

Bilingualism and Cognitive Resilience: Online Episodic Memory for Auditory Verbal Material

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Introduction

Cognitive reserve and bilingualism

- Cognitive reserve (CR) is the brain's ability to offset neuroanatomical decline in the face of neuropathology.
- Bilinguals have outperformed monolinguals on cognitive tasks even when showing greater brain atrophy, suggesting bilingualism may act as a CR-building factor.
- Among cognitive domains, episodic memory (EM) has emerged as an effective predictor of cognitive reserve, making it a critical target for studying bilingual effects.

Mixed evidence for bilingual effects on EM

- Bilingualism has been linked to enhanced executive control on multimodal tests of episodic memory (Mohammad et al., 2020).
- However, bilinguals with more consistent L2 activation can show *difficulties* on memory tasks due to insufficient L2 inhibition (Jeryous Fares & Taler, 2025).
- Bilinguals tend to perform better when remembering *concepts* than the actual lexical items presented (Francis et al., 2019).
- Together, these findings point to a dissociation between conceptual and lexical-level memory in bilinguals.

The Linguistic Disadvantage Theory

- Proposes that monolinguals develop stronger lexical-semantic networks than bilinguals.
- Bilinguals face a "lexical bottleneck": reduced word-access frequency from dividing exposure across two languages.
- Predicts a monolingual edge specifically on tasks requiring verbatim lexical recall (as opposed to gist or conceptual memory).

