



# Acute effects of alcohol on prospective memory

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# Outline

- What is prospective memory?
- Assessing it with the Virtual Week
- How does acute alcohol affect prospective memory?
- Can any deficits be overcome by ‘simulating’ future events?
- Conclusions

## Prospective memory (PM)

- Memory for intentions - remembering to do something in the future such as taking medicine on time, collecting dry-cleaning, or doing something we promised to do.

## Prospective memory (PM)

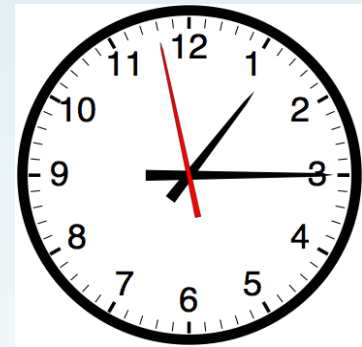
- Memory for intentions - remembering to do something in the future such as taking medicine on time, collecting dry-cleaning, or doing something we promised to do.
- Most everyday forgetting reflects prospective memory (PM) failures.
- Prospective memory failures cause more deficits in daily living than retrospective memory failures (Smith, Della Sala, Logie, & Maylor, 2000).

## Prospective memory (PM)

- Involves a retrospective component: remembering *what* you need to do *when* in the future.
- Also involves prefrontal/ executive systems such as planning & monitoring (Burgess & Shallice, 1997).

# Types of Prospective memory (PM) tasks

- **Time-based tasks** (McDaniel & Einstein, 1990)  
Require self-initiated activity in absence of cues
  - E.g. ‘Phone the plumber at 4pm’; ‘Get your hair cut at 1.15pm’
- **Event-based tasks**  
Require monitoring the environment for cues.
  - E.g. ‘Post the letter when passing the post-box’; ‘Drop the DVD off at the rental shop on your way home.’



## Types of Prospective memory (PM) tasks

- **Regular tasks** are those that happen routinely,  
e.g. take your medicine with breakfast each morning.
- **Irregular tasks** are occasional tasks that can be either  
time- or event-based,  
e.g. take particular papers to your office on Tuesday.

## Acute alcohol and memory

- Well established that acute alcohol (& chronic abuse) impairs memory for past events.
- How does alcohol affect memory for future events?

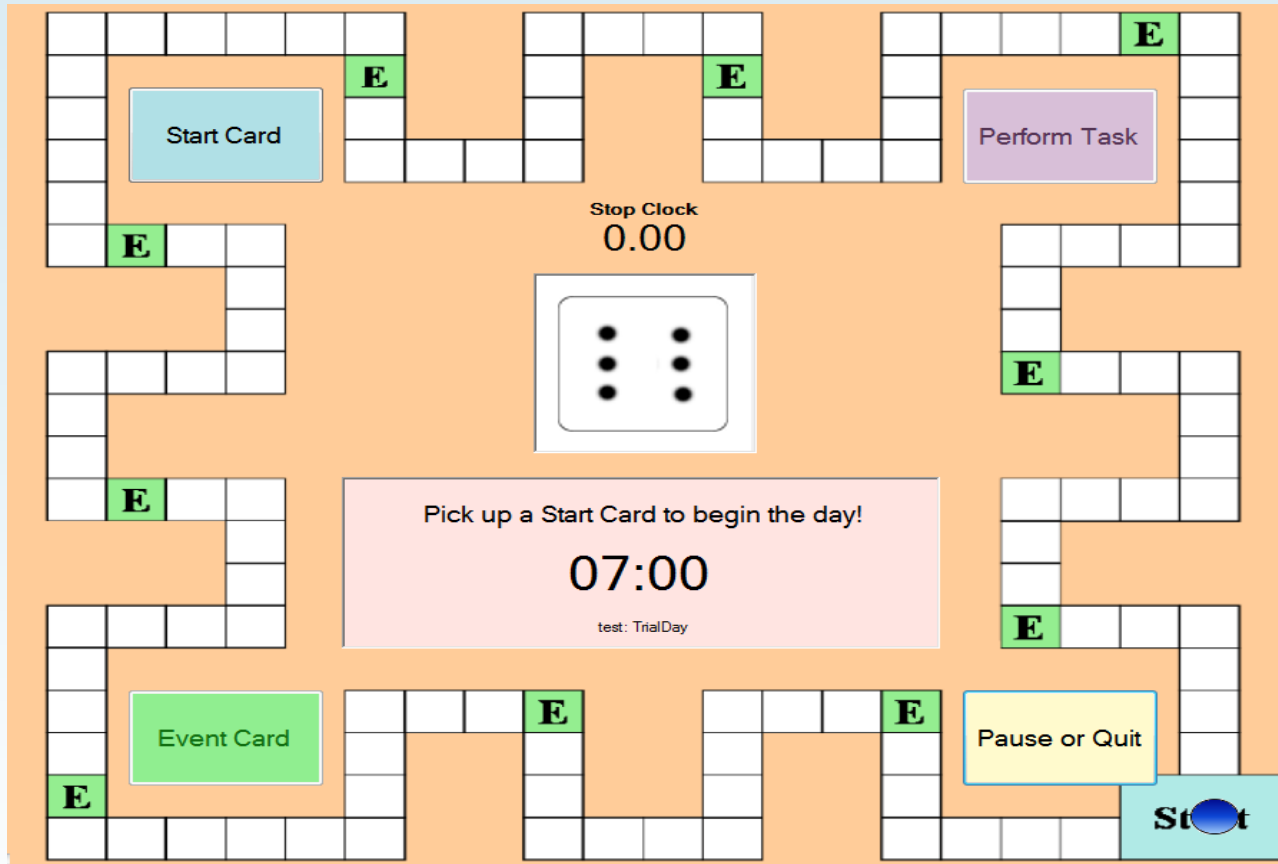


## Acute alcohol and memory

- Well established that acute alcohol (& chronic abuse) impairs memory for past events.
- How does alcohol affect memory for future events?
- Prior research used a questionnaire (PMQ). Increased self-rated alcohol use is associated with increased self-rated PM failures (Heffernan et al, 2002; Ling et al, 2003; Heffernan & Bartholomew, 2006).
- BUT - does this relate to actual PM performance?

