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Perceptual boost of stimulus memorability on visual short-term memory formation

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Abstract

Human observers naturally remember certain stimuli such as face/scene images with overwhelming consistency. This phenomenon has been attributed to stimulus memorability, which may reflect an ensemble perceptual attribute that enhances the long-term retention of visual information. However, how this stimulus property contributes to visual memory formation is yet fully understood. Here, we test the hypothesis that memorability adds a constant perceptual boost to the formation of visual short-term memory (STM). Given the probabilistic nature of visual perception, this hypothesis predicts that memorable information should increase the likelihood of an item being encoded into STM within the time when fragile sensory information is transferred into durable STM. To test this prediction, we asked participants to remember images of three unfamiliar faces with a certain level of memorability (high vs. low) and tested their memory after a short delay using the change detection paradigm. These stimuli were drawn from a large-scale crowdsourced dataset and were verified in a separate sample in the region where the study was conducted. While the study items were uniformly presented for 150 ms and the memory-and-test stimulus onset asynchrony (SOA) was fixed at 1,500 ms, we manipulated the time allowed to further encode these stimuli into STM by inserting a 200-ms consolidation mask at different memory-and-mask SOAs (150 ms, 388 ms, vs. 617 ms). We found that participants reliably remembered more memorable (vs. forgettable) faces across all masking conditions with similar effect sizes. These findings suggest that memorability facilitation of visual STM emerges early (<=150 ms), which is temporally separate from the impact of stimulus familiarity on the later stage

of visual STM formation as demonstrated in some previous studies (>330 ms). Future research needs to distinguish this early memorability effect and the later familiarity effect to understand how visual STM is formed in naturalistic vision.