Age Effects in Lexical Semantic Learning: Evidence from Uyghur Native Mandarin Second Language Acquisition

Age of acquisition (AoA) is studied extensively in second-language (L2) research, particularly with regard to the acquisition of syntax and morphology (Johnson & Newport, 1989; Hartshorne, Tenenbaum & Pinker, 2018). While some studies have claimed that AoA has little impact on semantic knowledge (Slabakova, 2006), experimental evidence indicates that adult learners have difficulties acquiring L2 verbs that map to different L1 translations in different collocations with noun objects (Saji, Imai, Saalbach, Zhang, Shu & Okada, 2011; Malt, 2020), implying that the late learning of lexical semantics is a disadvantage.

Focusing on the L2 verb representation of Uyghur-speaking learners of Mandarin, this study investigates specifically whether early and late learners differ in their processing of congruent and incongruent L2 constructions in which the direct L1 translation of verbs is suitable for or not collocated with those objects in Uyghur. For example, when expressing the phrase *to turn off the light*, "guan (turn off)" is used as the verb in Chinese ("guan deng: turn off the light") and "öčürmäk: turn off" is used in Uyghur ("čiraq öčürmäk": turn off the light), both of which convey the meaning *to close*. Bilinguals intuitively consider them direct translations of each other. However, "guan" can also collocate with the object *door* ("guan men: close the door") while "öčürmäk" cannot in Uyghur. Instead, "yapmaq" should be used because it means to *cover*. A single verb, "yapmaq: cover" is translated favorably into Chinese as "gai", which implies the action of covering from top to bottom, making "gai men: cover the door" unacceptable.

Thus, comparing access to "guan deng: turn off the light" (L1-L2, congruent) and "guan men: close the door" (L2-only) could reflect the learning of L2-specific semantic knowledge, while comparing the rejection of "guan men: cover the door" (L1-only) and a random incorrect construction "guan lian: close the face" (baseline) could indicate the interference of L1 translation (see Table 1).

The participants in this study were thirty-one Mandarin native speakers (NS), 35 Uyghur-speaking early learners (EARLY, learning since the ages of three to seven), and 35 late learners (LATE, learning after nine years old), all of whom were aged 19 to 24). Both the latter groups had passed the Chinese standard examination and could accordingly be considered to have reached the same proficiency level as each other. Participants were presented with constructions and asked to assess whether they were correct Chinese collocations by pressing keys to indicate either "yes" or "no". As Table 2 shows, for the L1-L2 and L2-only collocations, the reaction times of accurate responses revealed two main effects of AoA, indicating that both early and late learners process collocations less efficiently than NSs. The only significant interaction, i.e., the type and AoA contrast (NS, EARLY, and LATE), further suggested that only the late learners responded more slowly to L2-only constructions than to L1-L2 constructions. For L1-only and baseline, the results of the correctly rejected trials demonstrated the same pattern. Moreover, two interactions of type and AoA were significant. While the responses of NSs to both types were comparable, the early and late learners were both faster in rejecting L1-only than baseline.

Our findings confirm the disadvantage of re-categorizing semantic domains for verbs when learning occurs after a critical period (i.e., nine years old). In contrast, early learners learn L2-specific verb meanings as efficiently as they learn those with L1 equivalents. Furthermore, if an unfamiliar L2 construction has a possible word-for-word L1 translation, both early and late learners find it easier to reject because the correct use is accessed.

Table 1. Examples of items used in an acceptability judgment test.
L1-L2 (congruent): acceptable Chinese collocations whose Uyghur word-for-word translations are also acceptable collocations; L2-only: acceptable Chinese constructions, yet their Uyghur word-for-word translations are unacceptable collocations; L1-only: unacceptable Chinese constructions, yet their Uyghur word-for-word translations are acceptable collocations; Baseline: random combinations of words from L2-only.

