Is eyewitness memory continuous or 'all-or-none'?

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Introduction

When eyewitnesses are asked to identify someone from a lineup, they sometimes make a mistake and falsely identify an innocent suspect, or reject a lineup that includes a guilty suspect . Cognitive researchers thus seek to minimise these errors, through the development of a valid measurement model of eyewitness identification behaviour.

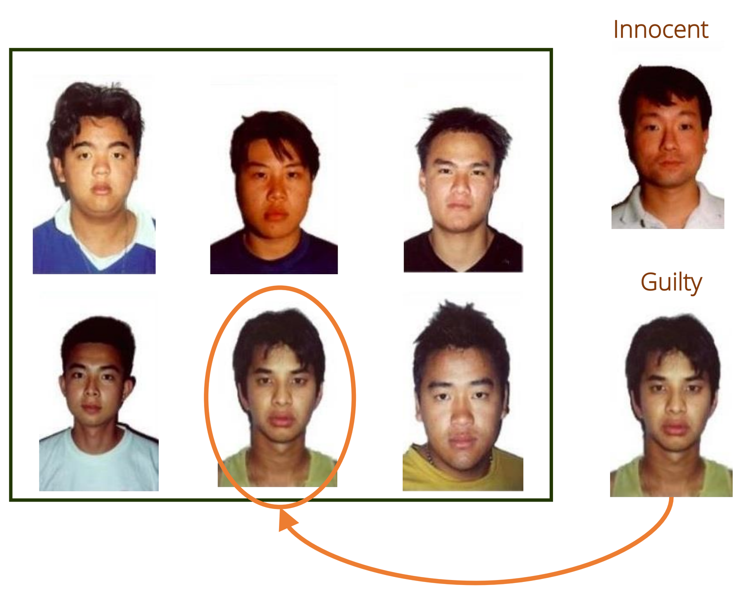
We ask: *how do eyewitnesses access their memory of the perpetrator's face?* Do they just 'remember' or 'forget' what they look like (i.e. memory trace is discrete), or is their recollection sometimes strong and sometimes weak (i.e. memory trace is continuous)?

The continuous and discrete state models of decision making predict different performance outcomes. For example, the discrete-state models predict no changes to 'conditional second guess'[1] accuracy (c_2) as memory strength increases.[2] Does empirical data support this assumption, or does c_2 accuracy improve as memory strength increases?

Experiment 1

Method

Participants (N = 2,008) viewed an online video of a theft.
Task 1: Identify someone as the thief or reject the 2 x 3 simultaneous lineup. Lineups either contained the culprit, or an innocent suspect.
Task 2: Rank members of the line up in order of likelihood that they were the culprit.



Results and discussion

Empirical analysis supported the predictions of the continuous models of eyewitness identification decisions ($\chi^2(3) = 29.24$, $p < .001$). Near perfect fits were calculated between the observed data and data predicted by the continuous model for both the high discriminability ($G^2(3) = 0.1$, $p = .99$) and low discriminability ($G^2(3) = 0.7$, $p = .87$) groups. However, concern was raised regarding the large cross-over effect observed after the fourth rank position. It was suspected that participants were ranking array items based on similarity to the face placed in the first rank position, rather than on their memory of the suspect.

