

## Processing of movement and pronoun dependencies in developmental disorders

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**Introduction:** pronouns and A'-movement are two ways of forming long-distance dependencies between two syntactic positions. In both (1) and (2) it is understood that grandma hugged the girl, even though the antecedent 'girl' is not in the complement position of the verb 'hug' in the surface form of the sentence.

- (1) The girl<sub>k</sub> said that grandma hugged her<sub>k</sub>.
- (2) This is the girl<sub>k</sub> that grandma hugged \_\_<sub>k</sub>.

In (1), the girl is referred to by a pronoun in the object position of the verb whereas in (2), the same effect is achieved by a gap in the object position of the verb. Although the two types of dependencies have a different structure, they have a similar function – to refer to a referent in the sentence without using the full expression. The similarity between gaps and pronouns is present at several levels of analysis: at the semantic level, both a gap (A'-trace) and a bound pronoun can be represented as a bound variable in the semantic representation (e.g., Heim & Kratzer, 1998). From a processing point of view, both a gap and a pronoun require the speaker/listener to find the correct antecedent (the girl), while rejecting interveners (grandma), which can, as in (1) and (2), be linearly closer to the gap/pronoun than the antecedent. The similarities between these two types of dependencies raise the possibility that similar processing mechanisms are responsible for their online processing and theoretical representations. We provide evidence against this possibility by reporting participants with syntactic-SLI (SySLI – a specific language impairment in syntax) and orally-trained children with a hearing impairment (HI) who show impairments in A'-movement but not pronouns. These populations were previously reported to have difficulties with A'-movement (SySLI: Friedmann & Novogrodsky, 2004, 2007; Novogrodsky & Friedmann, 2006, among others; HI: Berent, 1988, 1996; De Villiers et al., 1994; Friedmann & Szterman, 2006, 2011; Szterman & Friedmann, 2020, among others.)

Resumptive pronouns (RPs), are morphologically like pronouns, but they appear in A'-dependencies. In DP object relatives, RPs are optional in Hebrew (compare (3) to the minimally different (1) and (2) repeated below).

- (1) The girl<sub>k</sub> said that grandma hugged her<sub>k</sub> – non-resumptive pronoun.
- (2) This is the girl<sub>k</sub> that grandma hugged \_\_<sub>k</sub> – gapped object relative.
- (3) This is the girl<sub>k</sub> that grandma hugged her<sub>k</sub> – DP object relative with RP.

Given that RPs are a type of pronouns, we ask whether their presence at the gap position assists comprehension of relative clauses for participants who have difficulty with movement but not with non-resumptive pronouns. We show that the presence of an RP instead of a gap does not assist comprehension for neither SLI or HI.

**Methods:** We tested 43 orally-trained children with a hearing impairment (aged 9;5-11;11) and 61 children with Sy-SLI (9;3-19) using tasks that involve A'-movement and pronouns. For A'-movement we used a sentence-picture matching task including "which" questions and relative clauses with both gaps and resumptive pronouns, a sentence elicitation based on pictures, a sentence elicitation "preference" task, a sentence paraphrasing task, and a sentence repetition task. For pronouns we used a sentence-picture matching task. The performance of each participant in each task was compared to a control group of age-matched typically-developing children.

**Results:** Of the 43 children with a hearing impairment, 27 had an impairment in A'-movement, and 11 of them also had an impairment in pronoun dependencies. Of the children with Sy-SLI 40 had an impairment in A'-movement, and 4 had an impairment in pronouns. Crucially, we found a dissociation in both populations: 52 of those participants had an impairment in A'-dependencies but not in pronouns (16 HI, 36 SySLI), while all the participants who had an impairment in pronoun comprehension also had a difficulty with A'-movement. In both populations, for the dissociation group (impaired movement, intact pronouns) A'-dependencies with resumptive pronoun were as difficult as A'-dependencies with gap.

**Discussion:** A dissociation between A'-dependencies and pronoun processing shows that although these two types of dependencies share similarities, their processing is at least partly different. It also shows that the difficulty of children with SySLI and HI is selective and linguistically-defined: it can target A'-dependencies, bound pronouns, or both, but it is not the case that a general processing difficulty makes all kinds of long-distance dependencies difficult to process. The presence of a gap in A'-movement structures is not the source of difficulty in A'-movement, since A'-dependencies with resumptive pronouns are also difficult for the same participants.

Participants who can identify the antecedent of a non-resumptive object pronoun, and co-index the pronoun correctly but cannot understand or produce object relatives with a resumptive pronoun provide an important insight: co-indexation alone cannot provide the necessary information for thematic role assignment, not even as a strategy when A'-dependencies are impaired. This is reminiscent of the finding that the accusative case marker cannot be used by individuals with Sy-SLI to identify the theme in the sentence when it is in an A'-dependency (Friedmann et al., 2017).

We hypothesize that the difference is in the type of chain: in pronoun dependencies, the head and the tail each receive a thematic role locally, whereas in A'-dependencies only the tail is a thematic position, and the role is shared between both positions. We assume that arguments enter the syntactic tree only when they receive a thematic role (Pritchett, 1992; Siloni, 2014). Therefore, co-indexation in pronoun dependencies is between two arguments in the tree, but this is not the case in A'-dependencies: when the gap/RP is encountered, the head of the chain is not part of the tree yet; it is maintained in a working memory store specific for theta-less arguments, which might be susceptible to intervention. Forming a relation between an antecedent in the tree and an argument in WM is not the same as co-indexing two positions in the tree.

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