An age effect on implicit memory that is not due to explicit contamination

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INTRODUCTION

Are explicit and implicit memory driven by a single or multiple memory systems?

Explicit tests (e.g., recognition) require deliberate recollection of specific information from a prior study episode, whereas implicit tests measure memory of previously studied information in a seemingly unrelated task (e.g., perceptual identification). Priming (a facilitation in processing previously encountered stimuli) is a commonly used index of implicit memory.

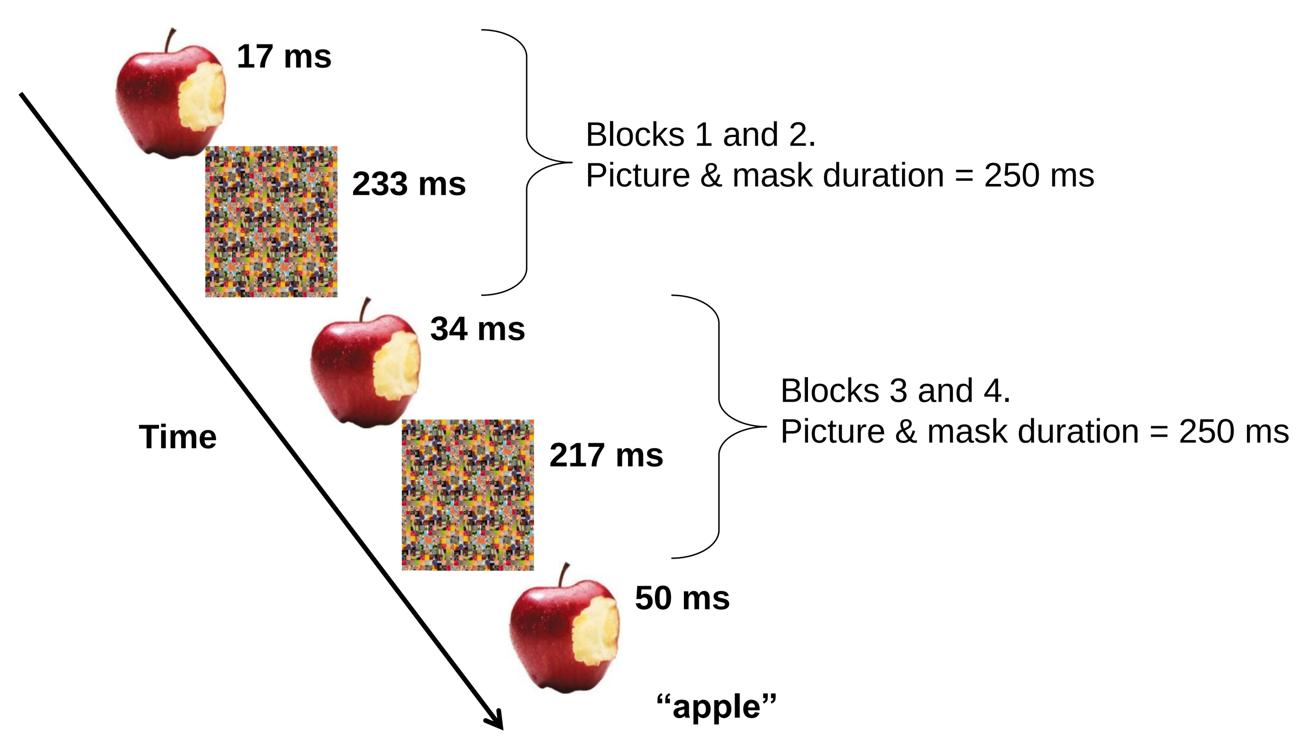
Healthy older individuals typically show decrements on explicit tests relative to healthy young individuals despite comparable priming levels.[1] This dissociation has provided particularly compelling evidence for the view that explicit and implicit memory operate from distinct systems.[2] The interpretation is that the explicit system is affected by age whereas the implicit system is not.

