# Searching for the Neurocognitive Mechanisms Underlying Gist and Verbatim Encoding

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Many higher cognitive functions, such as language processing, benefit from our brains' ability to organize episodic memories within a network of accumulated knowledge, which can be drawn from when interpreting input or generating output. Creating such a network requires organizing the plethora of single detailed (henceforth 'verbatim') memories formed every day. This is achieved by extracting commonalities from specific memories (*gist extraction*; Gilboa & Marlatte, 2017), which can follow or run in parallel to the creation of verbatim memory traces (e.g., Gilboa & Moscovitch, 2021). The goal of the current study (planned work) is to shed light on the neurocognitive mechanisms underlying the successful encoding of verbatim as compared to less-detailed gist traces by using online EEG measures of successful memory formation.

We use a modified version of an associative memory paradigm introduced by Cheng and Rugg (2004; 2010), in which participants study lists of semantically overlapping arbitrary word pairs. In a subsequent memory test, participants must classify originally studied pairs ('Old pairs') as 'old' and reject distractors as 'new' (a schema of the experimental design is depicted in Figure 1). The strength of the paradigm lies in its ability to disentangle the neurocognitive mechanisms underlying verbatim and gist encoding. This is achieved by two characteristics of the design:

First, there are different types of distractors in the memory test that vary in their degree of semantic overlap with the studied word pairs and thereby in whether their rejection can be based on gist or verbatim memory traces: 'Intra pairs' are recombinations within a list. By this, they maintain full semantic overlap to the original word pairs and thus, their successful rejection requires the formation of verbatim memory traces. In contrast, 'Inter pairs' are across-lists combinations of original word pairs, which are not fully semantically overlapping with the original word pairs anymore. By this, they can be rejected on the basis of gist traces, only. By contrasting encoding ERPs on correctly rejected 'Intra pairs' versus false alarms on 'Intra pairs', neural activity related to verbatim trace formation can be isolated.

Second, to isolate neural activity related to gist trace formation, we additionally manipulated the degree of semantic overlap during encoding in order to directly vary demands on gist extraction and verbatim trace formation: Higher semantic similarity in the high gist (HG; for example 'Pfeil-Forelle', 'Bogen-Karpfen') versus low gist (LG; for example 'Theorie-Rochen', 'Praxis-Koi') condition should impose higher processing demands on the formation of verbatim traces and potentially on gist extraction. Semantic similarity is operationalized as the relative frequency of a pair's second word (e.g., 'Koi'), being reported as a member of the shared category ('Fish'; Glauer et al., 2007). German stimuli are newly created based on category exemplar words from Glauer et al. (2007).

To the extent to which a parietal event-related potential (ERP) positive slow wave reflects the successful formation of verbatim, item-specific memory traces (Mecklinger & Kamp, 2023), we expect a larger early parietal ERP effect on subsequent 'Intra pair' correct rejections in the HG versus LG condition. Second, the ERP difference between subsequent 'Intra pair' false alarms in the HG versus LG condition should resemble the early frontal subsequent memory effect, which is indicative of semantic processing in the service of memory encoding (see Mecklinger & Kamp, 2023), reflecting neural activity related to successful gist trace formation. Based on a power analysis, we plan to sample at least $N = 24$ participants.

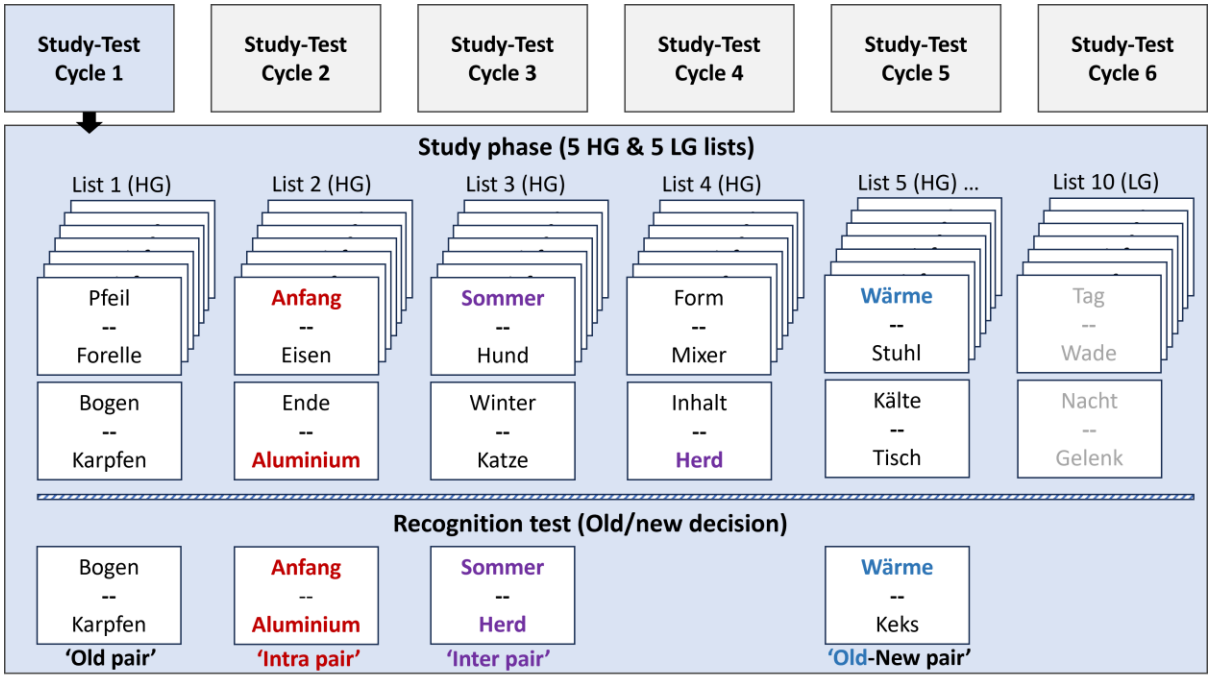


Figure 1: Experimental design (adapted from Cheng & Rugg, 2004; 2010). Participants will complete six study-test cycles. In each study phase, 10 lists are presented, each consisting of eight highly (high gist, HG) or moderately (low gist, LG) semantically overlapping arbitrary word pairs. After each study phase, a recognition test is performed in which original 'Old pairs' (black) must be discriminated from three types of distractors pairs: 'Intra pairs' (red) 'Inter pairs' (purple) and 'Old-New pairs'(blue-black). Note that 'Inter pairs' are separately created for the HG and LG condition.

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