Processing referential expressions in German Sign Language: The effect of overt localization

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In sign languages, discourse referents are localized and assigned to referential locations (R-loci) in the horizontal part of the signing space in front of the signers' body. These R-loci serve to establish a relation between a discourse referent and a referential expression (RE) in subsequent discourse [1], [2]. A discourse referent can be associated with a specific R-locus in a number of ways (e.g. with the use of IX (pointing) signs accompanied by non-manuals such as eyegaze and body lean in the direction of the IX). In spoken languages, the processing of REs is not only affected by their form, but also by the accessibility or prominence of their antecedents. Most accessible discourse referents are picked up by the least marked REs while less accessible referents are referred to by more marked REs [3]–[5]. Moreover, literature provides evidence for a subject preference, i.e., referents in subject position are more salient and thus more likely to be interpreted as the antecedent of a RE [6], [7]. Given that there is no available research on sign languages, the question arises whether the overt assignment of a discourse referent (i.e., subject and object) in space increases its prominence leading to facilitative processing of a subsequent co-referential expression.

The present study examines whether overt manual localization with the INDEX sign in German Sign Language increases the prominence and hence the accessibility of a discourse referent and how this interacts with a referent's grammatical role. Stimulus videos include short discourses (presented in Table 1 below) introducing two discourse referents with varying overt localization in a first sentence, i.e., localizing both referents (1a, 2a), only the subject (1b, 2b), only the object (1c, 2c) or none (1d, 2d). A subsequent second sentence starts with a bare noun co-referential with one of the referents, i.e., either the previous subject (examples in 1.) or object (examples in 2.) (note that DGS is an SOV language). Using eye tracking and a modified version of the Visual World Paradigm, 23 deaf native signers (20-58 years, mean age: 33 years) were presented with two pictures representing the discourse referents contained in the simultaneously presented stimulus video while their eye movements were recorded.

For the analysis, we fitted linear-mixed effects models for mean proportion of target looking (PTL) examined across a time window of 1000ms following the first fixation to one of the presented pictures. The best-fitting model ($\chi^2(4) = 12.59$; $p = .013$) with fixed effects for condition and continuation type and random effects for participants and items revealed increased looks to the target referent for conditions containing overt localization of both referents ($t = 2.8$; $p = .005$) or only localizing the subject ($t = 2.17$; $p = .031$) for the discourses where subjects were localized.

The data suggest a conjoined effect of overt localization and grammatical function i.e., subject preference, on the processing of REs. Changes in the accessibility of antecedents reflected in modulations of their activation patterns can account for the observed effects. Referents that are localized and occur in subject position show increased activation leading to easier lexical retrieval when the referent is mentioned again in subsequent discourse since less additional activation is needed to exceed the retrieval threshold. Localization with the IX sign seems to increase the accessibility of a referent similar to prosodic focus in spoken languages and can therefore be analyzed as a manual focus marker. However, the sign language literature describes focus markers often as a combination of manual and nonmanual components suggesting that the effect of overt localization might increase if accompanied by a nonmanual marker such as eye brow raise [8], [9]. However, our data cannot provide evidence for clarifying the role of nonmanuals

since these were not included in the stimulus material and their effects are subject to further research. This study is the first to determine the influence of manual localization on processing mechanisms and to show its interaction with the subject preference for German Sign Language.

Table 1: Overview of experimental conditions

Subject continuation	Object continuation
Localization of both subject and object	
1a) TEACHER **IX$_R$** GIRL **IX$_L$** TALK. TEACHER DIFFERENT CITY BORN.	2a) COOK **IX$_R$** WOMAN **IX$_L$** MEET. WOMAN A-LOT EAT CAN.
Localization of subject	
1b) TEACHER I**X$_R$** GIRL TALK. TEACHER DIFFERENT CITY BORN.	2b) COOK **IX$_R$** WOMAN MEET. WOMAN A-LOT EAT CAN.
Localization of object	
1c) TEACHER GIRL **IX$_L$** TALK. TEACHER DIFFERENT CITY BORN.	2c) COOK WOMAN **IX$_L$** MEET. WOMAN A-LOT EAT CAN.
No localization	
1d) TEACHER´GIRL TALK. TEACHER DIFFERENT CITY BORN.	2d) COOK WOMAN MEET. WOMAN A-LOT EAT CAN.
‘A teacher talks with a girl. The teacher was born in a different city.’	‘A cook meets a woman. The woman can eat a lot.’

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