	Example 1		Example 2	
L1-L2 (congruent)	关 (guan) öčürmäk (turn off)	灯 (deng) čiraq (light)	系 (ji) čägmäk (fasten)	绳子 (sheng zi) arğamča (rope)
L2-only	关 (guan) ∗öčürmäk (close)	门 (men) išikni (door)	系 (ji) ∗čägmäk (fasten)	扣子 (kou zi) tügmä (button)
L1-only	∗盖 (gai) yapmaq (cover [close])	门 (men) išikni (door)	∗关 (guan) tügmäk (close [button up])	扣子 (kou zi) tügmä (button)
Baseline	关 (guan) (close)	脸 (lian) (face)	系 (ji) (fasten)	背叛 (bei pan) (betray)

Table 2. Results of linear mixed models.
Fixed effects: Construction type, the two AoA contrasts (NS vs. EARLY, NS vs. LATE), and their interactions.

	L1-L2 and L2-only constructions ("yes" response)				**L1-only and Baseline constructions ("no" response)**			
Fixed Effect	Estim-ate	Std. Error	t value	Pr(>|t|)	Estimate	Std. Error	t value	Pr(>|t|)
Intercept	6.865	0.454	151.108	< 0.001	7.023	0.051	135.451	< 0.001
type	-0.240	0.363	-0.661	0.509	-0.036	0.033	-1.093	0.274
NS vs. EARLY	0.145	0.541	2.694	0.008	0.238	0.068	3.474	< 0.001
NS vs. LATE	0.316	0.542	5.829	< 0.001	0.417	0.069	6.026	< 0.001
type * (NS vs. EARLY)	-0.516	0.246	-0.210	0.833	-0.086	0.037	-2.280	0.022
type * (NS vs. LATE)	0.103	0.245	4.203	< 0.001	-0.139	0.037	-3.694	< 0.001
Post-hoc								
type (NS)	-0.022	0.030	-0.731	0.467	-0.047	0.029	-1.603	0.113
type (EARLY)	———	———	———	———	-0.102	0.036	-2.822	0.006
type (LATE)	0.078	0.039	2.01	0.048	-0.186	0.037	-4.998	< 0.001

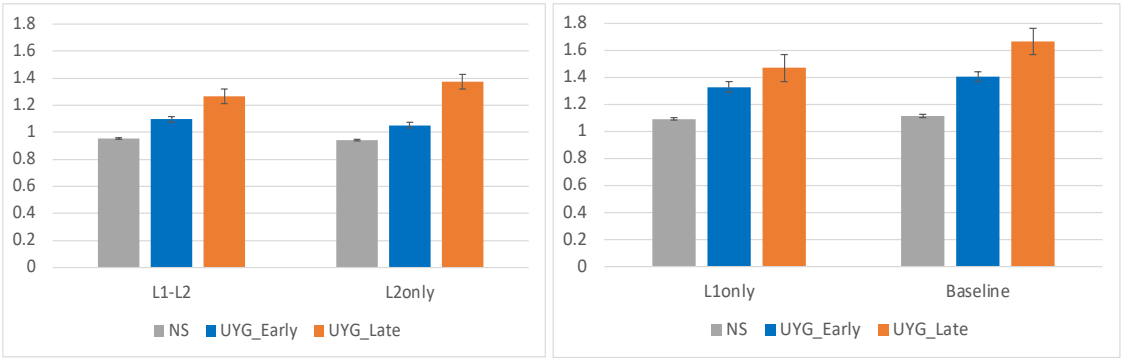

Figure1. Mean response times (in milliseconds) of early learners, late learners, and NSs
Left: L1-L2 and L2-only types; Right: L1-only and baseline types

-References-

[1] Johnson, J. S., & Newport, E. L. (1989). Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive psychology,* 21(1), 60-99. **[2] Hartshorne, J. K., Tenenbaum, J. B., & Pinker, S. (2018).** A critical period for second language acquisition: Evidence from 2/3 million English speakers. *Cognition,* 177, 263-277. **[3] Slabakova, R. (2006).** Is there a critical period for semantics?. *Second Language Research,* 22(3), 302-338. **[4] Saji, N., Imai, M., Saalbach, H., Zhang, Y., Shu, H., & Okada, H. (2011).** Word learning does not end at fast-mapping: Evolution of verb meanings through reorganization of an entire semantic domain. *Cognition,* 118(1), 45-61. **[5] Malt, B. C. (2020).** Understanding L2 word learning outcomes: The roles of semantic relations, input, and language dissimilarity. *International Journal of Bilingualism,* 24(3), 478-491.