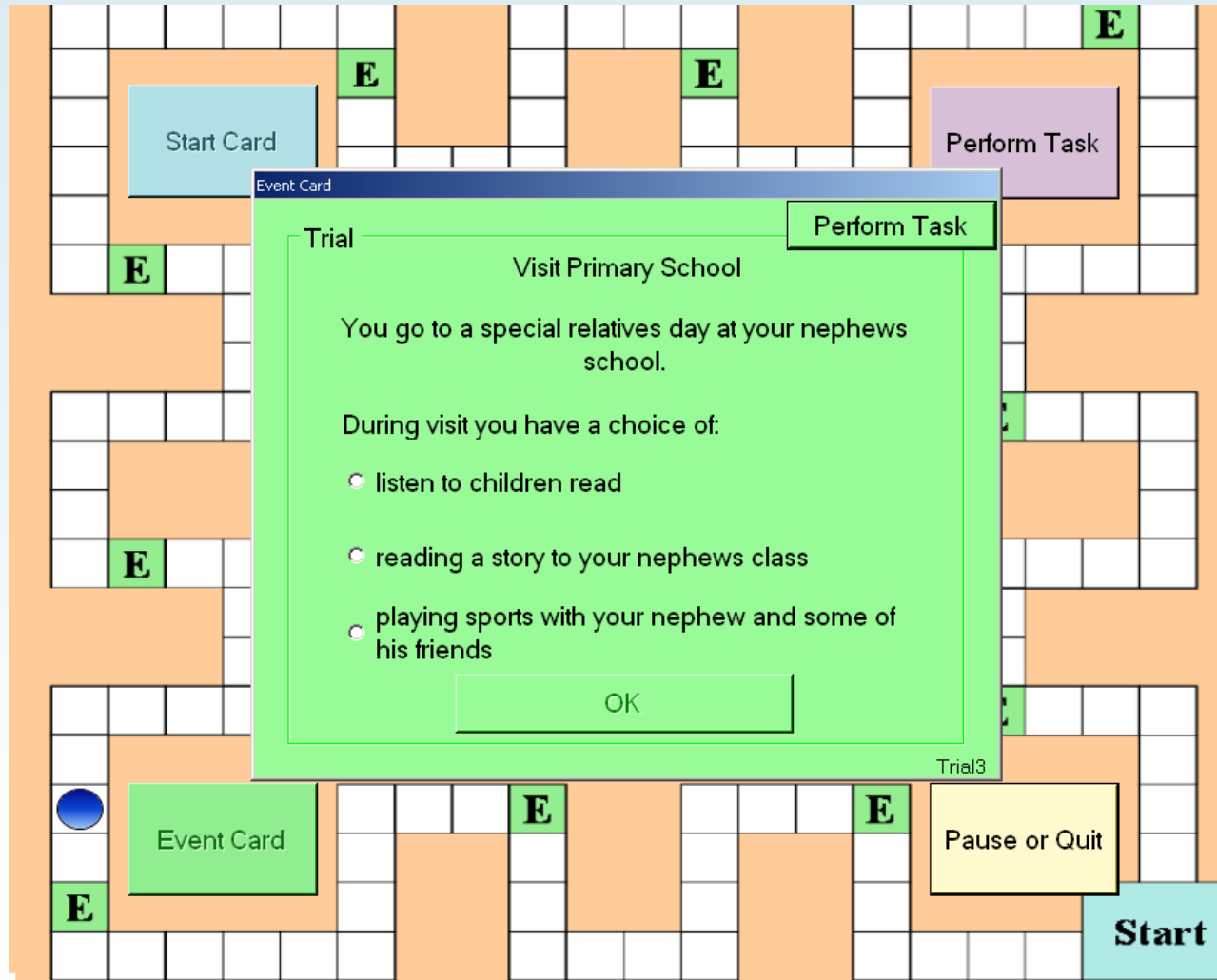
## How to assess prospective memory?

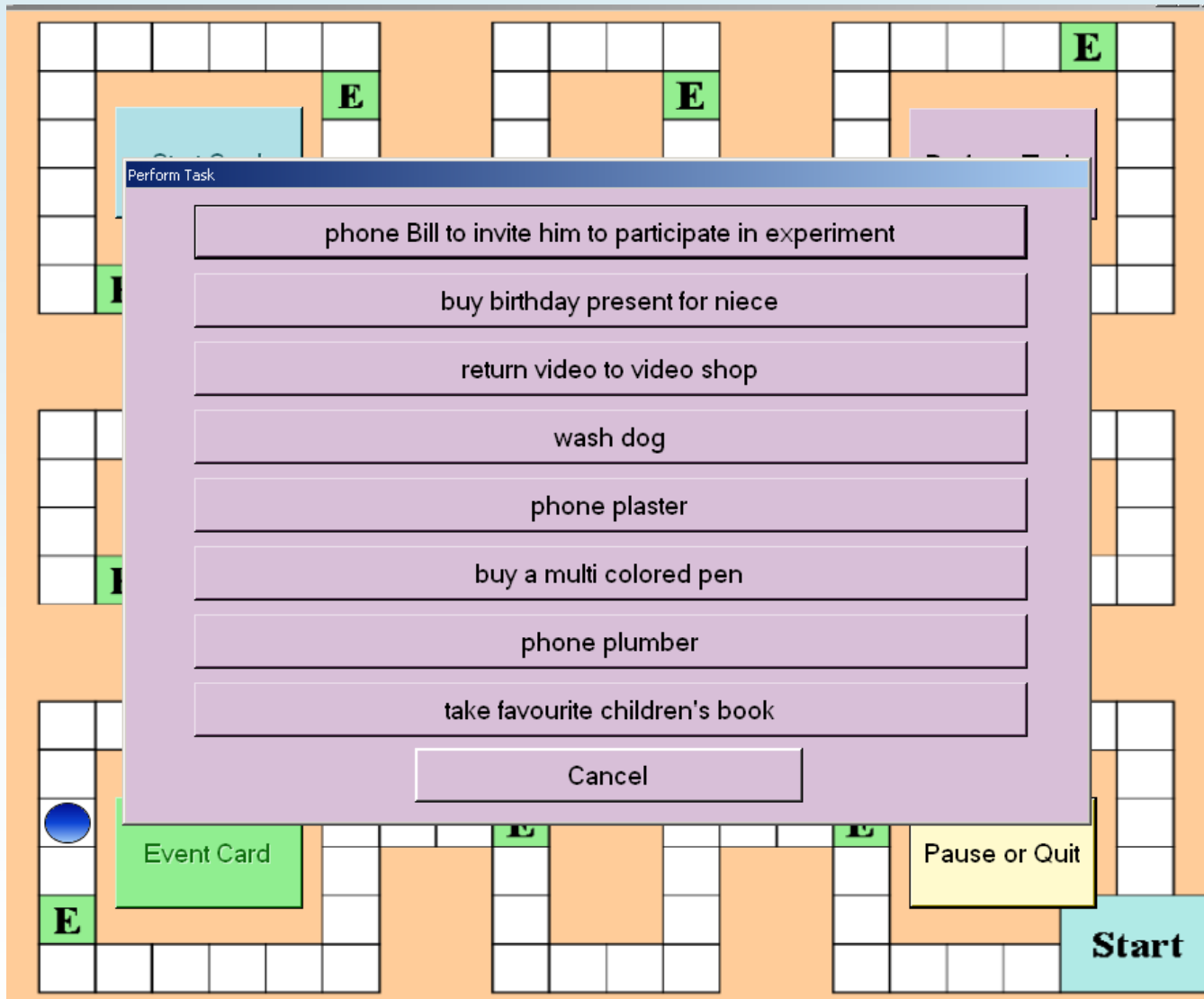
- Various measures e.g. Rivermede.
- ‘Virtual Week’ Rendell & Craik (2000)
- Designed to mimic demands of everyday life.
- Sensitive to aging & organic damage.



# 'Virtual week' (Rendell & Craik, 2000)





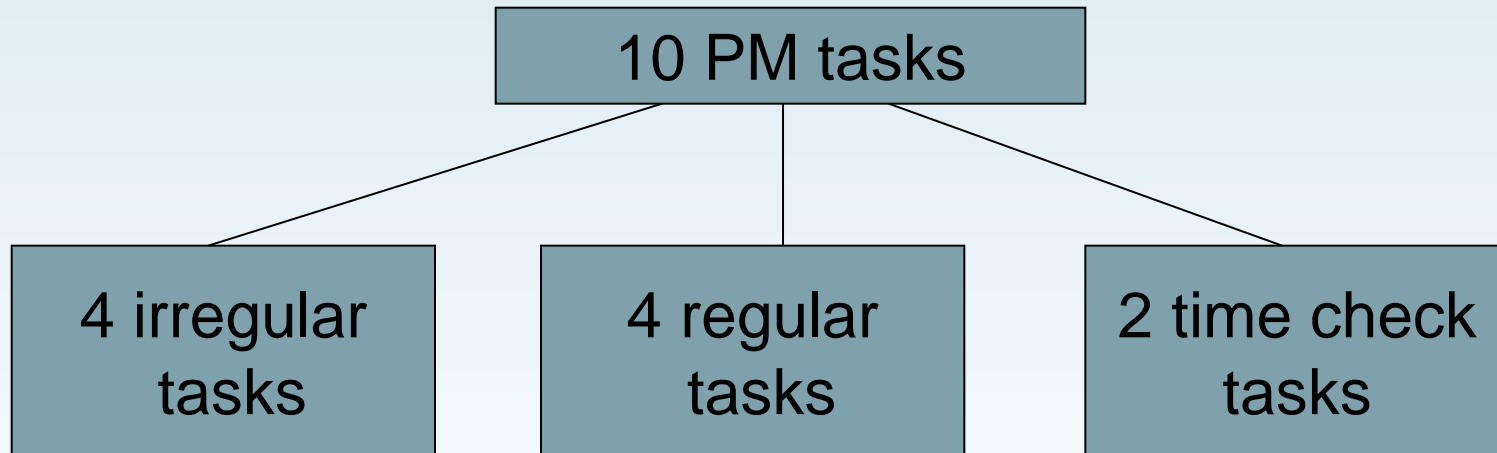


The image shows a screenshot of a game interface. The background is a grid-based map with orange and white cells. Several green squares with the letter 'E' are scattered across the map. A blue circle is located in the bottom-left area. A light blue box labeled 'Start' is in the bottom-right corner. A green box labeled 'Event Card' is in the bottom-left area. A yellow box labeled 'Pause or Quit' is in the bottom-right area. A large purple dialog box titled 'Perform Task' is centered on the screen, containing a list of tasks:

- phone Bill to invite him to participate in experiment
- buy birthday present for niece
- return video to video shop
- wash dog
- phone plaster
- buy a multi colored pen
- phone plumber
- take favourite children's book

A 'Cancel' button is located at the bottom of the dialog box.

# A DAY ON VIRTUAL WEEK

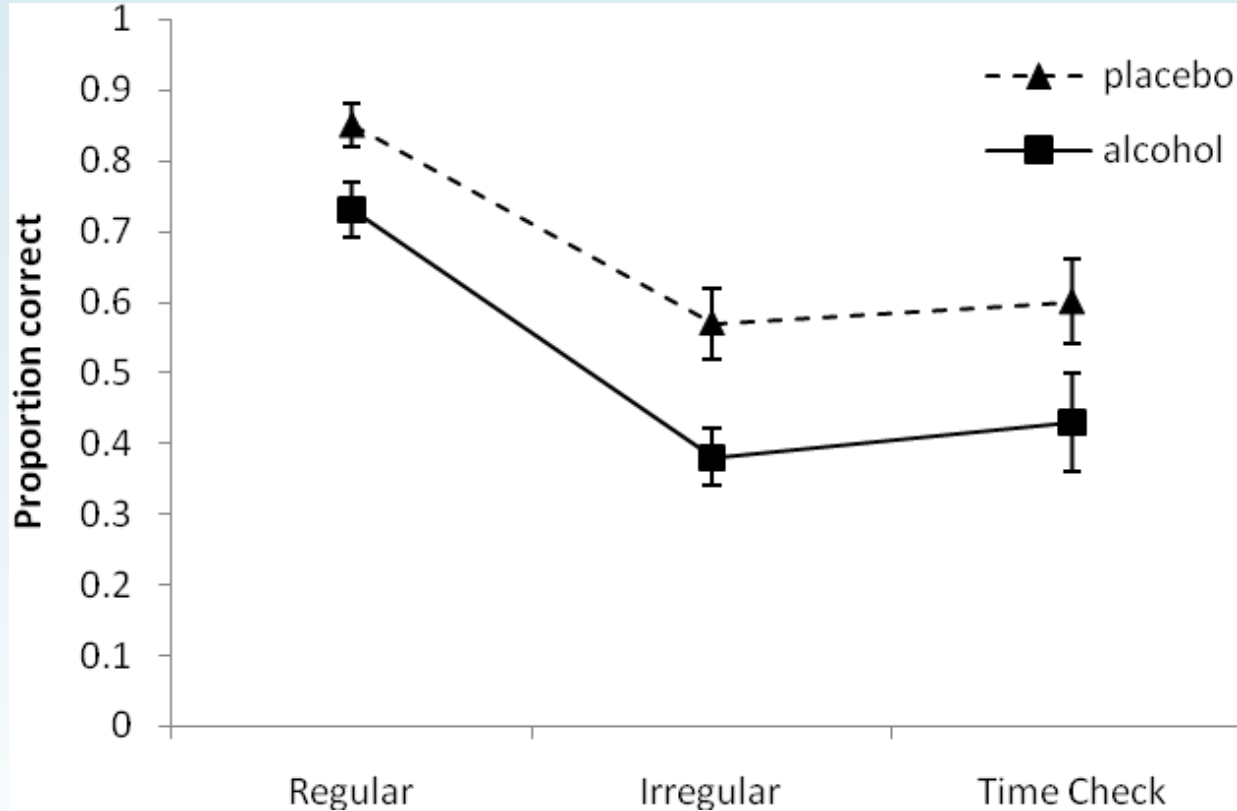


# How does acute alcohol affect Prospective memory?

## Design

- 40 healthy volunteers; 20 males & 20 females randomly assigned to alcohol (0.6g/kg) or placebo.
- Double-blind procedures.
- Three 'Virtual Days'
- Also assessed retrospective memory (prose recall) and executive planning (Tower of London).

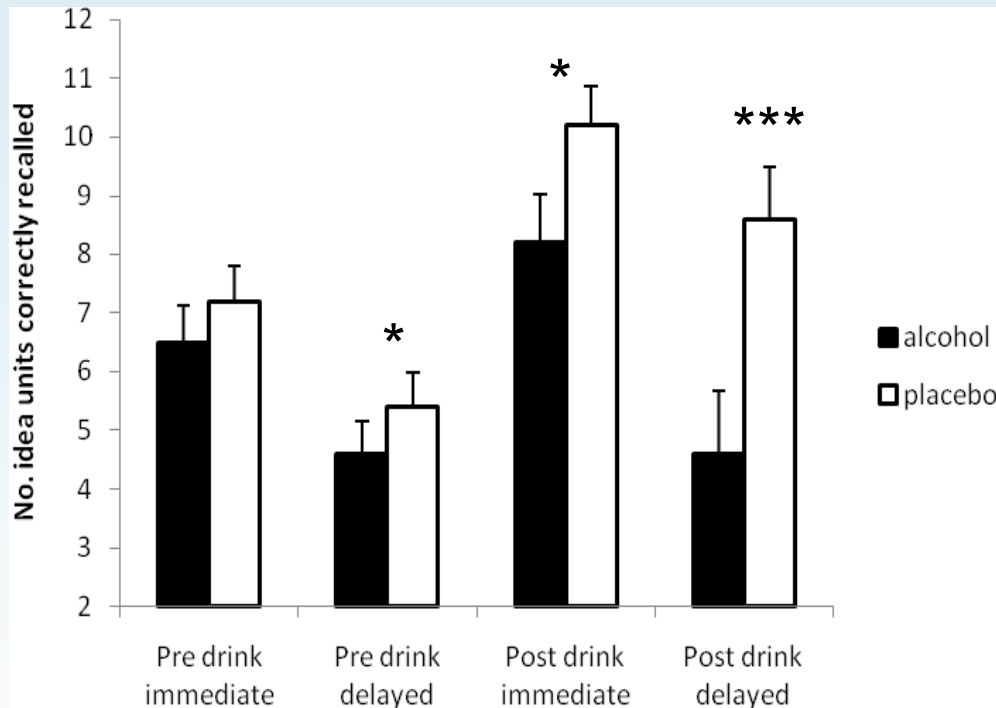




Proportion correct of each type of PM task

Main effects of drink ( $p=0.002$ ) & task ( $p<0.001$ ); no interaction.

