A semantic strategy training intervention aimed at enhancing young and older adults' visual working memory capacity.

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INTRODUCTION

- Actively 'combining' visual and verbal-based strategies is positively associated with visual working memory capacity (Brown et al., 2006; Brown & Wesley, 2013; Forsberg et al., 2020; Paivio, 1991)
- Long-term memory semantics may supplement working memory resources (Gonthier, 2020; Logie, 2011; Nicholls & English, 2020; Souza & Skóra, 2017; Verhaeghan et al., 2006)
- Abstract stimuli are more challenging to remember, rely on visual resources, and are less likely to activate semantics automatically (see Figure 1; Logie, 2011)
- A semantic strategy may therefore be most effective with abstract stimuli (Brown & Wesley, 2013; Nicholls & Stewart, 2023)
- Hypothesis: actively incorporating a semantic strategy benefits visual working memory performance, particularly during an abstract vs more meaningful task

EXPERIMENT 1: METHODS

- Study pre-registered on OSF (https://osf.io/yjrcz)
- 2 (instruction; control, semantic strategy) x 2 (semantic availability; low, high) remotely-administered experiment assessing visual working memory (recognition accuracy and RT)
- 44 young participants (M_{Age} = 24.7 (±3.66); 12 males, 31 females, 1 non-binary/prefer not to say)
- During task instructions, all participants shown the same sample patterns and informed that various strategies could be used, which they would be asked to self-report later
- Instructed participants additionally trained on a semantic strategy (see Figure 2)

EXPERIMENT 1: KEY RESULTS & DISCUSSION

- No significant effects on accuracy or RT (all $F < 1.81$; all $p > .18$; all $BF_{Incl} < .48$; $M = .83$ (±.08))
- No strategy instruction-based improvement (or any deficit)
- Both control and instructed participants reported using a semantic strategy at least 'sometimes'
- Overall use of a semantic strategy was positively correlated with abstract task accuracy, specifically in the instructed participants ($r_s = .53$, $p = .011$)
- A semantic strategy therefore positively associated with performance
- However, because older adults tend to use less efficient strategies, strategy training may be particularly effective for them, especially when considering age-sensitive abilities such as visual working memory (Johnson et al., 2010; Nicholls & English, 2020)

EXPERIMENT 2: METHODS

- Hypothesis: actively incorporating a semantic strategy benefits visual working memory performance, particularly for older adults during an abstract vs more meaningful task
- Study pre-registered on OSF (https://osf.io/mxdzv)
- 2 (age group; young, older) x 2 (instruction; control, semantic strategy) x 2 (semantic availability; low, high) on accuracy (span)
- Lab-based, recall paradigm, but same instructions manipulation as per Exp. 1
- 61 young participants (M_{Age} = 21.8 (±3.9); 12 males, 49 females, 0 non-binary/prefer not to say; M_{YrsEdu} = 15.1 (±2.4); M_{NartIQ} = 103 (±7.3))
- 64 older participants (M_{AGE} = 71.1(±6.5); 16 males, 47 females, 1 non-binary/prefer not to say; M_{YrsEdu} = 16.2 (±3.5); M_{NartIQ} = 116.2 (±9.0); $M_{Mini\text{-}Cog}$ = 4.6 (±.7))

EXPERIMENT 2: PRELIMINARY RESULTS

- Effects of age group ($F = 65.97$, $p < .001$, $\eta_p^2 = .35$) and semantic availability x age group ($F = 4.15$, $p = .044$, $\eta_p^2 = .03$) on visual working memory span (see Figure 3; all other $p > .17$)
- Semantic effect in young ($p = .033$) but not older participants ($p = .592$)
- Practice effect when the low semantic task administered first ($p < .001$; see Figure 4)
- More efficient, multimodal strategy use reported by young participants, and greater active semantic strategy use by instructed participants (see Table 1)
- Semantic strategy use positively associated with capacity, especially for instructed older adults in the high semantic task ($r = .39$, $p = .028$)

EXPERIMENT 2: DISCUSSION

- Semantic strategies fairly prevalent, especially in young participants (Nicholls & English, 2020)
- Semantic strategy instruction did not affect span for either age group, but modulated reported strategy
- Semantic strategy reports positively associated with performance, specifically for older adults when considering those who were trained, showing promise
- Future studies planned to involve more in-depth instruction and practice (Nicholls & English, 2020), trial-by-trial strategy reports (e.g., Bartsch et al., 2021; Lemaire, 2016), and EEG methods (Orme et al., 2017)

FINANCIAL DISCLOSURE

- Part of this work was supported by The Carnegie Trust for the Universities of Scotland

Semantic strategy training **did not boost** visual working memory performance, but using a semantic strategy was **positively correlated with accuracy**