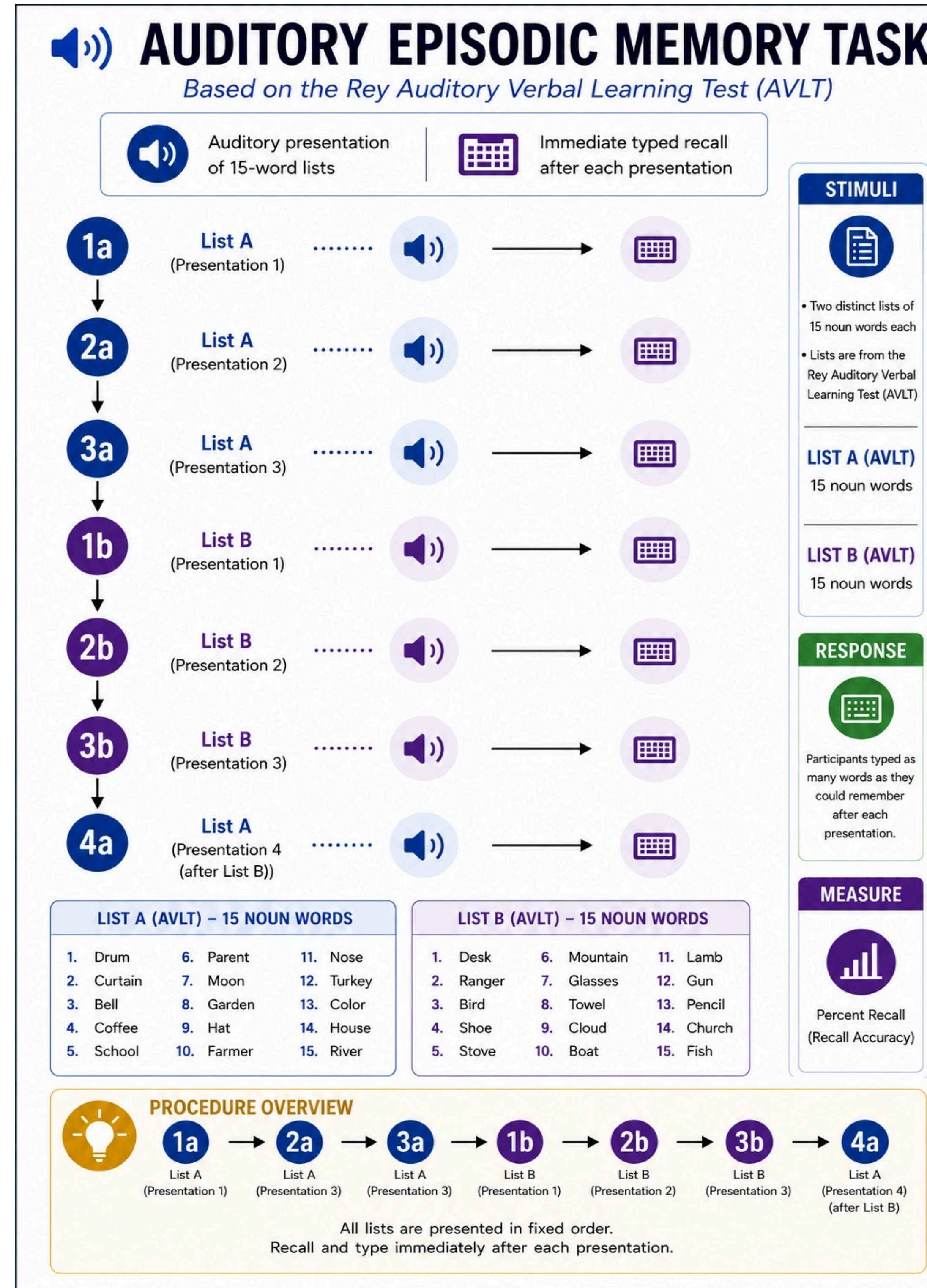
Present Study

*Verbal episodic memory paradigms vary in how heavily they load on lexical retrieval, so existing findings may not generalize across tasks.

*The Rey Auditory Verbal Learning Test (AVLT) is a strongly lexical task: participants must recall the *exact words* presented, repeatedly, under interference, making it a sensitive test of the Linguistic Disadvantage account.

*We compared 6 monolinguals and 12 bilinguals on a computerized auditory adaptation of the AVLT to assess whether group differences emerge in acquisition, interference susceptibility, and short-delay recall.

Experiment



Results

Mixed ANOVA (Trial × Group) on percent recall. A robust within-subject effect of Trial ($F(6, 96) = 42.70$, Greenhouse–Geisser-corrected $p < .001$, $\eta^2 = .73$) confirmed the canonical AVLT learning curve.