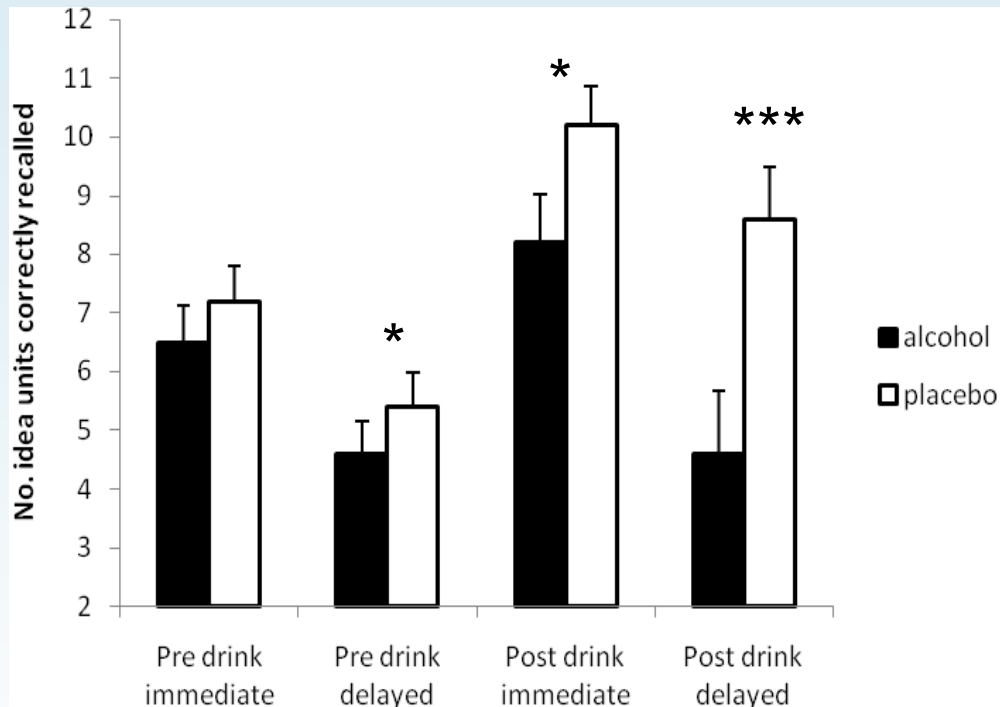
# Prose recall



# Tower of London

No effects of alcohol on any measure

## Prose recall

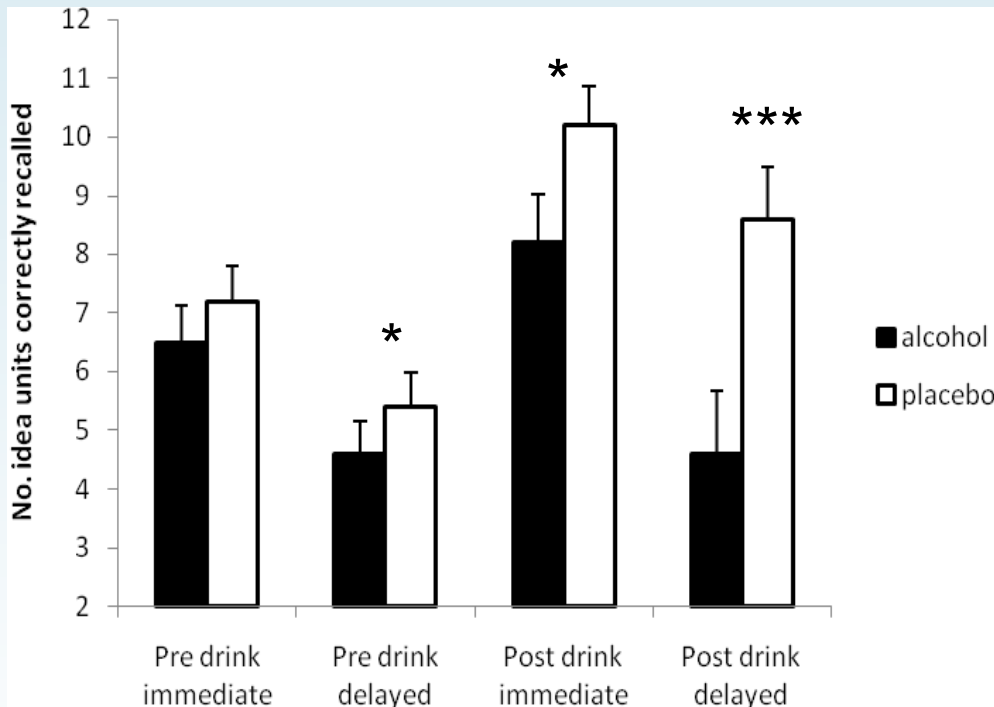


Delayed prose recall in alcohol group correlated with proportion correct on irregular PM tasks ( $r=0.564$ ;  $p=0.012$ )

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No effects of alcohol on any measure

## Prose recall



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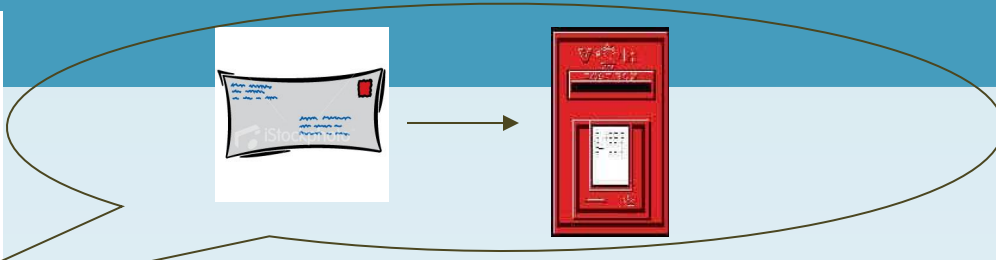
## Tower of London

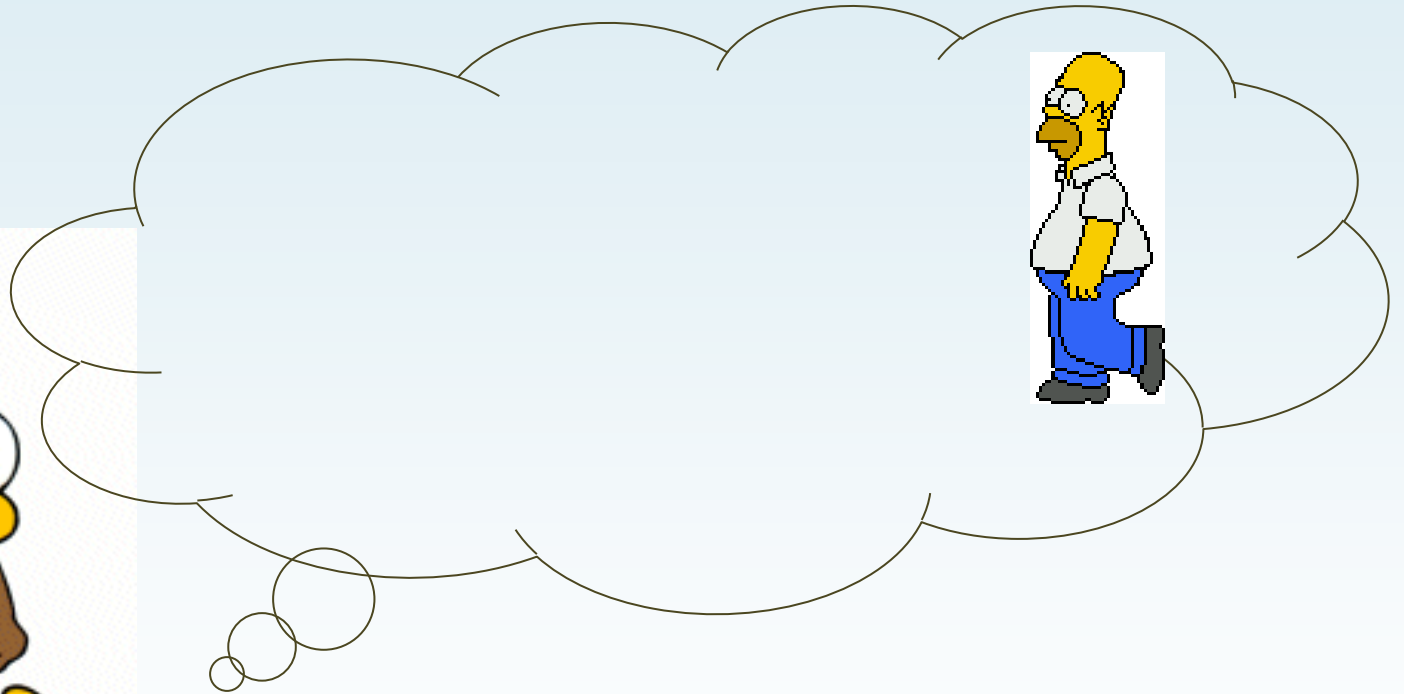
No effects of alcohol on any measure

Suggests i) alcohol impairs PM across all 3 PM tasks; ii) retrospective memory shares about 31% of variance with prospective memory performance.

