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Cognitive Processes In Second Language Learning: A Psycholinguistic Perspective

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Abstract: This article examines the constellation of cognitive processes that underlie second-language (L2) learning, drawing on contemporary psycholinguistic theory and empirical evidence. The study integrates models of working memory, attentional control, implicit–explicit knowledge interaction, and lexical access to explore how learners internalise and retrieve a new linguistic system. A mixed-methods design combined eye-tracking with stimulated-recall protocols during an intensive twelve-week instructional programme for Uzbek-Russian bilingual adults acquiring English. Quantitative analyses of gaze duration and reaction-time measures were triangulated with qualitative thematic coding of verbal reports to trace the dynamics of noticing, chunking, form–meaning mapping, and automatisation. Results show that high phonological working-memory span and efficient executive control predict faster consolidation of morphosyntactic sequences, while implicit statistical learning mechanisms dominate the acquisition of low-salience grammatical cues. The discussion situates these findings within usage-based and declarative/procedural frameworks, arguing that successful L2 learning emerges from the synergy of domain-general and language-specific cognitive resources modulated by task design. Pedagogical implications point to adaptive scaffolding that targets the shifting locus of cognitive load across proficiency levels.

Keywords: - Second-language acquisition, psycholinguistics, working memory, attentional control, implicit learning, eye-tracking, bilingualism.

Introduction: The quest to unravel how humans acquire a new language after early childhood has long engaged linguists, psychologists, and educators. Classic hypotheses—from Krashen's input-driven monitor model to Ellis's usage-based emergentism—highlight the pivotal role of cognition in mediating exposure to linguistic input. Despite substantial progress, the field lacks an integrative account that reconciles mechanism-oriented laboratory findings with classroom-based evidence. Recent advances in cognitive neuroscience, particularly the precision of eye-tracking and the temporal resolution of electroencephalography, create unprecedented opportunities to observe language processing in situ.

Psycholinguistics views language as a set of mental representations manipulated by specialised and general-purpose cognitive systems. During L2 acquisition, learners must segment the speech stream, map novel forms to existing conceptual schemas, and restructure attentional routines forged by the first language (L1). Working memory supplies a buffer for holding verbal material; attentional control regulates the allocation of limited resources; implicit learning tallies distributional regularities; and metalinguistic awareness enables hypothesis testing. These processes do not operate in isolation but converge dynamically, conditioned by proficiency, task demands, and affective variables.

Research with Uzbek-Russian bilinguals presents a fertile testing ground because their L1s differ typologically from English in morphology, syntax, and word order. Such contrast sharpens the visibility of transfer effects and heightens cognitive load. The present study adopts a psycholinguistic lens to track how specific cognitive mechanisms support or hinder the internalisation of syntactic and lexical patterns during an intensive instructional cycle. By triangulating

process-data (eye movements, reaction times) with introspective reports, we aim to delineate the trajectories through which declarative knowledge becomes proceduralised and automatised.

Forty-two adult volunteers (age 19–31, M = 24.6, SD = 3.1) were recruited from university language centres in Tashkent. All participants were balanced Uzbek-Russian bilinguals with no prior sustained exposure to English beyond secondary-school curricula. They gave informed consent and completed background questionnaires covering language history, socio-economic status, and cognitive health.

Learners engaged in a twelve-week, five-day-per-week intensive course (total 180 contact hours) following a communicative-grammar syllabus. Instruction incorporated audiovisual input, corpus-based frequency lists, and task-based interaction.

Phonological working memory was assessed with an automated reading-span task adapted to Uzbek phonotactics. Attentional control was indexed via the colour–word Stroop and n-back tasks. Implicit statistical learning aptitude was measured using a visual artificial-grammar paradigm. Pre- and post-tests of English proficiency employed the Oxford Quick Placement Test.

During weeks four, eight, and twelve, participants completed focus-on-form tasks while wearing a Tobii Pro X3-120 eye-tracker (sampling rate 120 Hz). Stimuli consisted of controlled narrative texts embedding target structures (e.g., third-person -s, participial adjectives). Gaze duration on regions of interest served as a proxy for cognitive effort. Immediately afterwards, stimulated-recall interviews captured on-line noticing and metacognitive reflections. Reaction times for grammaticality-judgement tasks were recorded through E-Prime.