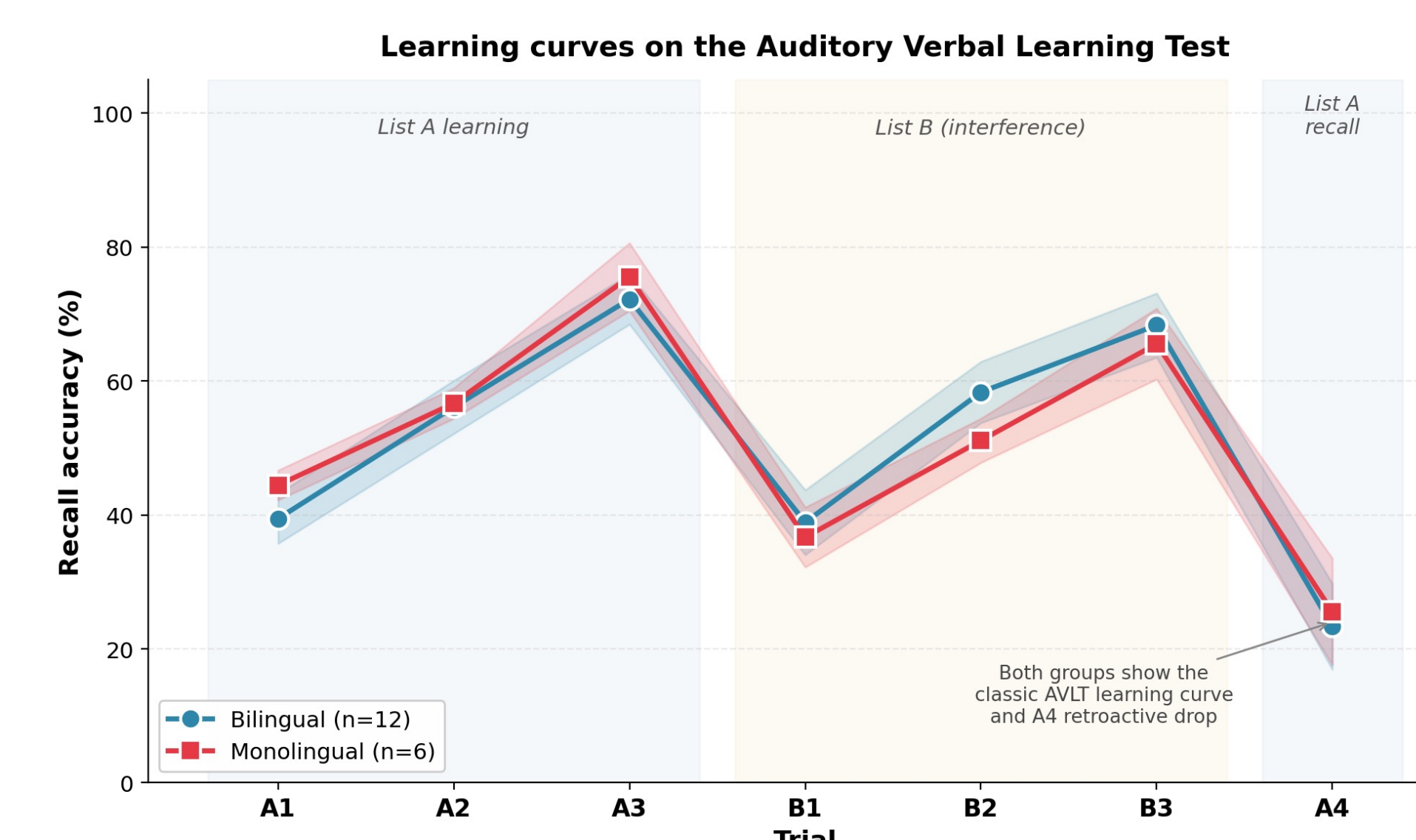
No main effect of Group ($F(1, 16) = 0.001$, $p = .98$, $\eta^2 = .0001$) and no Trial × Group interaction ($F(6, 96) = 0.56$, $p = .76$, $\eta^2 = .03$).

Per-trial group comparisons. No significant bilingual-monolingual differences (Welch's t-tests at each of the 7 trials, all uncorrected $p \geq .22$; all Holm-corrected $p = 1.00$).