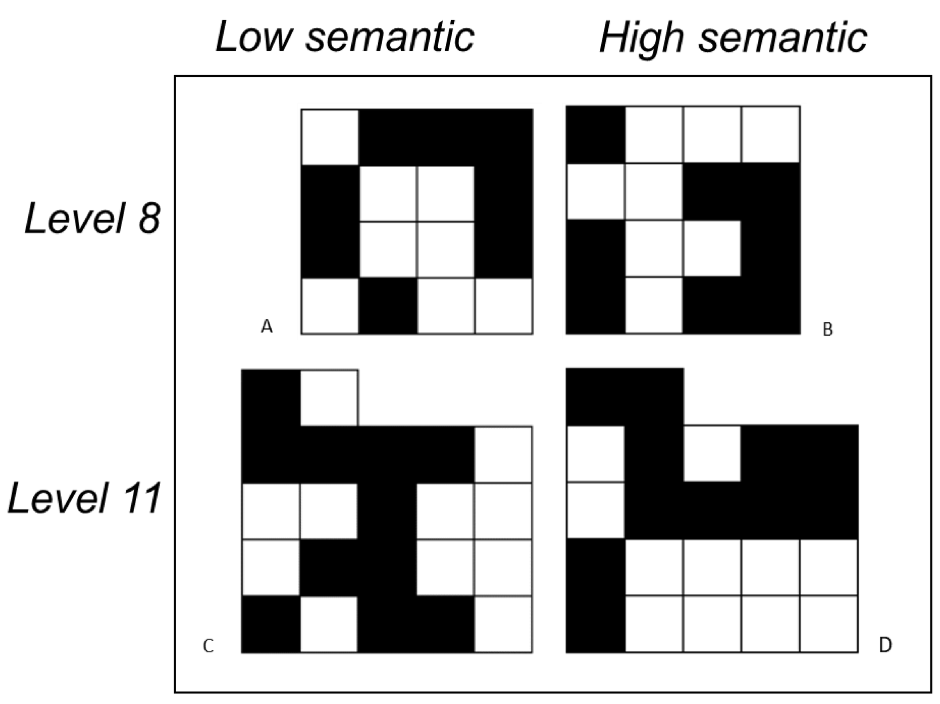

FIGURE 1: Example low and high semantic stimuli (Brown et al., 2006, 2013; Della Sala et al., 1997)

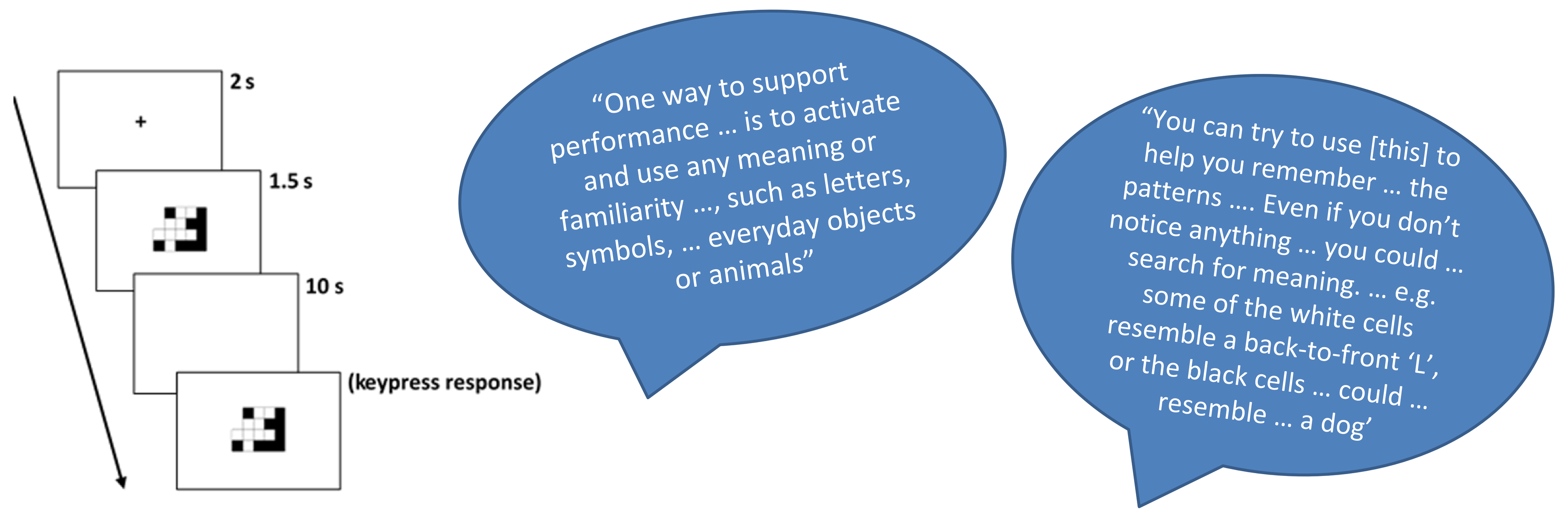

FIGURE 2: Experiment 1 Paradigm (Brown et al., 2006; Riby & Orme, 2013)

