Temporal Regularity Does Not Improve Item-Specific Memory

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Introduction

Regular Event Timing Trains Attention and Enhances Perception
• Visual and auditory target discrimination is better when stimuli occur at expected times.1,2
• High-excitability in sensory cortices aligns with times when a stimulus is most likely to occur.3,4

Temporal Regularity May Also Improve Long-Term Memory (LTM)
• Memory for scenes5 and objects6 is improved when stimuli are presented with regular event timing during encoding.
• Results indicate these effects are limited to materials that are recollected.5

Research Objectives
1. Examine whether benefits extend to detailed item-specific memory representations.
2. Attempted replication of results reported for scenes.

Method

Experiments 1 & 2 – Objects (n's=24)

Encoding: 2 Blocks, 24 Trials/Block, 4 Objects/Trial

Test: 144 Trials (48 Old, 48 Similar, 48 New)

- Trial Structure and Event Timing: As in Experiment 2

- Object Timing: 1000 ms (Exp 1) / 700 ms (Exp 2, 3)
- Regular Event Timing ITIs: 50, 500, 1000, 2500 ms (Exp 1) / 100, 500, 1000, 2000 ms (Exp 2, 3)
- Irreg. Event Timing: ITIs shuffled (Exp 1) / randomised (Exp. 2, 3)

Experiments 3 – Scenes (n=24)

Encoding: 2 Blocks, 12 Trials/Block, 4 Scenes/Trial

Test: 96 Recognition Test Trials (48 Old, 48 New)

- Trial Structure and Event Timing: As in Experiment 2

- Object Timing: 1000 ms (Exp 1) / 700 ms (Exp 2, 3)
- Regular Event Timing ITIs: 50, 500, 1000, 2500 ms (Exp 1) / 100, 500, 1000, 2000 ms (Exp 2, 3)
- Irreg. Event Timing: ITIs shuffled (Exp 1) / randomised (Exp. 2, 3)

Results

Experiment 1

• Exp 1 and 2 – performance varied as a function of object type (high sim. < low sim. < new)
• No effects of event timing were evident in Experiments 1, 2, or 3

Experiment 3

- LTM for Item-Specific Detail Not Affected by Timing
  • Past work suggests regular event timing improves LTM and increases the reported experience of conscious recollection.
  • However, here, memory for item-specific detail was not affected by event timing regardless of the specific timing parameters used to induce temporal regularity/irregularity.

Discussion

LTM for Item-Specific Detail Not Affected by Timing

• Regular event timing did not improve scene recognition
• Effects of temporal expectation on LTM may be small or variable.
• Perceptual enhancement due to temporal expectation may not be sufficient to have downstream effects on memory.

Acknowledgements

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References
1 Nobre & van Ede. (2018). Nat Rev Neurosci
2 Wilsch et al. (2014). Cerebral Cortex
3 Miller et al. (2013). Psych Science
4 Rohenkohl et al. (2012). J Neuroscience
5 Thavabalasingam et al. (2016). Frontiers Psych