# Simulation of future events

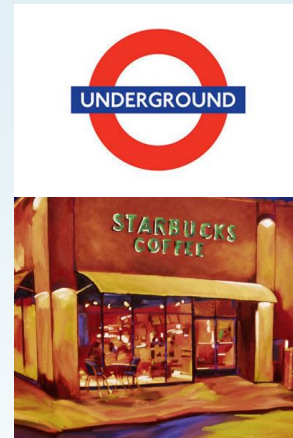
- Key aspect of memory is to enable 'mental time travel' not only to the past but also to the present & future  
(Tulving, 1995; 2000).
- Mentally simulating future events allows us to 'pre-experience' them & construct future scenarios to help us plan.
- Schacter et al (2007) suggested that simulation of future events will enhance PM.

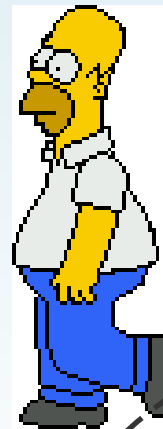




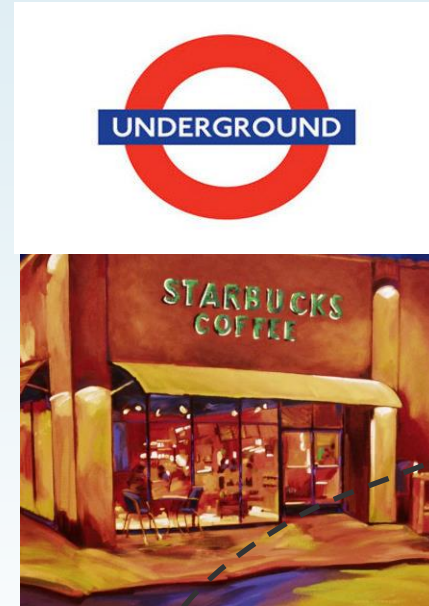
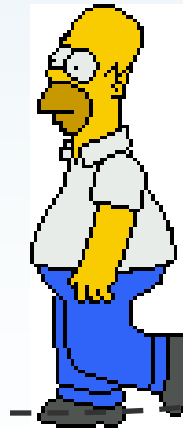
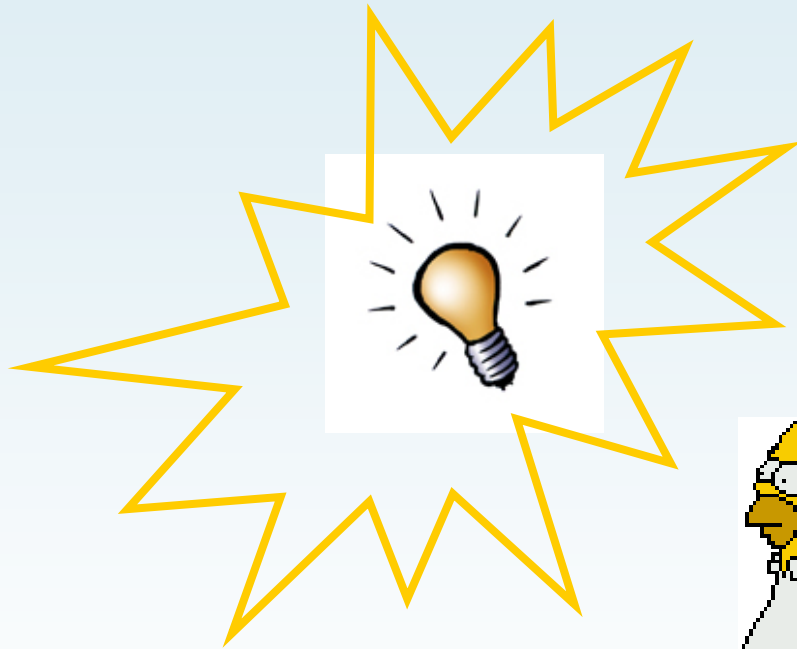


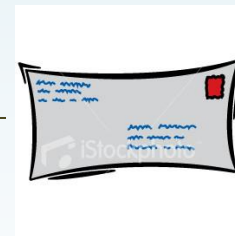
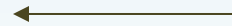






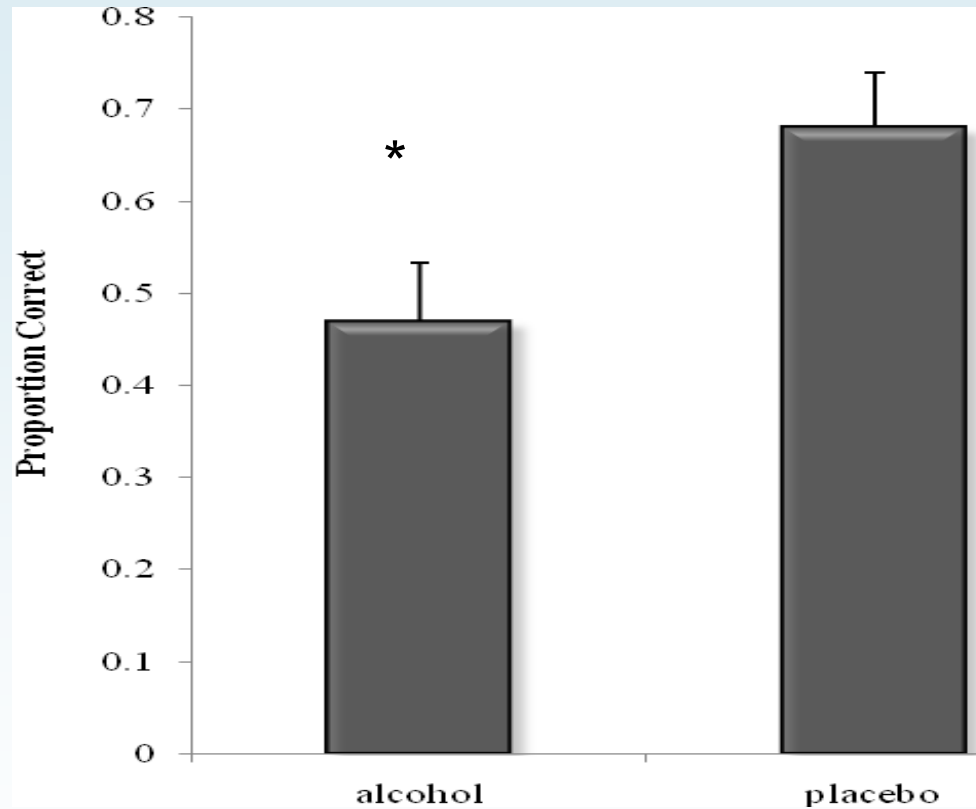






## Design

- 32 healthy volunteers; 16 males & 16 females randomly assigned to alcohol (0.6g/kg) or placebo.
- Double-blind procedures.
- Two days standard Virtual Week; Two days Simulate irregular tasks.
- Also Tower of London; source memory.