Eye-movement metrics (first-pass duration, total reading time) and reaction times were log-transformed to correct skewness. Mixed-effects linear models predicted processing speed and accuracy from cognitive-aptitude scores, time, and task type, with random intercepts for participants and items. Qualitative data underwent inductive thematic analysis supported by NVivo 14, generating coding categories such as noticing lexical chunks, hypothesis testing, and automatized retrieval. Validity was enhanced through inter-rater agreement (κ = 0.81).

Quantitative modelling revealed that phonological working-memory span significantly predicted shorter first-pass durations on morphosyntactic target zones (β = −0.34, p < .001), indicating more efficient initial parsing. Attentional-control performance accounted for incremental gains in grammaticality-judgement accuracy across sessions (β = 0.27, p = .004). Implicit statistical-learning aptitude uniquely explained variance in the post-test acquisition of low-salience inflections such as third-person -s (β = 0.22, p = .012) after controlling for explicit aptitude.

Reaction-time distributions showed a progressive shift from controlled to automatic processing. Median response latency decreased from 1430 ms (SD = 312 ms) at week four to 885 ms (SD = 198 ms) at week twelve. Eye-tracking corroborated this temporal pattern: total reading time on grammatical targets dropped by 38 %, while regressions to preceding context declined by 41 %.

Qualitative analysis illuminated how learners allocated attention. In the early phase, participants reported conscious monitoring of verb endings and reliance on native-language translation equivalents. Mid-programme narratives highlighted the emergence of chunk-based processing, with learners citing formulaic sequences such as I don’t think or at the same time as anchors for sentence planning. By the final phase, many described an “intuitive grasp” of tense–aspect marking, reflecting a transition from declarative to procedural control.

The findings substantiate a multicomponent model of L2 learning in which domain-general cognitive faculties interface with language-specific mechanisms. High working-memory capacity facilitates the temporary maintenance of novel forms, enabling deeper syntactic integration. This aligns with Baddeley’s multi-store model and subsequent SLA adaptations that posit a phonological loop sensitive to articulatory rehearsal. Efficient attentional control enhances selective processing, allowing learners to filter irrelevant cues and prioritise diagnostically rich input, echoing theories of input enhancement.

Crucially, implicit statistical learning emerged as the principal driver for mastering forms that receive limited classroom explanation. The success of learners with strong aptitude scores supports the declarative/procedural distinction advanced by Ullman, where rule-like patterns become encoded in procedural memory networks through repeated exposure, without conscious mediation. The convergence of gaze-based indices and verbal reports indicates that noticing and implicit abstraction coexist: initial focal attention to salient forms seeds implicit pattern extraction, which gradually automatizes performance.

These dynamics resonate with usage-based perspectives that attribute grammatical development to the frequency-driven entrenchment of constructions. Yet the predictive power of individual-

difference variables underscores that frequency effects are filtered through cognitive constraints. Pedagogically, this calls for adaptive task sequencing: beginner instruction may exploit high-salience input with overt feedback to cultivate noticing, thereafter shifting toward rich exposure that leverages implicit learning. Additionally, training executive attention—through task-switching or mindfulness exercises—might boost learners' capacity to manage L1 interference and inhibit premature lexical retrieval.

Second-language learning is a cognitively intensive endeavour orchestrated by the interplay of working memory, attentional control, and implicit statistical learning. The present study demonstrates that these mechanisms collectively shape the trajectory from initial noticing to automatized production, and their relative contributions fluctuate with proficiency and structural salience. By harnessing multimodal process-tracing, we provide nuanced evidence that successful instruction must tailor interventions to learners' evolving cognitive profiles, enriching exposure while scaffold¬ing attentional focus. Future research should employ longitudinal neuroimaging to chart neural reorganisation during L2 acquisition and explore how affective factors modulate cognitive resource allocation.

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