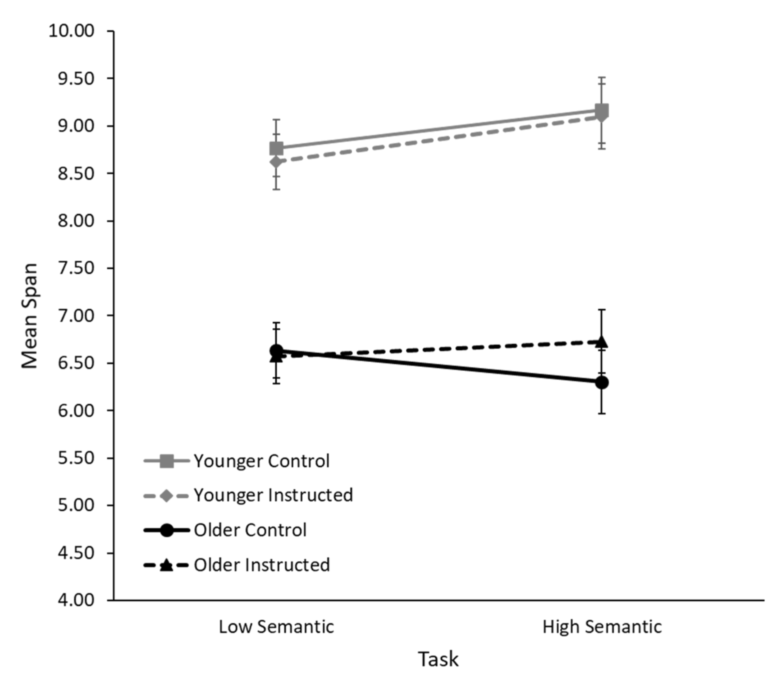

FIGURE 3: Exp. 2 accuracy data.

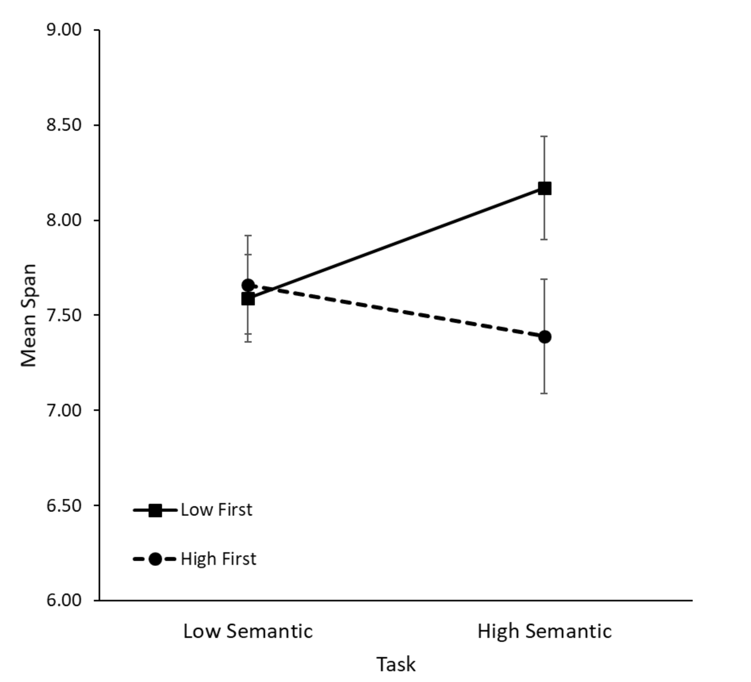

FIGURE 4: Exp. 2 interaction between admin. order and semantic availability.

Overall Strategy (visual-verbal)	- all $p > .37$
Combining	- all $p > .37$
Counting Up	- all $p > .35$
Labelling	**- YAs (3.52 ±1.13) report more than OAs (3.00 ±1.15; $p = .009$)** - all other $p > .13$
Automatic Semantics	**- YAs (3.16 ±1.20) report more than OAs (2.70 ±.95; $p = .018$)** - all other $p > .15$
Active Semantics	**- YAs (3.48 ±1.31) report more than OAs (2.89 ±1.31; $p = .012$)** **- Control Ps (2.89 ±1.38) report less than instructed Ps (3.46 ±1.24; $p = .016$)** - all other $p > .22$
Use of Semantics	**- YAs (3.52 ±1.13) report more than OAs (3.03 ±1.17; $p = .016$)** **- Control Ps (3.00 ±1.20) report less than instructed Ps (3.54 ±1.09; $p = .009$)** - all other $p > .15$
Visual Refreshing	- all $p > .36$

TABLE 1: Effects of age group and instruction on strategy reports (Experiment 2).