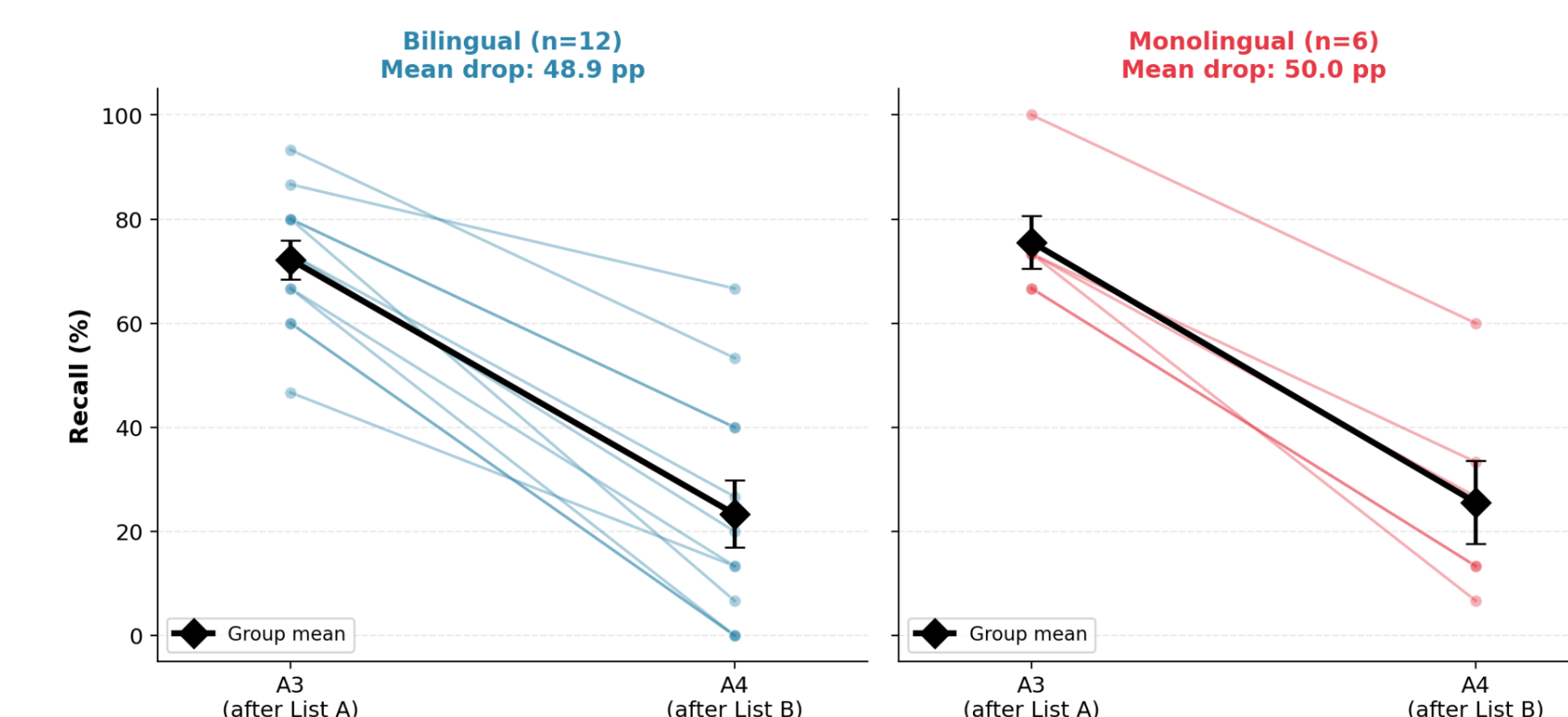
Results (cont)

Derived measures. No group differences emerged on List A total recall ($A1+A2+A3$: $t(16) = -0.80$, $p = .43$, $d = -0.32$), learning slope ($A3 - A1$: $t(7.7) = 0.24$, $p = .82$, $d = 0.14$), proactive interference ($A1 - B1$: $t(15.5) = -0.91$, $p = .38$, $d = -0.38$), or retroactive interference ($A3 - A4$: $t(14.3) = -0.18$, $p = .86$, $d = -0.08$).

