The effects of repetition on the simulation of past and future events

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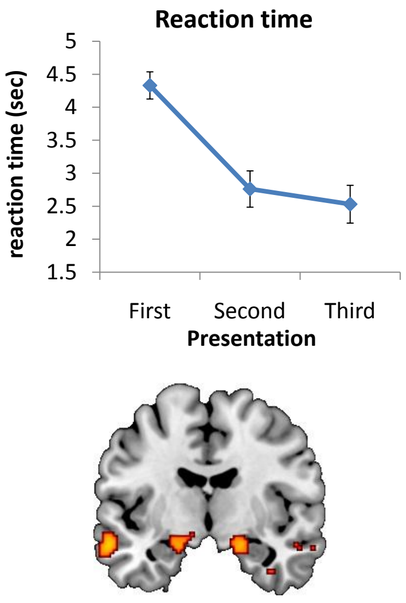
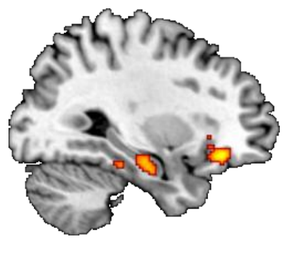
Introduction

Previous fMRI work in our lab has examined the effect of novelty on future event simulation with a repetition suppression paradigm[1].

We found that repetitions decrease reaction times for event construction, as well as producing an fMRI adaptation effect in a number of regions recruited by episodic simulation.





These findings were attributed to the effects of novelty inherent to imagining future scenarios.

It is not clear if these effects are specific to the repetition of future events or if they would occur when repeatedly recalling past events.

To this end, we conducted an adjusted behavioural version of the experiment that requires repeatedly recalling past and imagining future events.

We were also interested in whether the degree of categorical novelty of future events, as indexed by event plausibility, could influence these effects.

Method

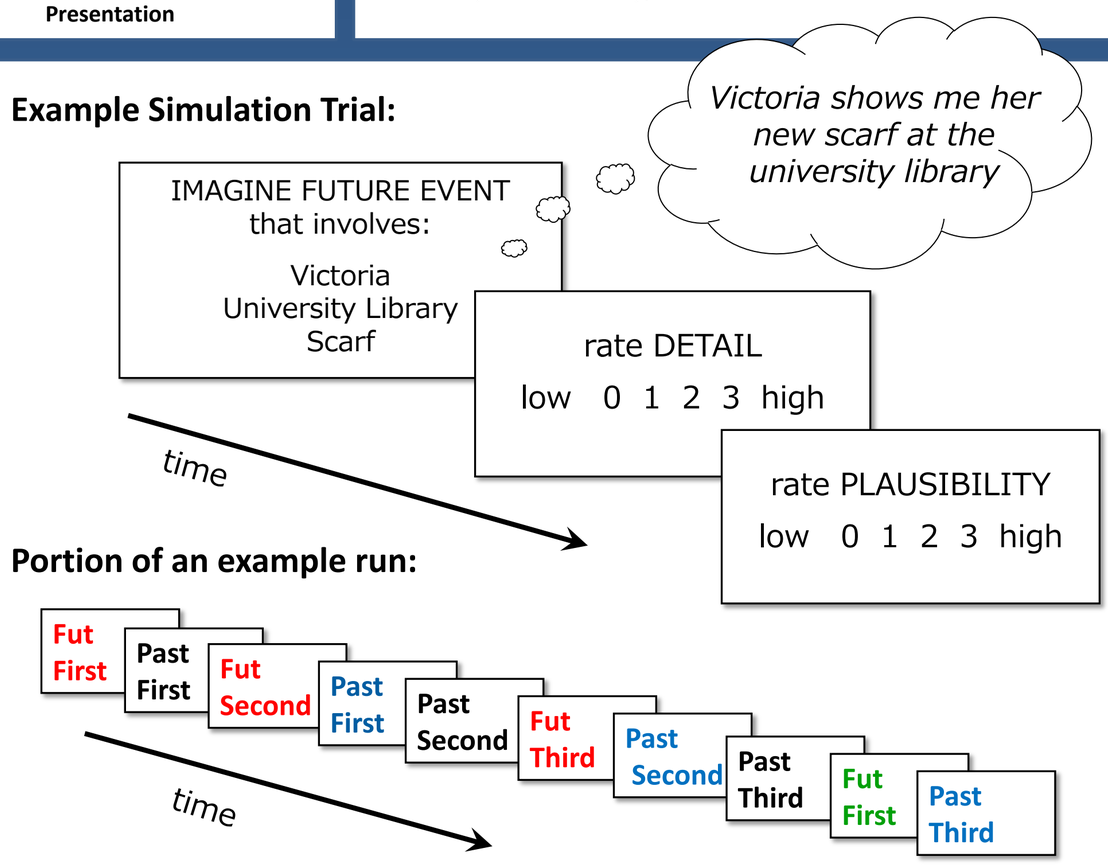
Participants: N=13, age range = 18-22 yrs (*M*=18.9 yrs); 3 males

First session: Participants recalled 100 past events, identifying a unique person, object and location in each memory.

