

Retention of Content versus Surface Form Information during Reading: Asymmetries between L1 and L2 processing

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Background: In the current study, we investigate the final stage of word/language processing during reading, namely the representation of linguistic information within a mental text model. We focus on differences between L1 and L2 reading in what aspects of words/language are retained, contrasting surface-level (form-related) and content-level (meaning-related) information. Building on our recent findings showing an L2 advantage in the retention of surface linguistic information [1, 2], we ask whether this advantage is accompanied by reduced memory for content information, which has been shown to dominate mental text representations in numerous memory studies [3, 4]. These issues are relevant not only for theoretical accounts of L1 and L2 processing and memory, but also for understanding academic reading and literary experience in a non-native language.

Method: Native speakers of German (N=64) and learners of German (N=64, L1=Czech, B2/C1 level in German) performed a series of tasks in an original eye-tracking paradigm. After reading short texts, participants completed two control tasks: a picture task and a single sentence task. The pictures showed either scenes congruent with the information described in the text or with a factual deviation (content manipulation, see Figure 1). In the sentence task, participants read either completely identical sentences that had appeared in the texts, or sentences in which the surface linguistic information was manipulated without changing its meaning (surface linguistic manipulation, e.g., changes in grammatical voice, positioning of an attribute, see examples below). Eye-tracking data were analysed (mixed effects models) to determine fixation durations on regions with manipulated versus unaltered information. The rationale was that participants are only able to detect changes (of content or surface linguistic information) if they had stored this information from the preceding text-phase. Change detection should manifest itself in longer fixation durations on regions with altered compared to unaltered information. There were four different texts, each followed by 24 pictures and 56 single sentences (pictures and sentences included fillers).

Results: A contrasting pattern for content versus surface-level manipulations was observed in both populations (see Figure 2): While significant retention effects for content manipulation were observed only for L1 but not for L2 participants, the opposite pattern was found for surface-level manipulations. In an additional number manipulation that involves both changes in content (one vs. many) and surface linguistic, (different suffixes and agreement) information, a retention effect was observed in both populations.

Discussion: Our study provides empirical support for key differences in memory retention between L1 and L2 reading. L1 readers prioritize content information while surface linguistic details decay rapidly, aligning with classic memory research [5]. In contrast, L2 readers retain more surface-level information, corroborating recent findings [1, 2]. In line with the Shallow Structure Hypothesis [6], stronger reliance on verbatim memory in L2 may compensate for syntactic processing difficulties and may also support grammar acquisition through the storage of linguistic chunks [7]. Overall, the study highlights fundamental differences in L1 and L2 mental text models, affecting comprehension and language learning. It also sheds light on the challenges L2 readers may face when engaging with academic texts in a non-native language, which may ultimately impact their academic success.

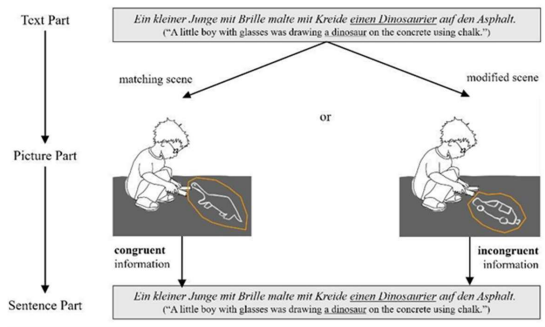


Figure 1: Example of one critical content sentence across the experimental tasks and conditions.

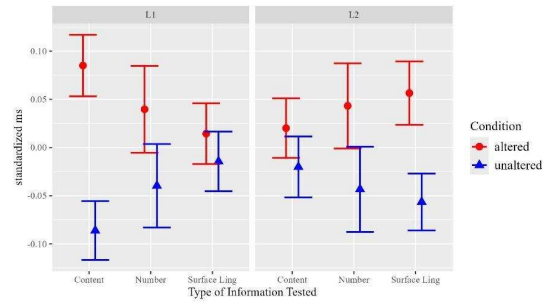


Figure 2: Summary of results of the sentence task. Means of total durations in critical ROIs, standardized within Language & Type of Manipulation. Examples.

Grammatical voice:

<i>Ein junger Mann hob die Tasche der Dame auf.</i>	↔	<i>Die Tasche der Dame wurde von einem jungen Mann aufgehoben.</i>
('A young man picked up the lady's bag.')		('The lady's bag was picked up by a young man.')

Attributive position:

<i>Auf dem Schoß der Frau saß <u>ein laut schreiendes Baby</u>.</i>	↔	<i>Auf dem Schoß der Frau saß <u>ein Baby</u>, <u>das laut schrie</u>.</i>
('A loudly crying baby was sitting on the woman's lap.')		('A baby who was crying loudly was sitting on the woman's lap.')

Table 1: Examples of the surface linguistic manipulation.

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