**Supplemental Information**

**Data Pre-processing**

***Attentional Control Tasks.***

To score the attentional control tasks, we used the R package developed by the Attention and Working Memory Lab specifically for these tasks (Tsukahara, 2022). Performance on each task was standardized (i.e., z-scores were calculated across participants). Each person’s score represents whether they performed better or worse than the group mean. Scores on the Flanker and Stroop Deadline task were multiplied by -1 so that positive scores indicated better performance, in accordance with the other two tasks. In line with the methods in Draheim, et al., (2021), if participants had outlying accuracy scores greater than 3.5 SD from the mean, scores on that task were removed (Anti-saccade: 0%, Flanker: 0.83%, Stroop: 2.48%, Visual arrays: 1.65%). One additional participant had missing data on the Flanker task due to the program crashing. After removing outlying scores, all participants had data for at least three of four tasks and 94.22% of participants had data for all four tasks. Each person’s available z-scores were then averaged to create an overall attentional control score for each participant.

***Implicit Associative Memory Tasks.***

Reaction time data were trimmed such that anticipatory responses less than 200ms were removed, then RTs greater than 2.5 SD from an individual’s mean were removed (in line with Davis et al., 2021). This trimming procedure resulted in 2.83% intact pairs and 2.77% rearranged pairs removed from the hyper-binding block, and 3.52% intact pairs and 3.10% rearranged pairs removed from the full-attention block. Mean RTs for each block type and pair type condition were calculated, including only trials in which participants responded accurately to the object categorization task. Answers to the object categorization question for each trial was predetermined by second author (E.T.) and reviewed by first author (E.D.) and two other research assistants. It is worth noting that the results remain relatively the same if inaccurate trials are included in the RT measures. Accuracy was entered into a 2 Block Type (hyper-binding, full-attention) x 2 Pair Type (intact, rearranged) within-subjects analysis of variance (ANOVA), which yielded no significant main effects (Block type: *F* (1, 119) = 0.33, *p* = .566, ηp2 = .003, Pair Type: *F* (1, 119) = 0.71, *p* = .401, ηp2 = .006), or interaction, *F* (1, 119) = 0.35, *p* = .558, ηp2 = .003, indicating that there was no difference in accuracy across conditions.

**Task Reliability**

Split-half reliability (even/odd trials) for the Anti-saccade and Selective Visual Arrays task was calculated using the Spearman-Brown prophecy formula. The Anti-Saccade task was highly reliably (.85), while reliability for the Selective Visual Arrays Task was notably lower (.64). Unfortunately, due to the dynamic nature of the blocks in the Flanker and Stroop Deadline tasks, split-half reliability measures are not possible for these tasks (Draheim, et al., 2021). That said, correlations across all four attentional control tasks were positive and significant, *ps* < .01 (see Table SI Table 1). Further, intelligence positively correlated (though not all significantly) with each attentional control task (Anti-saccade task: *ρ* = .24, *p* = .086, Flanker: *ρ* = .22, *p* = .125, Stroop: *r* = .26, *p* = .061, Visual Arrays: *ρ* = .25, *p* = .011)[[1]](#footnote-1), in line with previous literature (see Mashburn et al., 2021 for review). Together, these analyses indicated that the attentional control scores were reliable and valid.

**SI Table 1.**

*Correlations amongst attentional control tasks*

|  |  |  |  |
| --- | --- | --- | --- |
|  | 1 | 2 | 3 |
| 1. Anti-saccade | - |  |  |
| 2. Flanker DL | .42\*\* | - |  |
| 3. Stroop DL | .40\*\* | .46\*\* | - |
| 4. Visual Arrays | .30\*\* | .28\* | .33\*\* |
|  |  |  |  |

*Note.* Spearmancorrelations. DL = Deadline.

\*\* < .001, \*\* < .01

Split-half reliability was calculated the same way for the implicit associative memory tasks scores. Reliability for both the hyper-binding score (.33) and full-attention score (.25) were low. This fits with prior work showing that highly correlated measures typically yield lower reliability scores and that scores based on RT differences tend to have low reliability (see Draheim et al., 2019)

**Correlations between Implicit Associative Memory Task Scores and Attention Task Scores**

To determine if the relationship between attentional control and hyper-binding was driven by specific attention tasks, we calculated correlations between the hyper-binding score and each attention task. There was a significant negative correlation between hyper-binding and the Flanker task, *ρ = -.*207 *p* = .024. There was a trend for a significant correlation between hyper-binding and the Stroop, *ρ = -.*156 *p* = .092. The relationship between hyper-binding and the anti-saccade, *ρ = -.*138, and the visual arrays task, *ρ = -.*124, were not significant, *ps* > .13.

We also tested this for the full-attention score. There was a significant negative correlation between full-attention scores and the anti-saccade, *ρ = -*.227 *p* = .013, and the flanker task, *ρ = -.*198 *p* = .031. The relationship with the full-attention score and the Stroop, *ρ = -.*063, and the visual arrays *ρ = -.*084, were not significant, *ps* > .36. Together, this suggests that performance on the hyper-binding task was mostly driven by the Flanker task, while for the Full-Attention block it was mostly driven by the anti-saccade and Flanker task.

References

Draheim, C., Mashburn, C. A., Martin, J. D., & Engle, R. W. (2019). Reaction time in differential and developmental research: A review and commentary on the problems and alternatives. *Psychological Bulletin*, *145*(5), 508. https://doi.org/10.1037/bul0000192

Mashburn, C. A., Tsukahara, J. S., & Engle, R. W. (2021). Individual differences in attention control: Implications for the relationship between working memory capacity and fluid intelligence. In R. Logie, V. Camos, & N. Cowan (Eds.), *Working Memory: The state of the science* (pp. 175–211). Oxford University Press. https://doi.org/10.1093/oso/9780198842286.003.0007

Tsukahara, J. S. (2022). *englelab: An R package for processing complex-span and attention control tasks* (1.1.0) [Zenodo]. https://doi.org/10.5281/zenodo.6987145

1. It should be noted that only 52 participants completed the intelligence test, so there is less power to detect these correlations. [↑](#footnote-ref-1)