However, single-system computational models can explain several dissociation patterns in the literature.[3] A more challenging observation for this account would be evidence of completely preserved priming in the face of compromised recognition memory when the two are measured consecutively on each test trial, thus we compared the performance of young and older individuals on the continuous identification with recognition (CID-R) task. Because recognition memory is typically affected by age, this study allowed us to test the multiple-systems prediction that priming will not be similarly affected.

GENERAL METHOD

Study: Participants view a series of pictures and make a category decision

Test: Continuous identification with recognition (CID-R) task.
Each trial: 1) speeded masked picture identification (priming)
2) studied / new judgement (recognition)

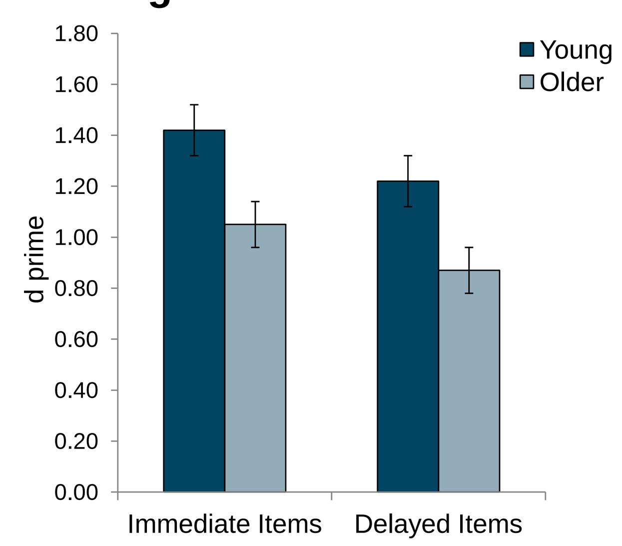


… continue blocks until ID object (RT captured)
THEN: "Was the pictures shown in the study phase?"

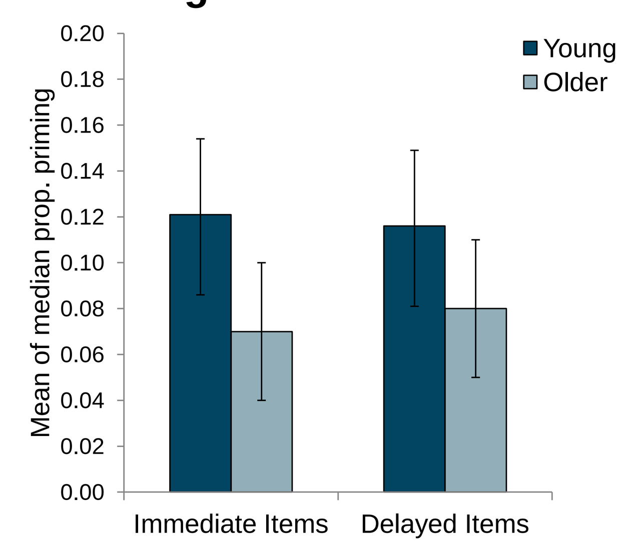
RESULTS

Experiment 1
- Healthy Young (*M*=24 years) and Older (*M*=69 years) adults [*n*=20 per group]
- Pictures studied immediately prior to and 60-minutes prior to CID-R task