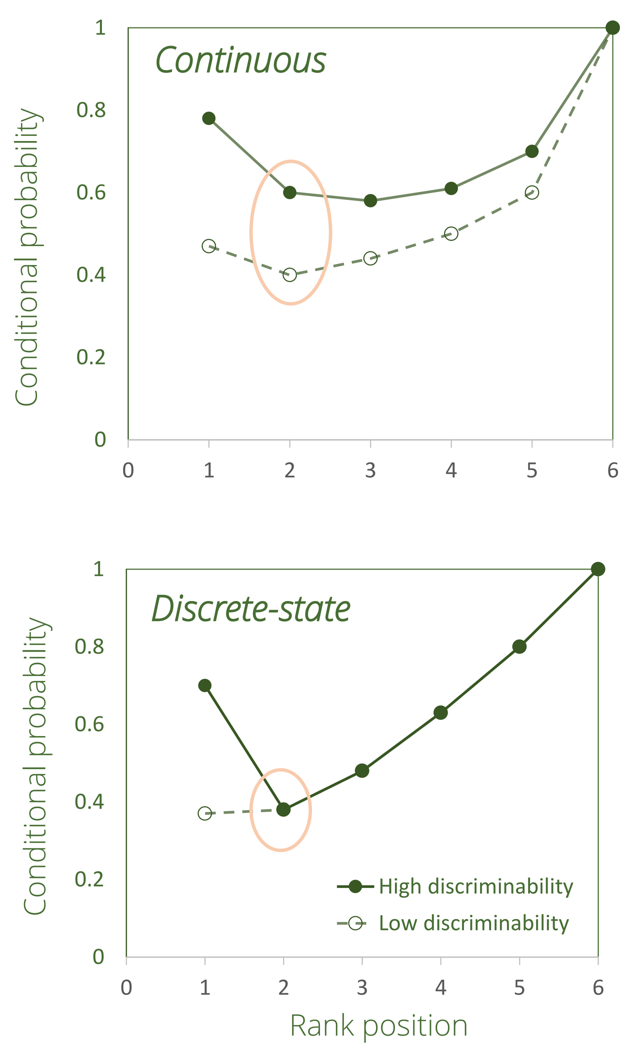


Fig 1. ***Model predictions of conditional accuracy (c_i) across rank positions.*** The top panel shows the continuous models' predicted increase in c_2 as discriminability increases. In contrast, the bottom panel shows the discrete-state models' prediction of no change in c_2 as discriminability increases.

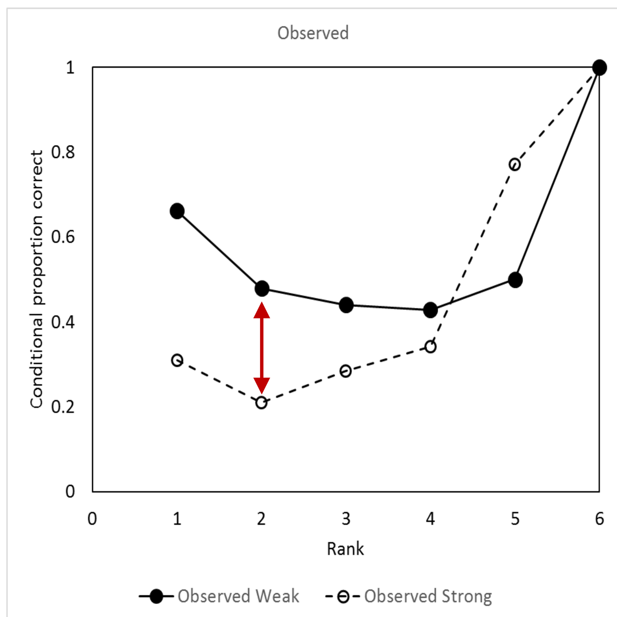


Fig 2. ***Conditional accuracy (c_i) across rank positions.*** The discrete-state model prediction regarding c_2 was falsified, with a much greater c_2 for the high discriminability group, than for the low discriminability group.

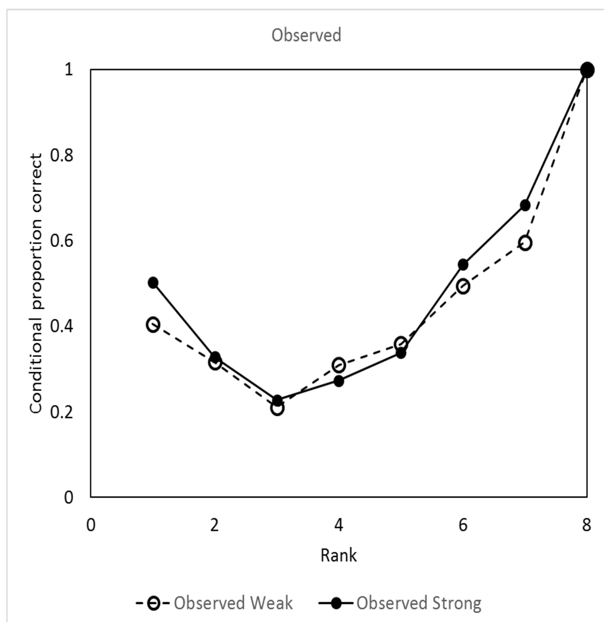


Fig 3. ***Conditional accuracy (c_i) across rank positions.*** Conditional second choices, c_2, were not significantly different for those with high discriminability, than for those with low discriminability. However, the shape of the curve reflects the predicted outcomes made by the continuous model.

