



Driving with Future Intentions: Examining the Influence of Prospective Memory Representations on Driving Performance



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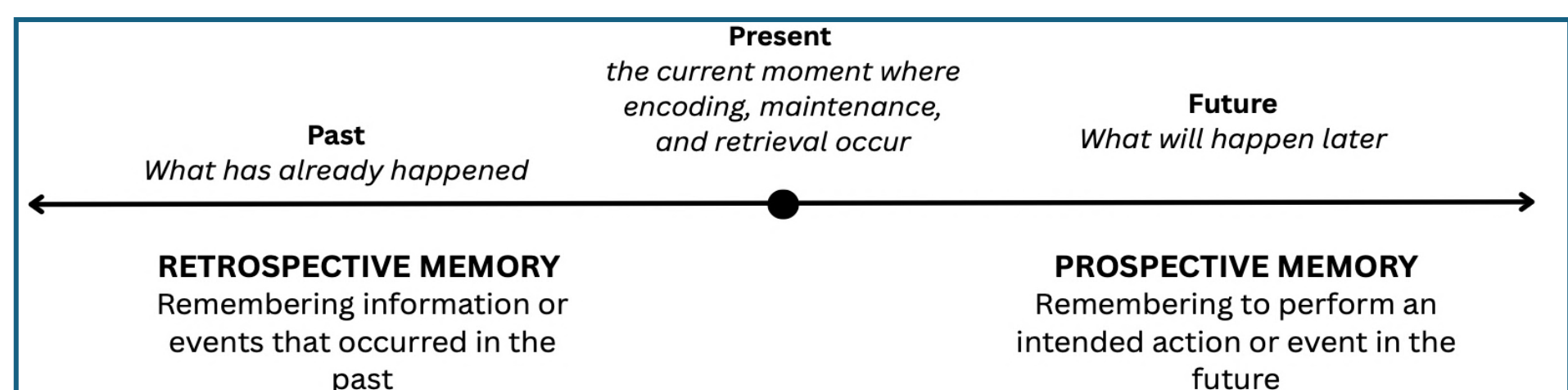
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BACKGROUND

Prospective Memory (PM), a vital cognitive ability to “remember to remember,” supports goal-directed behaviour.

PM failures range from minor inconveniences, such as forgetting to buy milk, to life-threatening consequences, such as leaving an infant in a car (Dismukes, 2012).



But remembering PM comes at a cost: maintaining future intentions can consume cognitive resources and interfere with ongoing task performance (Anderson et al., 2019).

Factors Modulating PM-Related Costs:

Focal PM: Cues are related to the ongoing task, may facilitate spontaneous retrieval.

Non-focal PM: Cues are less related to the ongoing task, requiring more conscious monitoring.

Time-based PM: Requires self-initiated time monitoring and retrieval

METHOD

Participants: N = 30

Mean age of 32.43 years (SD = 10.48)

56.7% aged between 20 and 29 years

Equal number of male and female



Scenario Display

Experimental Design

Design: Within-subjects, repeated-measures experiment.

Conditions: No PM (baseline), focal PM, non-focal PM, and time-based PM.

Order: Baseline always completed first to prevent carryover effects, remaining counterbalanced

Apparatus and Driving Scenario

Simulator: STISIM® Drive (STISIM100WS) at MUARC, Australia.

Scenario: 4-km urban route (~8 min) with a 40 km/h speed limit.

Lead vehicle: Speed varied sinusoidally by ±10 km/h around 40 km/h

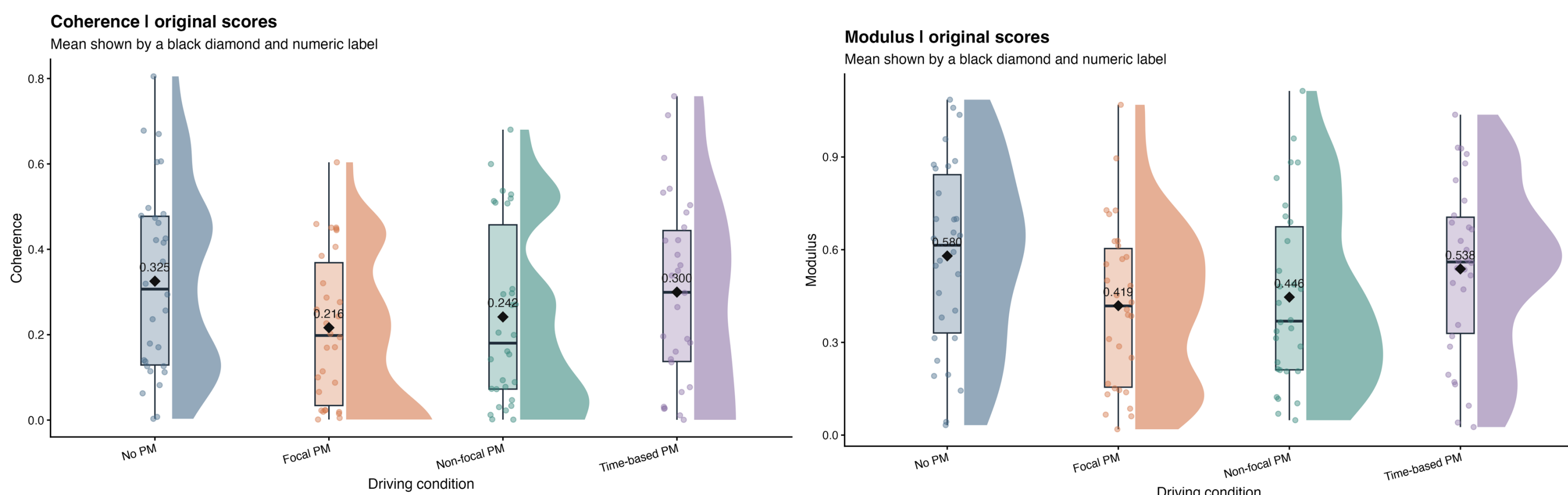


Portable Driving Simulator setup

KEY FINDINGS

PM accuracy: differed significantly across conditions ($p < .001$), with the lowest accuracy in focal PM (74.4%).