Proportion correct – regular tasks (standard instructions)

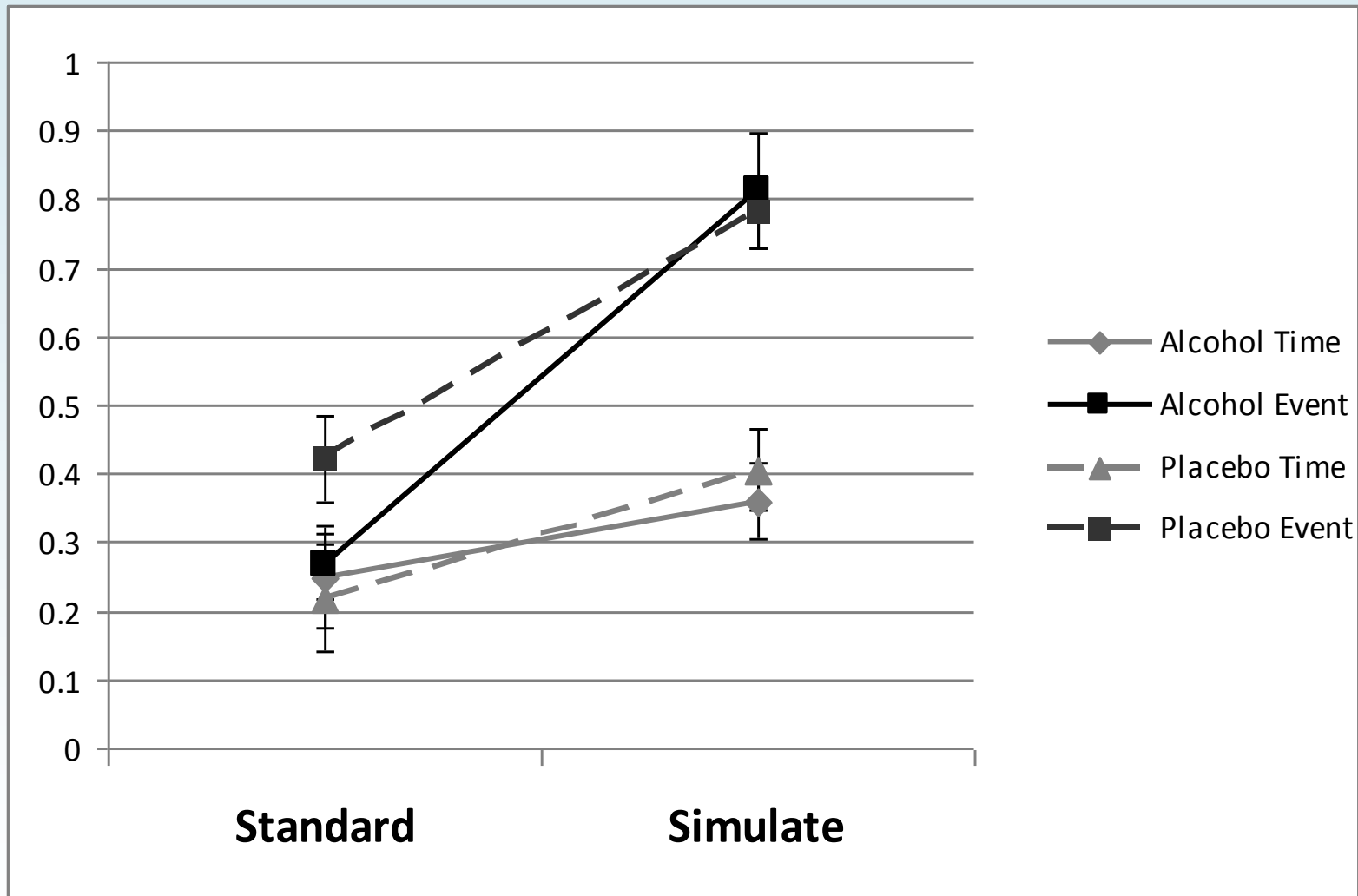
## Source memory

Alcohol group had poorer source memory ( $p=0.017$ ).

## Tower of London

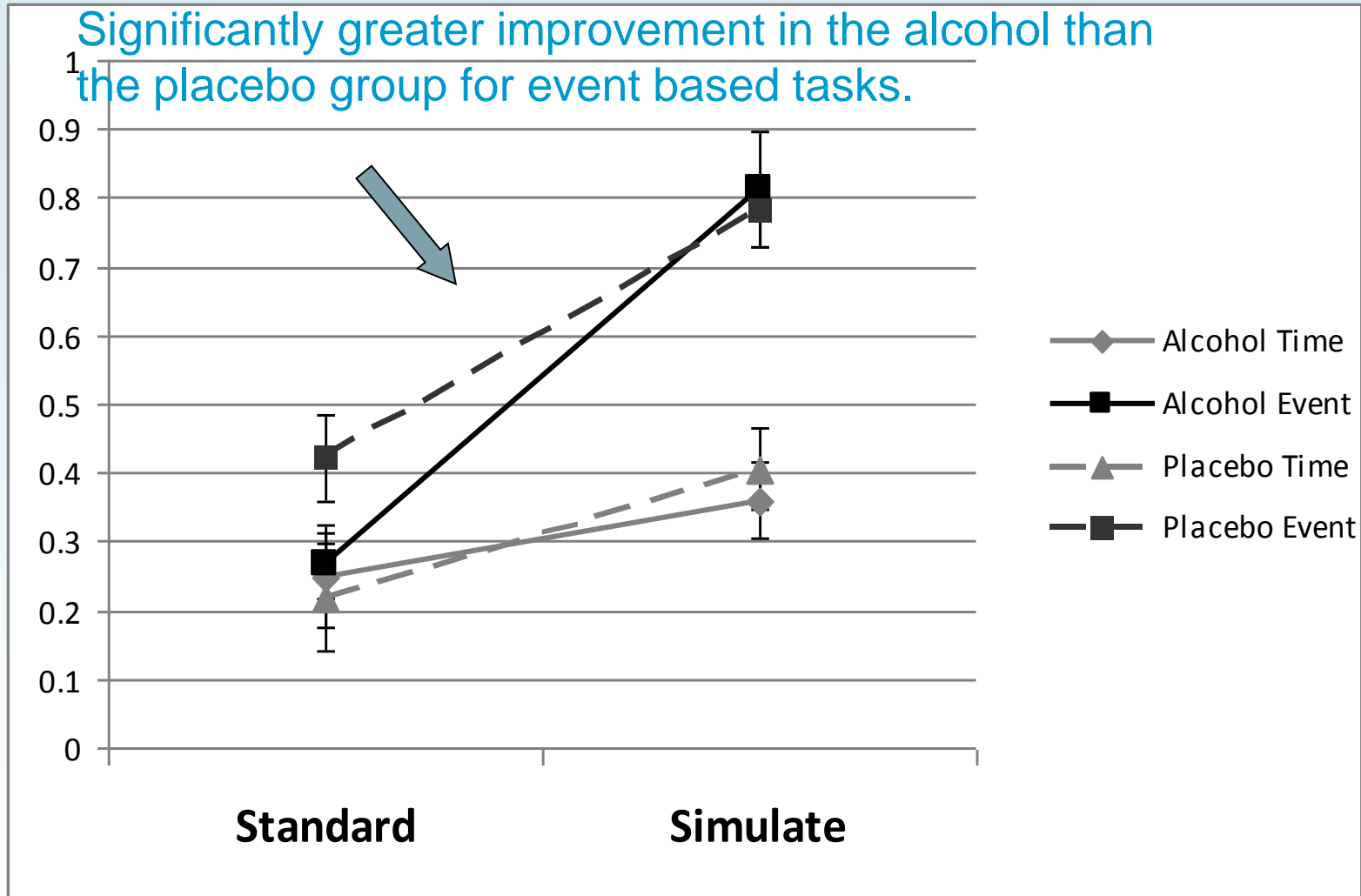
No effects of alcohol





Proportion correct: irregular time & event-based tasks.

Significantly greater improvement in the alcohol than the placebo group for event based tasks.