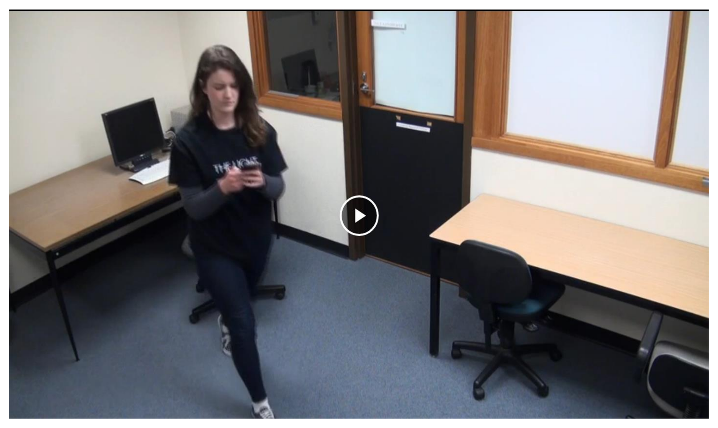
Conclusion

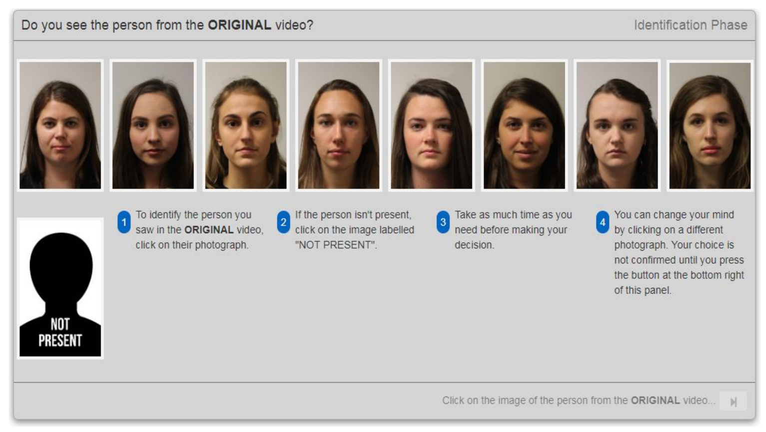
- Empirical evidence was found in support of a continuous model of eyewitness identification decision making.
- This suggests that further information is available within the eyewitness' memory trace, beyond their first choice.
- Small effects are difficult to identify in eyewitness studies.
- Web-based studies offer eyewitness researchers the opportunity to increase statistical power to test model predictions.

Experiment 2

Method

Participants (N = 2,012) viewed an online video of a student in a computer laboratory.
Task 1: Identify someone as the culprit or reject the lineup. The simultaneous lineup either contained eight foils, who were previously rated as being of equal similarity to the culprit, or contained the culprit with seven foils randomly selected from the pool of eight.
Task 2: Rank members of the line up in order of likelihood that they were the culprit, from first to eight rank position. After each rank was filled, the ranked face was removed from the screen.





Results and discussion

Although a c_2 differential of 1.26% was observed between high- and low-discriminability groups, this was not statistically significant ($\chi^2(3) = 1.25$, $p = 0.74$). This may be explained by the continuous model predicting only a very small effect on c_2 (2.6%) indicating that a lack of statistical power may have led to a Type II error.

Comparison on the basis of Bayesian Information Criterion (BIC) shows much greater support for the continuous model.

Table 1.
Comparison of different eyewitness ranking models on the basis of the Bayesian Information Criterion

Model	Number of independent parameters k	Log-likelihood	BIC
Continuous	2	-2307.5	41.62
Discrete-state	1	-2408.2	235.89

[1] On condition that their first choice was incorrect.
[2] Kellen, D., & Klauer, K. C. (2014). Discrete-state and continuous models of recognition memory: Testing core properties under minimal assumptions. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 40(6), 1795-1804.

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