Uncertainty in Memory Judgments: Selected Distortions in Memory Representations of Events

In psychology and cognitive science, there is a growing popularity of the view that the human mind (brain) continuously generates and updates a model of the surrounding world based on incoming experiences. In this way, we possess a "map" that represents reality, allowing us to navigate this reality efficiently. Our memory stores key elements of this representation so that we can use them in response to the challenges of everyday functioning in the world. The aim of many studies, including this project, is to answer the fundamental question concerning the reliability of the event representations stored in our memory. In particular, we are interested in whether, when reconstructing past events, we preserve the actual structure of frequency relations between those events. In science, the expected frequency of occurrence is described using probability theory, which thus serves as a normative framework against which we will compare the structure of events probability emerging from responses obtained from participants in episodic memory tasks. We will also ask whether classical probability theory is an appropriate normative model, or whether quantum probability theory might serve as a better point of reference.

The research we will conduct will focus on three specific problems. The first concerns the so-called source memory overdistribution phenomenon, which manifests in test responses indicating that people allow for the occurrence of events in more contexts than is actually possible. For example, in a memory task where participants are presented with a series of individual words in colored frames—e.g., green and red—they too often respond affirmatively both to the question "Did the word appear in a green frame?" and to "Did the word appear in a red frame?", as if believing that some words appeared in both frames at once. Moreover, when asked, "Did the word appear in a green or red frame?", the acceptance rate of this question is lower than the sum of acceptance rates for the individual components of the disjunction (this is called subadditivity). In our studies, we will examine the robustness of and contributing factors to such deviations from classical additivity of probabilities for mutually exclusive events.

The second problem we will explore in our project concerns the consistency of memory judgments with the transitivity rule. In our studies, we will attempt to verify whether memory judgments about the occurrence of events in the same context are transitive—that is, whether from memory judgments that items A and B occurred in the same context, and that items B and C occurred in the same context, our memory can "infer" that A and C also occurred in the same context.

In the third part of our research, we will investigate whether surprise caused by an unexpected item or a change in context helps segment the stream of experience into discrete episodes, thereby making the item and context that open a new episode better remembered. This research is based on the assumption that what aligns with our expectations does not require learning, because the next time we can successfully predict what will happen using knowledge we already possess. However, when something occurs that is inconsistent with our expectations (a so-called prediction error), it requires learning in order to update our knowledge of the world.

We expect our results to address, among other things, the question of whether violations of classical probability rules are a stable feature of episodic memory functioning, or merely "noise"—a by-product of guessing strategies adopted when memory fails to provide an answer. We will also identify the experimental conditions that enhance or reduce such memory "distortions." Furthermore, we will describe the consequences of inconsistencies between context or items and expectations for memory of these items and contexts.