Proportion correct: irregular time & event-based tasks

## Conclusions

- Acute alcohol impairs event-based PM.
- Mental simulation of future events reverses this impairment.
- PM failures may be an important factor in the clinical management and rehabilitation of those diagnosed as alcohol dependent.
- Translation to the clinic? Can simulation of future events be a therapeutic aid which might impact on relapse rates?

# Thank you!

## And



Julie Leitz



James Bisby



Thea  
Paraskevaides



Celia Morgan

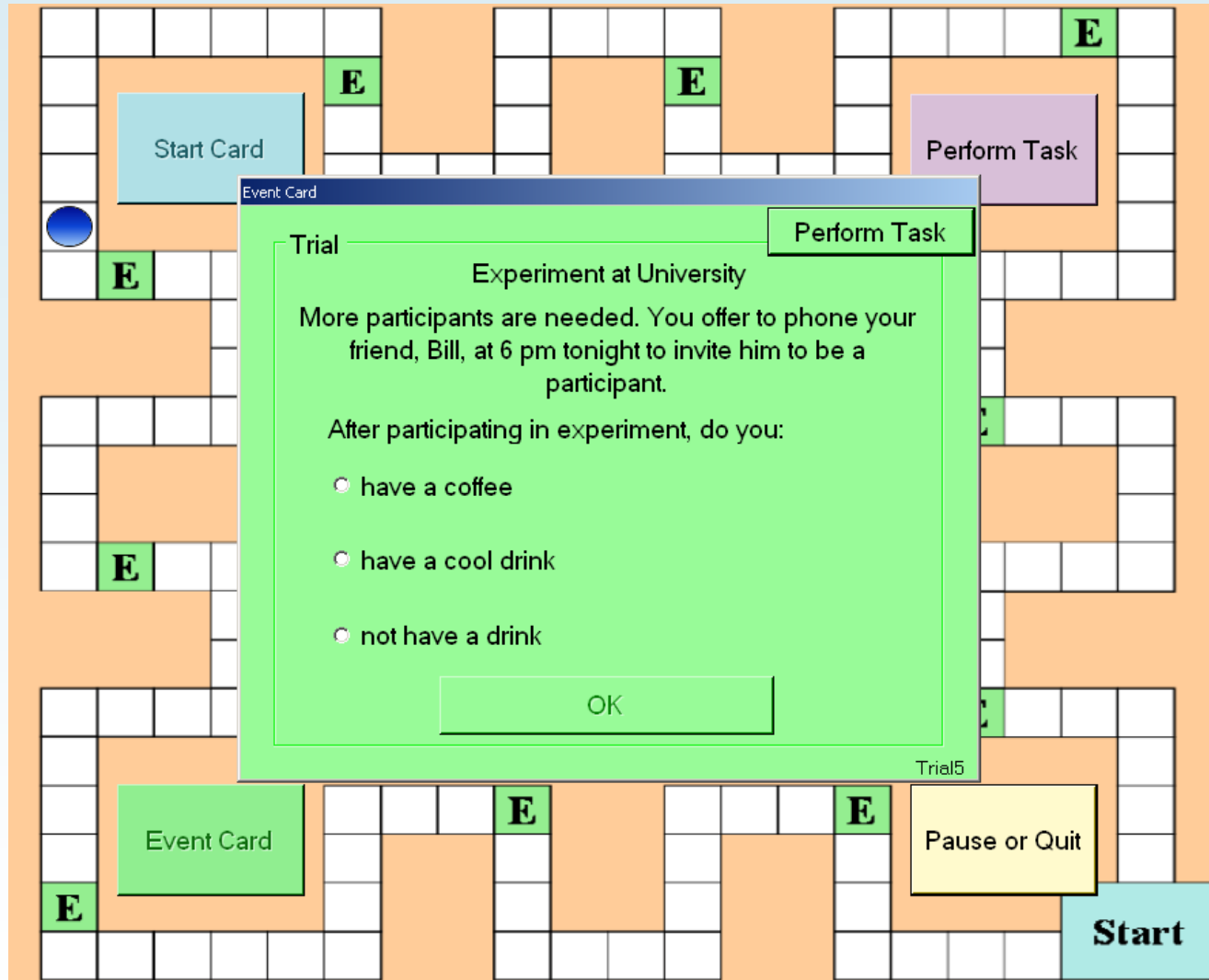


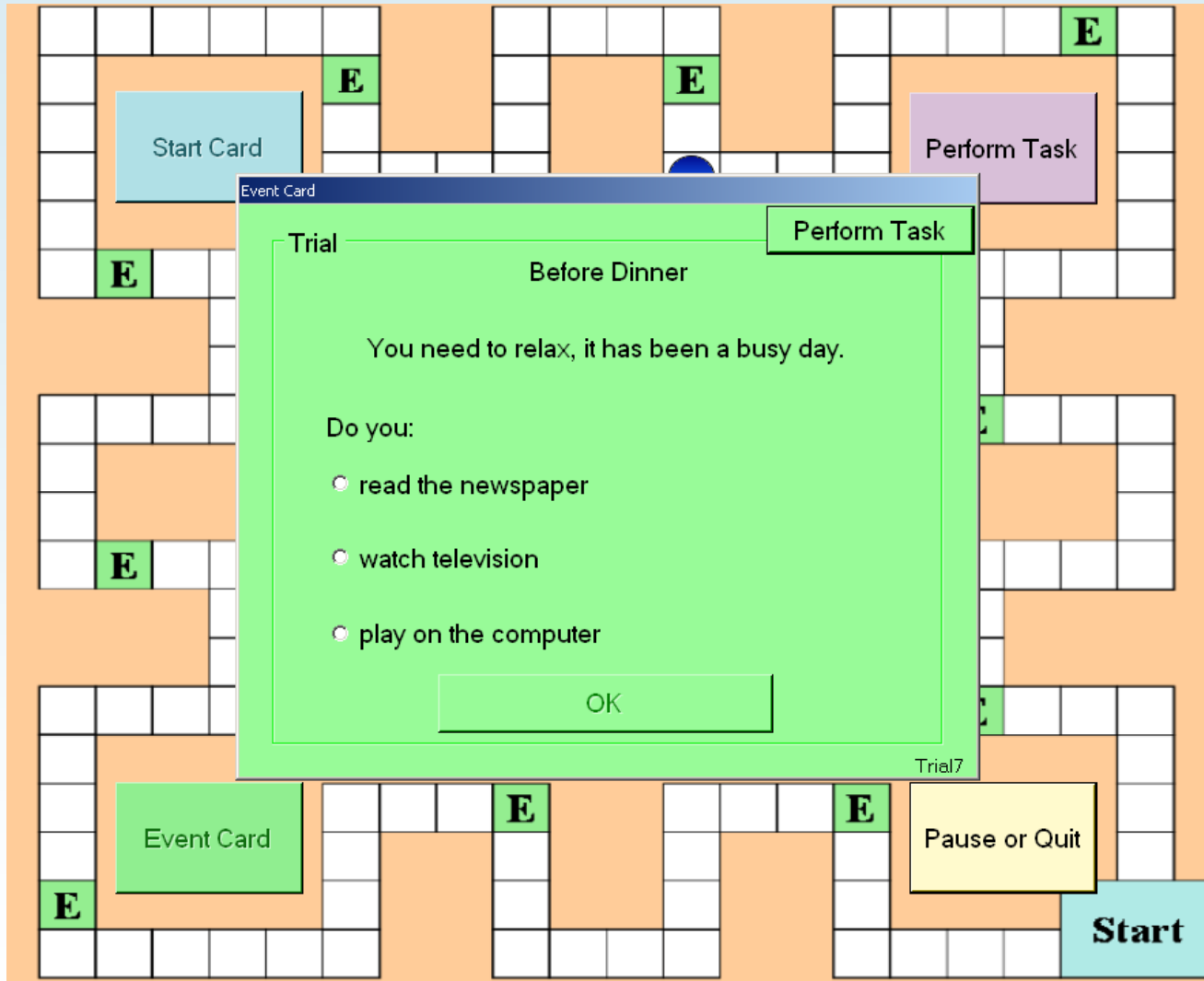
Peter Rendell

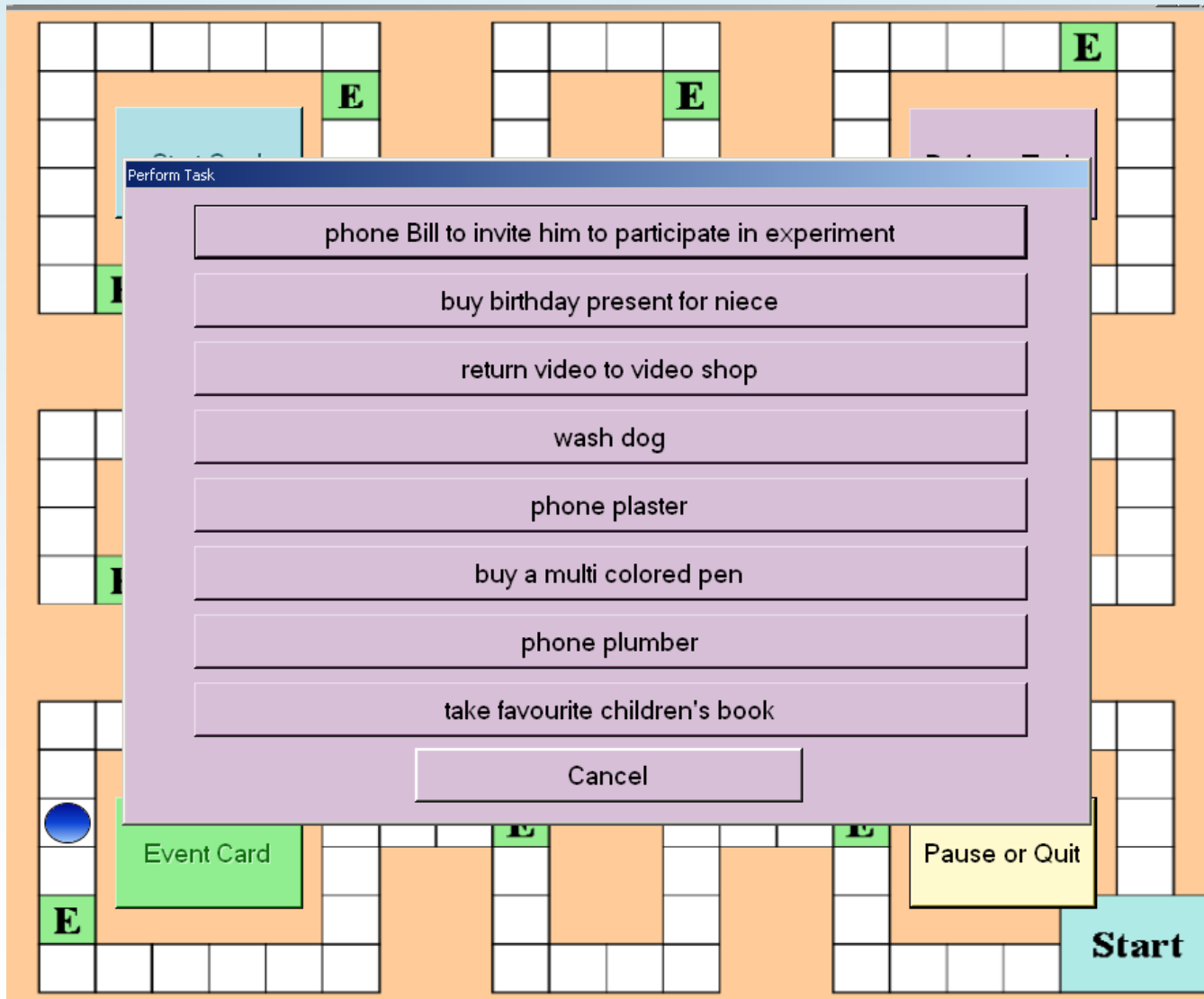
# & AERC

**Table 1.** Procedure: tasks performed with corresponding times and breath alcohol levels (BAC)

<b>Time (mins)</b>	<b>Tasks and measures</b>
0	Vividness of Visual Imagery Questionnaire Prose recall - immediate Virtual Week instructions Initiation of alcohol administration (0.6 g/kg) Virtual Week Trial day Alcohol Usage Questionnaire