Recognition



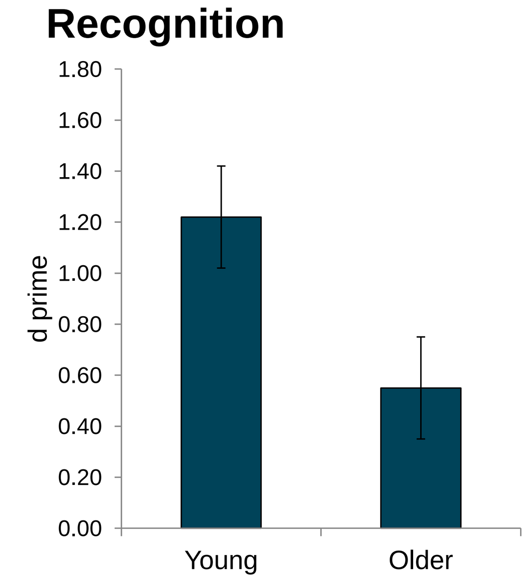
Priming



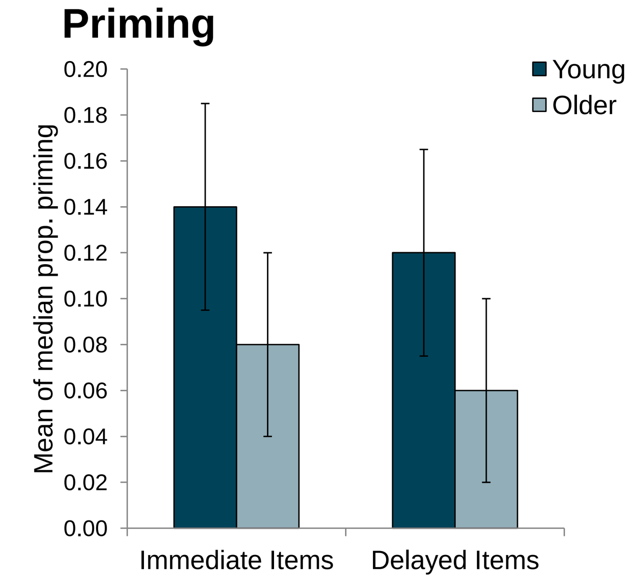
Recognition memory significantly reduced as a function of age and delay. No significant effects on priming.

Experiment 2
- Healthy Young (*M*=24 years) and Older (*M*=73 years) adults [*n*=18 per group]
- Pictures studied immediately prior to and 60-minutes prior to separate CID and recognition tasks (to reduce test awareness in the CID phase)

Recognition



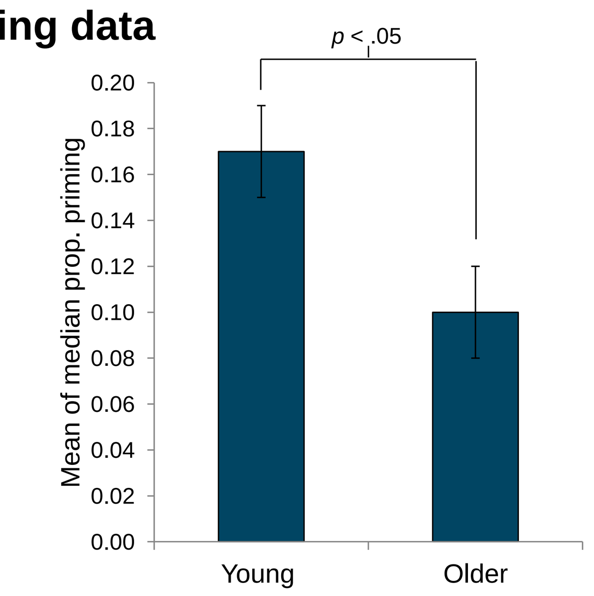
Priming



- The results of Experiment 1 were replicated
- 55% of young participants and 50% of older participants were rated as test-aware during the CID phase (on a post test questionnaire). Collapsed across items, priming did not reliably differ between aware versus unaware participants (Young: aware *M*=.12; unaware *M*=.13; Older: aware *M*=.08; unaware *M*=.08). The numerical trend towards lower priming in older relative to young adults was still present when aware participants were removed

Pooled priming data

- Pooled priming data from Young and Older adults over 3 experiments using the CID-R task under various different designs (*n*=58 per group)
- Figure illustrates priming for items studied immediately before testing