Second session: Completed approx. 1 week later

- *First Simulation Trial:*
  - > Past recall trials: Memory details shown; past event recalled (8 s)
  - > Future simulation trials: Memory details randomly rearranged into novel combinations; future event imagined (8 s)
    - > Button press made when the participant had the event in mind
- *Second & Third Simulation Trials:* Recalled/imagined the same event (for 8 s) twice more after short intervals (12-48 s) of 1-3 trials.
- *Ratings:* During the First presentation, each event was rated for the amount of Detail generated, and the Plausibility of the event (4s)

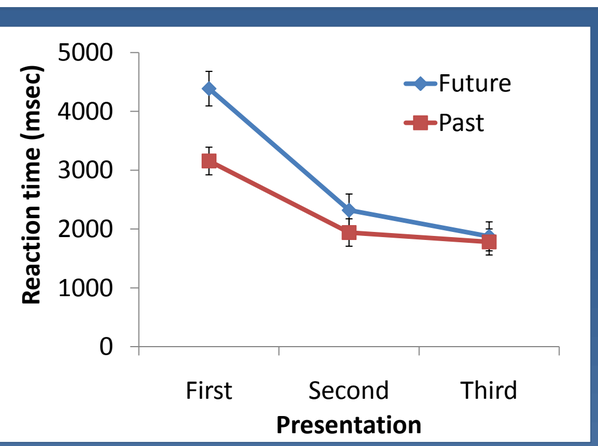
Example Simulation Trial:



Portion of an example run:

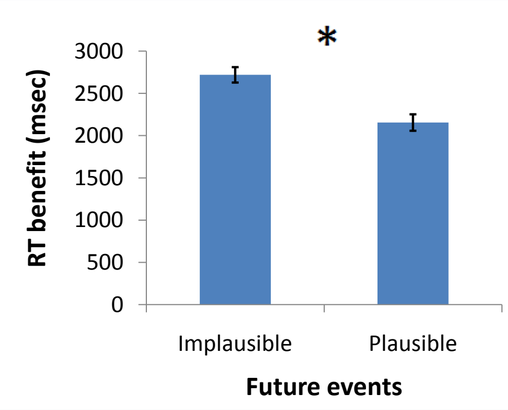
Results – Repetition Effect

- RM-ANOVA: Condition (Past, Future); Presentation (1st, 2nd, 3rd)
- Repetition effects differ between recalled past and imagined future events



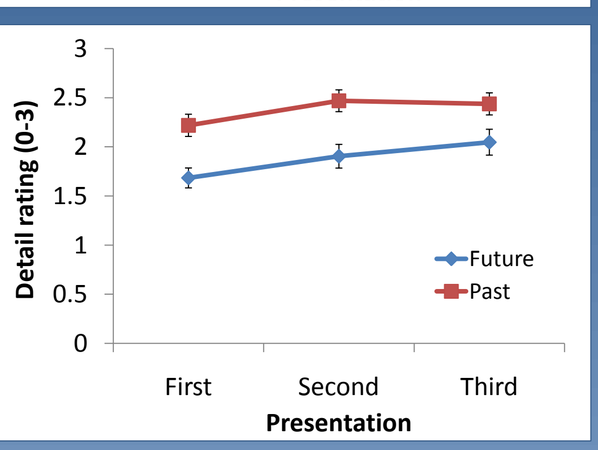
Reaction time

- Main effect of Condition (p< .001)
- Main effect of Presentation (p< .001)
- Interaction effect (p< .001)
  - Future: significant RT decreases between all presentations
  - Past: significant RT decrease between 1st & 2nd only



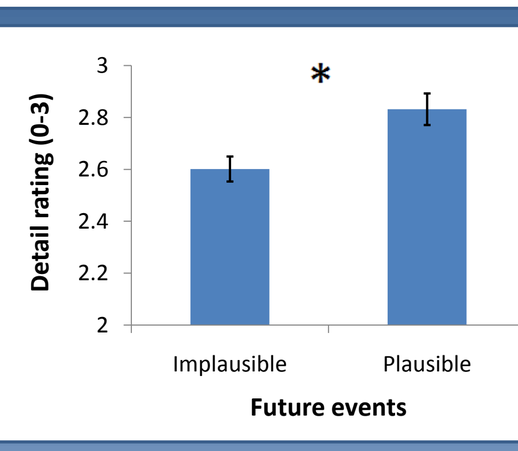
Reaction Time Benefit

- RT benefit = RT decrease between 1st & 3rd presentation
- RT benefit is larger for implausible events relative to plausible events (p<.05)



Detail

- Main effect of Condition (p< .001)
- Main effect of Presentation (p< .001)
- Interaction effect (p< .05)
  - Future: significant Detail increases between all presentations
  - Past: significant Detail increase between 1st & 2nd only



Detail

- Detail ratings collected during 1st presentation were higher for plausible versus implausible events
- Detail ratings were higher for plausible than for implausible events (p<.05)

Conclusions

- It took longer to construct future than past events, and construction time decreased across presentations.
- Importantly, the effect of repetition was greater for future event construction than for past events, suggesting these repetition effects are more than an increase in fluency across presentations.
- Categorical novelty appears to influence future simulation: constructing implausible events takes longer and results in greater RT benefits, but the resulting events are less detailed.
- A follow-up fMRI study is planned to further understand the effects of categorical novelty on future events.

References & Funding

[1] van Mulukom et al., *submitted*

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