30	End of alcohol administration period Source memory encoding
35	Virtual Week – two days control condition
40	BAC 1 = 0.48 ( $\pm$ .16) g/l
55	Tower of London, Prose recall - immediate, Source memory recall
70	Top-up drink 1 (0.1g/kg) Virtual Week – two days simulate condition
80	BAC 2 = 0.54 ( $\pm$ .11) g/l
90	Top-up drink 2 (0.1 g/kg) Virtual Week – two days simulate condition
100	BAC 3 = 0.53 ( $\pm$ .13) g/l
110	Delayed recall tasks for prose recall
115	Question choice memory Guess on drink, payment







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**Perform Task**

- phone Bill to invite him to participate in experiment
- buy birthday present for niece
- return video to video shop
- wash dog
- phone plaster
- buy a multi colored pen
- phone plumber
- take favourite children's book

Cancel

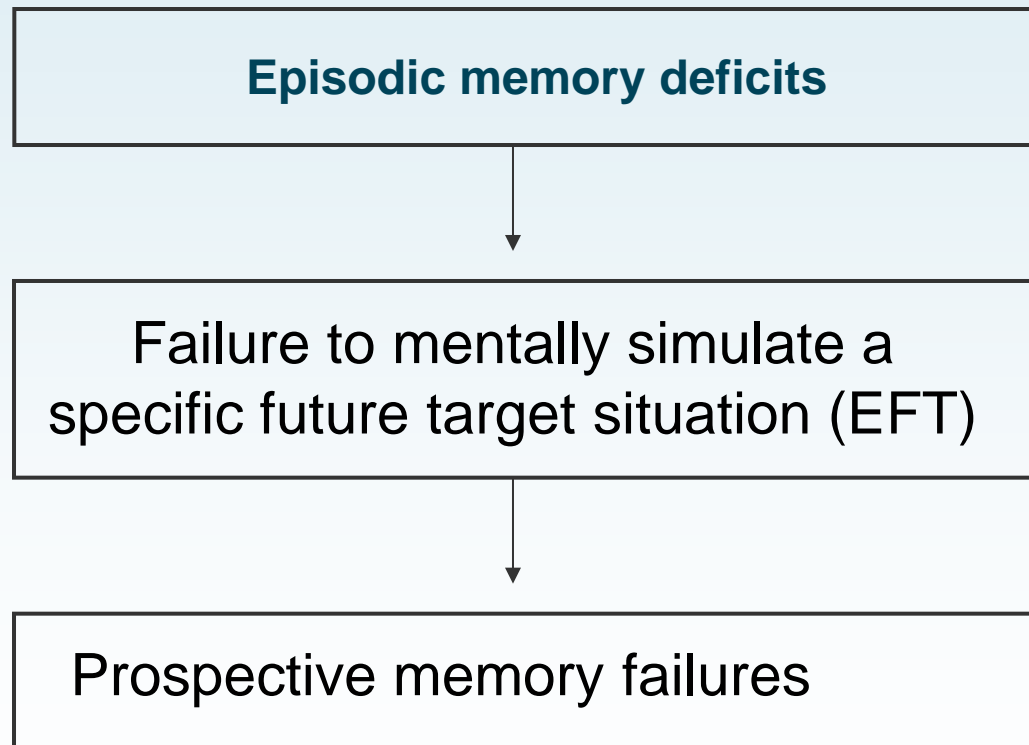
Event Card

Pause or Quit

Start



# Hypothesis



**“Post a letter when passing by the post-box that is next to the tube station.”**

