Bilingual Experience and Auditory Health Literacy: Online Comprehension of Spoken Medical Instructions

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Background

- Approximately 80 million U.S. adults have limited health literacy, which is associated with greater medication errors, hospitalizations, and poorer health outcomes [1]. Patients with limited English proficiency face additional comprehension barriers and elevated medication-error rates [2].
- Auditory health literacy is the ability to comprehend spoken medical information, drawing on speech perception, language processing, and working memory. L2 listeners rely more heavily on acoustic detail and are more vulnerable to cognitive load than L1 listeners [3].
- Managing two languages requires sustained attentional control and inhibition of interference, which may yield broader benefits in attention, working memory, and conflict resolution [4] — abilities relevant to comprehending complex spoken instructions. Meta-analytic evidence remains mixed [5], and few studies have examined this in medical contexts.

Our Study

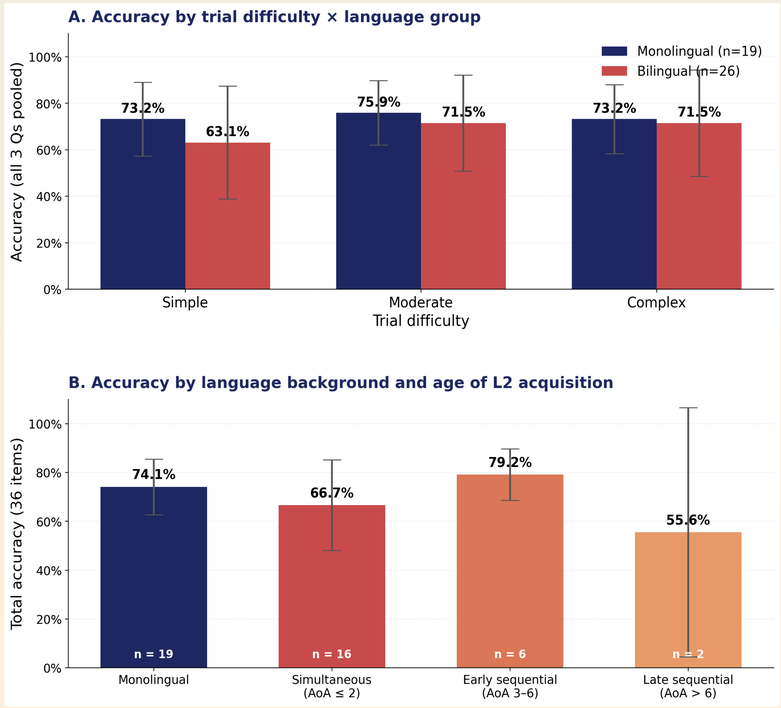
- We tested whether bilingual experience predicts comprehension of spoken medical instructions (online task via Pavlovia).
- Participants listened to 12 short medical instruction passages varying in complexity (4 simple, 4 moderate, 4 complex). Each passage was followed by 2 comprehension questions and 1 numeracy question (36 items total).
- Bilingual status, age of L2 acquisition, language(s) and proficiency, and percent daily L1 use were self-reported. Incomplete sessions and invalid demographic entries were excluded.

Hypothesis

Bilinguals will show higher auditory health literacy than monolinguals.

Results

- **Sample**: 45 participants (19 monolingual, 26 bilingual).
- **Overall accuracy** (36 items): Monolingual 74.1%, Bilingual 68.7% (d = 0.34).
- **Mixed ANOVA** (Group × Difficulty): No significant main effect of language group, $F(1,43) = 1.18$, $p = .28$. No Group × Difficulty interaction, $F(2,86) = 1.13$, $p = .33$. Difficulty main effect was marginal, $F(2,86) = 2.54$, $p = .085$. (Panel A)
- **ANCOVA controlling for age**: Group effect drops to $\eta^2p = .010$ once age is controlled. Age itself was a significant predictor, $F(1,42) = 5.94$, $p = .019$, $\eta^2p = .124$.
- **Comprehension vs. numeracy**: Small descriptive difference on comprehension (mono 81.4% vs. bili 73.9%; d = 0.44); none on numeracy (d = 0.06).
- **Correlations**: Comprehension ↔ numeracy $r = .49$, $p = .001$; age ↔ accuracy $r = .38$, $p = .011$.



Summary & Discussion

- The hypothesized bilingual advantage in auditory health literacy was not supported. A 2 (group) × 3 (difficulty) mixed ANOVA showed no significant main effect of language group and no Group × Difficulty interaction.
- Raw group differences were largely explained by age. With age controlled, the group effect dropped to $\eta^2p = .010$. Age predicted accuracy more strongly than language background.
- Numeracy was unrelated to language background but was predicted by age and overall comprehension, suggesting it indexes general cognitive ability rather than language-specific processing.
- The strong within-subject correlation between comprehension and numeracy ($r = .49$) is consistent with auditory health literacy being a relatively unified construct.

Conclusion

- Bilingual experience was not significantly associated with auditory health literacy.
- Once age was controlled, the apparent group difference essentially disappeared ($\eta^2p = .010$), indicating that age, not bilingualism, drove most of the observed variance in this sample.
- Larger samples and continuous measures of bilingual experience (age of L2 acquisition, dominance, daily use), rather than a monolingual/bilingual binary, are needed to characterize how bilingualism shapes comprehension of spoken medical information.

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