Driving costs: Focal and non-focal PM significantly impaired vehicle-following performance, while time-based PM showed smaller, non-significant costs.



Target-specific effects: Steering variability changed during focal and non-focal PM targets; lane position shifted during time-based PM.

PM performance–driving cost: Controlling for PM condition, better PM performance was associated with greater vehicle-following costs coherence in coherence and modulus.

Intention recall: All participants correctly recalled their PM intentions (100%).

AIM OF THE STUDY

Most evidence for cost/ interference effect of PM on ongoing task comes from on the abstract laboratory tasks e.g., Lexical Decision Tasks.

What happens when the ongoing task is driving?

Research Objective?

Do these PM costs extend to safety-critical tasks such as driving?

Research Questions?

To examine whether the introduction of PM tasks impose costs on ongoing driving performance and how these costs vary across PM conditions.

EXPERIMENTAL TASK AND PROCEDURE

Prospective Memory Parking Paradigm (PMPP)

Ongoing task: Follow a lead motorcycle while maintaining a safe, consistent distance.

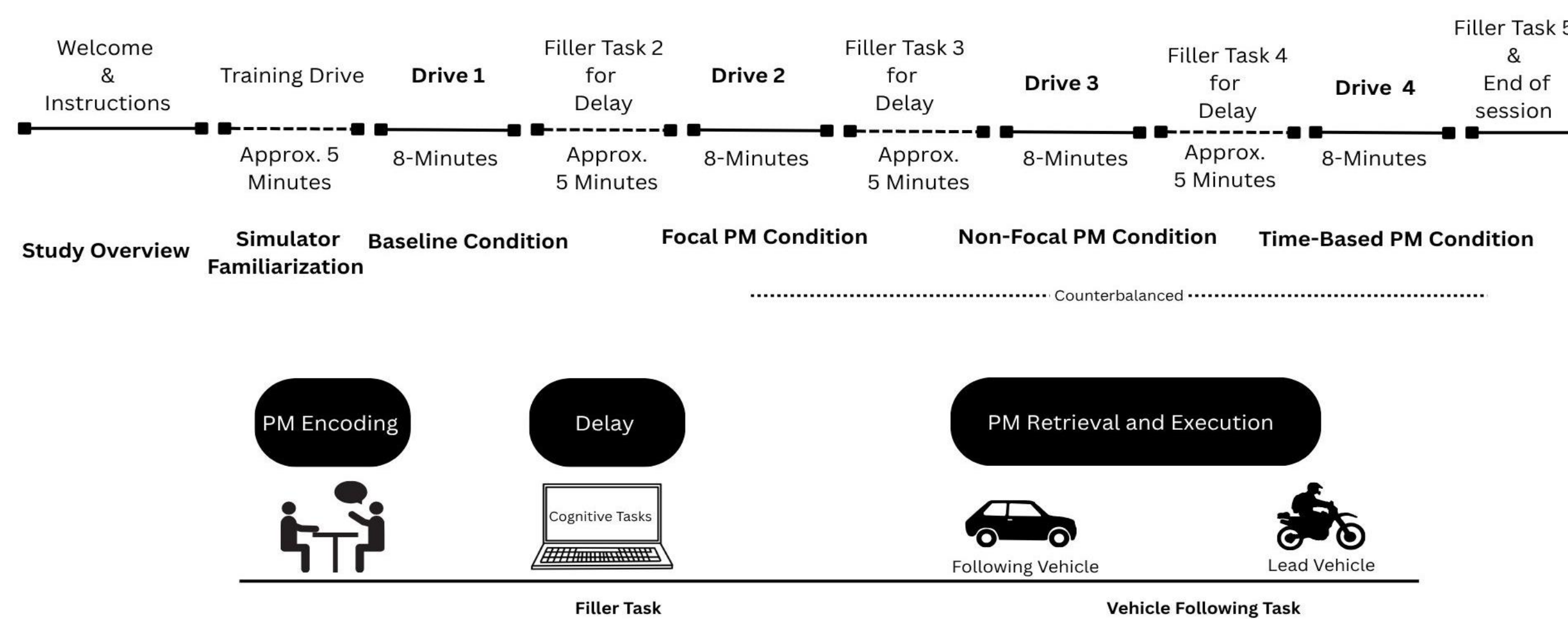
PM tasks (3 targets per condition):

No PM (Baseline): Vehicle-following only.

Focal PM: Press L2 when detecting target parking signs.

Non-focal PM: Press R3 when detecting available parking spaces.

Time-based PM: Press R2 at 2, 4, and 6 minutes, using a clock to monitor time.



CONCLUSION

PM demands can disrupt ongoing driving performance.

Event-based PM produced the clearest vehicle-following costs, particularly focal task.

Better PM performance was associated with greater vehicle-following costs.

Overall, PM demands as a potential source of cognitive distraction in safety-critical contexts.

LIMITATIONS

Only 3 targets per condition limit the reliability of PM accuracy and target-specific driving measures.

The same route was driven in all conditions, so learning or fatigue may partly contribute to differences from baseline.

The PM–driving cost link may reflect prioritization trade-offs, not causation.

REFERENCES

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