

Acquisition Age Gradients in Phonological Fluency: Evidence from Deaf Signers of Turkish Sign Language

Phonological fluency tasks—requiring participants to retrieve as many lexical items as possible sharing a phonological feature within a fixed time limit—offer a sensitive window into mental lexicon organisation and retrieval under cognitive load. In signed languages, this paradigm is operationalised through the handshape parameter, prompting signers to produce signs sharing a target handshape (Marshall et al., 2014; Keleş et al., 2022). Although age of acquisition (AoA) effects are well-documented in sign language processing, how AoA shapes phonological fluency in Turkish Sign Language (TİD) remains underexplored—particularly along a continuous rather than a binary gradient.

The present study investigates how the timing of first language acquisition shapes lexical retrieval in TİD. Forty-nine Deaf participants—21 early acquirers (birth to age 6), 17 early-late acquirers (ages 7–12), and 11 late-late acquirers (age 13+)—completed two 120-second phonological fluency tasks: one using the unmarked, high-frequency “Flat-Hand” handshape (HS1), and the other the marked, lower-frequency “ASL A-Bar” (HS2). Participants also completed the LEAP-Q. Performance was evaluated through a Weighted Fluency Score (WFS) based on Marshall et al.’s (2014) quartile model ($Q1 \times 1$, $Q2 \times 1.5$, $Q3 \times 2$, $Q4 \times 3$), type-token ratios (TTR), and Troyer et al.’s (1997) clustering framework.

Acquisition age predicted fluency in a continuous, cumulative gradient rather than a binary early/late contrast. Kruskal–Wallis tests revealed significant group differences in both conditions (HS1: $H = 17.12$, $p < .001$; HS2: $H = 12.78$, $p = .002$), with mean WFS declining stepwise from early ($M = 41.19$) through early-late ($M = 26.62$) to late-late acquirers ($M = 19.09$). All three pairwise comparisons—including early-late versus late-late (HS1 WFS: $p = .010$)—reached significance. The gradient concentrated in lexical diversity rather than production volume: type totals differed sharply across groups (HS1: $H = 18.70$, $p < .001$), while token totals showed no significant difference in HS2 ($p = .428$).

Quartile-by-quartile analyses isolated the Q3–Q4 transition—where WFS weights are heaviest—as the decisive point. Early acquirers stabilised under maximum load (HS1 Q3–Q4: -2.7%) and partially recovered in HS2 (Q3: $+9.2\%$), consistent with flexible switching to lower-frequency retrieval pathways. Early-late acquirers collapsed precisely at Q3–Q4 (-24.5%), while late-late acquirers displayed an erratic, unstable profile. TTRs followed the same hierarchy (early > early-late > late-late): by HS2-Q3, late-late TTR fell to .25, meaning roughly three-quarters of their output consisted of repetitions earning no type credit in high-weighted quartiles.

Turkish proficiency did not predict TİD fluency in any group (full-sample Spearman: HS1 $r_s = .178$, $p = .222$; HS2 $r_s = .243$, $p = .093$). Within the late-late group, WFS remained narrowly compressed (range 16–25) across all Turkish proficiency levels, revealing a structural ceiling that second-language competence cannot lift (Karadöller et al., 2023). Education correlated positively with WFS at the full-sample level but is confounded with acquisition group.

Together, these findings indicate that early exposure fosters a flexible phonological network enabling diverse, sustained retrieval under pressure, and that the costs of delayed TİD acquisition accumulate continuously rather than emerging at a single critical threshold.

References

- Karadöller, D. Z., Sümer, B., Ünal, E., & Özyürek, A. (2023). Late sign language exposure does not modulate the relation between spatial language and spatial memory in deaf children and adults. *Memory & Cognition*, 51(3), 582–600.

- Keleş, O., Atmaca, F., & Gökgöz, K. (2022). Effects of age of acquisition and category size on signed verbal fluency. *Language Acquisition*, 29(4), 361–383.
- Marshall, C. R., Rowley, K., & Atkinson, J. (2014). Modality-dependent and -independent factors in the organisation of the signed language lexicon. *Journal of Psycholinguistic Research*, 43(5), 587–610.
- Troyer, A. K., Moscovitch, M., & Winocur, G. (1997). Clustering and switching as two components of verbal fluency. *Neuropsychology*, 11(1), 138–146.

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