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)
Your appointments for today:

- phone plumber at 4pm
- take favourite children's book when you visit a school

You must throw an even number to wake up

OK
Visit Primary School

You go to a special relatives day at your nephews school.

During visit you have a choice of:

- listen to children read
- reading a story to your nephews class
- playing sports with your nephew and some of his friends

OK
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

Start
A DAY ON VIRTUAL WEEK

10 PM tasks

- 4 irregular tasks
- 4 regular tasks
- 2 time check tasks
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.
No effects of alcohol on any measure
Prose recall

No effects of alcohol on any measure

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

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.

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

Paraskevaides et al
<table>
<thead>
<tr>
<th>Source memory</th>
<th>Tower of London</th>
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<tbody>
<tr>
<td>Alcohol group had poorer source memory (p=0.017).</td>
<td>No effects of alcohol</td>
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Proportion correct: irregular time & event-based tasks.
Significantly greater improvement in the alcohol than the placebo group for 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)

<table>
<thead>
<tr>
<th>Time (mins)</th>
<th>Tasks and measures</th>
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| 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 (± 0.16) 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 (± 0.11) g/l |
| 90          | Top-up drink 2 (0.1 g/kg)  
Virtual Week – two days simulate condition |
| 100         | BAC 3 = 0.53 (± 0.13) g/l |
| 110         | Delayed recall tasks for prose recall |
| 115         | Question choice memory  
Guess on drink, payment |
Experiment at University

More participants are needed. You offer to phone your friend, Bill, at 6 pm tonight to invite him to be a participant.

After participating in experiment, do you:

- have a coffee
- have a cool drink
- not have a drink

OK
Before Dinner

You need to relax; it has been a busy day.

Do you:
- read the newspaper
- watch television
- play on the computer
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
Prospective memory failures

Failure to mentally simulate a specific future target situation (EFT)

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