

Prior knowledge Congruency and Satisfaction Shape the Neural Mechanisms Underlying Curiosity-Driven Memory Formation for Novel Compound Words

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Curiosity enhances memory for novel information [1]. Correspondingly, processing this information elicits a reward positivity (RewP) [2], an event-related potential (ERP) component associated with reward processing [3], suggesting that curiosity engages reward-related mechanisms supporting memory formation [1]. However, it remains unknown whether curiosity similarly promotes memory formation when semantically congruent prior knowledge is available.

Therefore, in the current study we investigated the cognitive processes underlying curiosity-driven memory formation depending on whether congruent prior knowledge supported memory formation. Participants first read questions referring to novel German compound words and rated how curious they were to learn the answers. During the subsequent study phase, questions were re-presented and followed by answers that were either congruent or neutral with respect to the preceding questions (What do you call a dictionary used by gardeners_{congruent}/ teachers_{neutral}? vegetable bible). After which, participants rated their satisfaction with each answer. Importantly, ERPs were assessed during answer presentation. In the following cued recall test, participants recalled the first part of the compound word (e.g. 'vegetable') when presented with the second part ('bible'). To identify the cognitive processes contributing to curiosity-driven memory formation, we examined the RewP and the N400, an ERP component indexing semantic integration [4]. In addition, subsequent memory effects (SMEs) [5] of RewP and N400 were assessed by comparing ERPs elicited by answer presentation in the study phase for compound words that were later remembered or forgotten. Thus, the presence of a RewP-SME or an N400-SME would indicate that the corresponding processes contribute to successful memory formation.

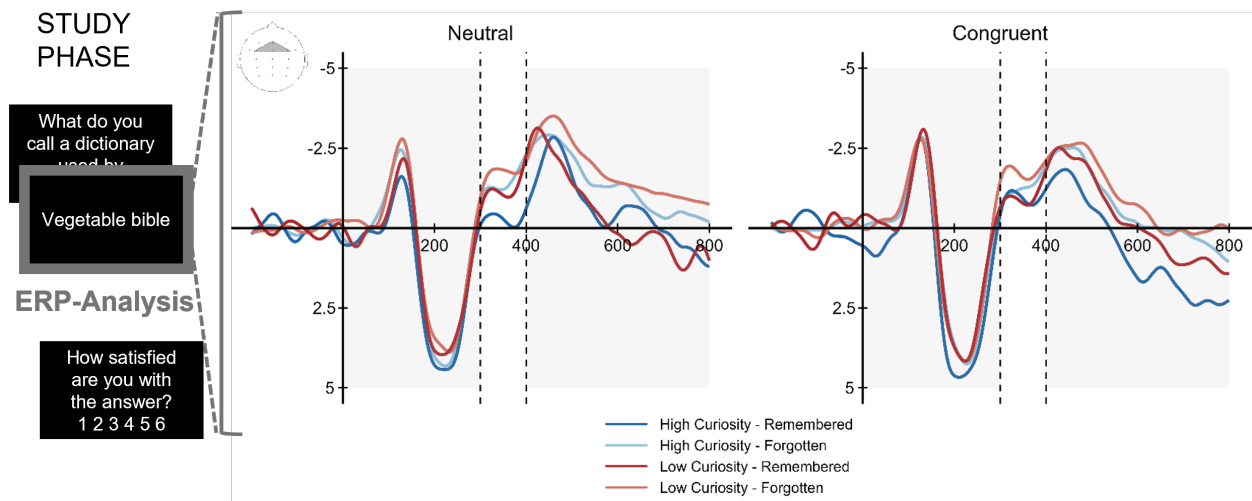
Our results revealed a RewP-SME when participants were highly curious in the neutral, but not in the congruent condition (see Figure 1). This finding suggests that curiosity supported reward-related memory formation for neutral, but not for congruent information. Conversely, successful memory formation in the congruent condition was characterized by an N400-SME that was modulated by the learner's satisfaction with the answer. Together, these findings suggest that curiosity-driven learning is associated with reward signals when learning is not supported by prior knowledge whereas satisfaction with information and semantic integration processes are important catalysts for learning when learning is driven by prior knowledge.

References

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Figures and Tables

Figure 1: The RewP-SME



Note that the trial procedures presented here are simplified to facilitate visualization. ERPs were assessed during answer presentation. Presented stimuli are translations from German.