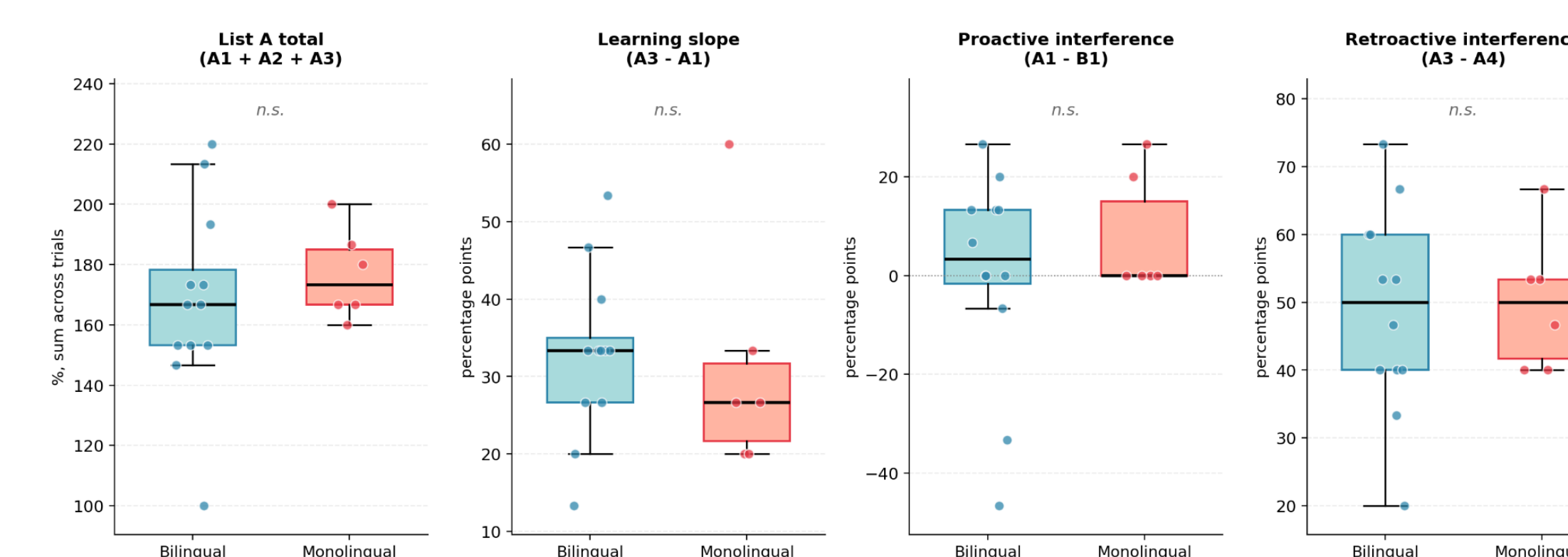
Within-group learning and interference. Both groups showed strong learning across $A1 \rightarrow A3$ (Bilingual $F(2, 22) = 35.0$, $p < .001$, $\eta^2_G = .53$; Monolingual $F(2, 10) = 21.2$, $p < .001$, $\eta^2_G = .73$) and a large retroactive drop from $A3$ to $A4$ (Bilingual: $72.2\% \rightarrow 23.3\%$, $t(11) = 11.19$, $p < .001$, $d = 2.68$; Monolingual: $75.6\% \rightarrow 25.6\%$, $t(5) = 12.12$, $p < .001$, $d = 3.06$). Proactive interference ($A1$ vs $B1$) was non-significant in both groups.



Retroactive interference: List A recall before vs after List B



Derived AVLT measures by group (no significant differences)



Discussion

What we found

- Bilinguals and monolinguals performed indistinguishably on every AVLT measure.
- Both groups: classic learning curve ($\approx 40\% \rightarrow 73\%$ across $A1-A3$), a sharp drop with List B interference, and a large retroactive drop at $A4$.
- Trial effects were huge ($\eta^2 = .73$); group and trial × group effects were essentially zero.

Fits the broader literature

- Consistent with recent failures to replicate a "bilingual advantage" in healthy adults.
- A small numerical bilingual disadvantage at $A1$ (39.4% vs 44.4%) echoes prior reports of weaker single-language lexical access in bilinguals.
- No evidence of enhanced interference control in bilinguals.

Limitations

- Small monolingual group ($n = 6$); minimum detectable effect $\approx d = 1.0$, far above typical bilingual-effect sizes ($d \approx 0.2-0.4$).
- Bilingual sample heterogeneous in L2 acquisition age ($0-25$ yrs) and dominant-language use ($25-80\%$); a continuous-predictor approach may be more informative than a binary split.
- Online auditory administration introduces uncontrolled noise (audio quality, attention, etc.).
- AVLT taps only short-list verbal learning; other paradigms (paired associates, recognition with high-similarity lures) may be more sensitive.

Conclusion

- No bilingual advantage or disadvantage detected on the AVLT after rigorous data cleaning.
- The null is real but underpowered (absence of evidence, not evidence of absence).
- Future work: larger samples, equivalence testing, continuous bilingual-experience predictors

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