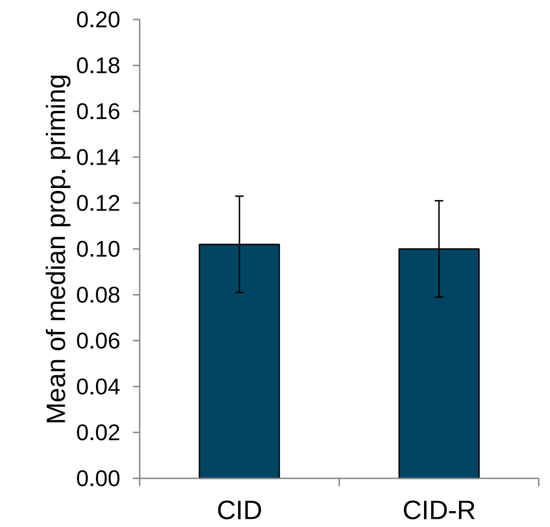
- Analysis confirms a reliable reduction in priming as a function of age

EXPLICIT CONTAMINATION

Is the age-effect in priming due to explicit contamination?

- Participants may use an explicit processing strategy in an implicit memory test if they are aware that previously studied items are being re-presented
- Explicit processing could be more beneficial to young individuals

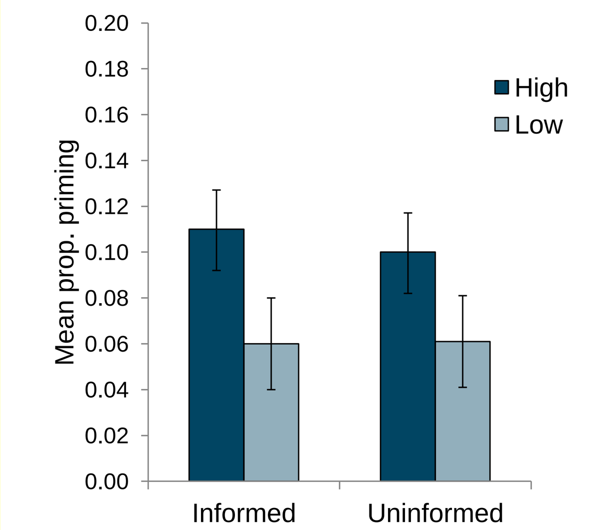
Experiment 3
- Comparison of priming in CID-R (aware) vs. CID (unaware) tests
- Forty young participants [n=20 in each group]



- Priming equivalent in CID and CID-R tasks
- 45% participants performing the CID task were classified as aware, but there was no difference in priming between aware (*M*=.09) and unaware (*M*=.11) participants

Experiment 4
- Create optimal conditions for the use of an explicit strategy in the priming task
- 107 young participants performed a CID task (4 groups):
  - **Informed** (told 'old' / 'new' before each trial) vs. **Uninformed**
  - **High** (80%) vs. **Low** (20%) proportion of studied trials in the test

- No benefit to priming of informing participants
- Significant main effect of varying the proportion of studied trials – greater motivation in the High groups?
- 93% of participants in the Uninformed-High condition, and 52% in the Uninformed-Low condition were classed as aware. Priming did not significantly differ to that in unaware participants (High: aware *M*=.09, unaware *M*=.11; Low: aware *M*=.06, unaware *M*=.05)



CONCLUSIONS

- Priming, like recognition memory, is affected by aging when adequate statistical power is achieved
- Priming in this task is unaffected by differences in test awareness and explicit processing, so the age-related reduction in priming is unlikely to have been driven by differences in explicit processing between groups
- Findings are consistent with the view that explicit and implicit memory are driven by a single underlying system rather than by multiple systems

References:
[1] Fleischman, D.A. (2007). Repetition priming in aging and Alzheimer's disease: An integrative review and future directions. *Cortex, 43,* 889–897. [2] Squire, L.R. (2009). Memory and brain systems: 1969–2009. *Journal of Neuroscience, 29,* 12711–12716. [3] Berry, C. J., Shanks, D. R., Speekenbrink, M., & Henson, R. N. A. (2012). Models of recognition, repetition priming, and fluency: Exploring a new framework. *Psychological Review,* 119, 40-79.

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