β=0.61, t=1.34, p=0.18). It is possible that the active gap filling effect will emerge when we complete participant recruitment. If it does, this would indicate adult-like active gap filling behaviour in this condition.

While the removal of the need for revision did not affect 5-year-olds' active gap filling behaviour, it may aid 6-year-olds' in generating an active association between the filler and the verb more quickly, i.e., in the same timeline as adults [4], but only for events with both an object and an instrument. Implications for the development of children's sentence processing mechanisms, and active gap filling in particular, will be discussed as well as the potential interaction with the development of broad cognitive resources (e.g., memory).

References

[1] Trueswell et al. (1999). *Cognition*, 73. [2] Snedeker & Trueswell. (2004). *Cog Psych*, 49. [3] Borovsky et al. (2012). *J Exp Child Psych*, 112. [4] Atkinson et al. (2018). *Cognition*, 179. [5] Stowe. (1986). *LCP*, 1(3). [6] Omaki et al. (2014). *LLD*, 10. [7] Lassotta et al. (2016). *QJEP*. [8] Sussman & Sedivy. (2003). *LCP*, 18(2). [9] Barr (2008). *JML*.

Examples

(1) Questions with PO gaps (Obj+Inst)

a. *Wh-question:* Can you tell me **what** Emily was eating the cake with __?

b. *Yes-No question:* Can you tell me **if** Emily was eating the cake with **the fork**?

(2) Questions with DO gaps (Only Obj)

a. *Wh-question:* Can you tell me **what** Emily was cleaning __?

b. *Yes-No question:* Can you tell me **if** Emily was cleaning **the dishes**?

Figures and Tables

Figure 1. Sample visual world display.

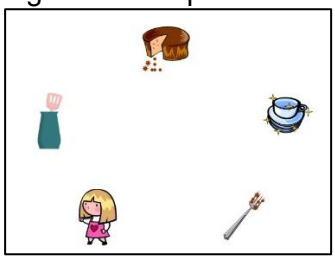

Figure 2. 5- (top) and 6- (bottom) year-olds' fixations on the target object during the verb region by event items (Only Obj vs. Obj + Inst) and question type (*wh-* vs. *yes-no*). Vertical lines indicate the verb region shifted 200ms to account for saccade planning and execution.