

Structural Priming and the Developing L2 Construct-i-con: A Critical Review of Representation, Association, and Change

Cheng Qian^{1,*}

¹School of International Studies, Zhejiang University, Hangzhou, China

*Corresponding author: jasonqian2003@zju.edu.cn

Abstract

Construction-based accounts characterize second-language (L2) grammar as a construct-i-con, a network of learned form–function pairings. Structural priming, the influence of a recently processed structure on later production or comprehension, offers a way to examine how this network is organized and how it changes. This critical review brings together within-construction, L2-internal cross-structural, and cross-language priming and attempts to discuss about what each design can show about representation, what factors condition the effect, and when priming supports a developmental claim. There is disagreement over the processes underlying structural priming: residual activation may cause recently accessed information to be temporarily more accessible, but implicit-learning theories view persistent or cumulative priming as adaptation to experience and therefore view cumulative priming as an implicit learning. Since these processes can coexist, a priming effect shows a context-dependent influence, not a permanent network link. Three patterns emerge: first, increased experience tends to lead to generalization across lexical items, although item-specific knowledge remains active; second, transfer between L2 constructions and languages is selective: development may strengthen licensed relations while reducing carry-over based only on a repeated string or an incompatible L1 pattern; third, immediate production, delayed production, and online prediction often diverge. Large effects therefore need not indicate mature representations; low baselines, rare structures, and unexpected verb–structure pairings can all increase priming. The state of an L2 construct-i-con is better determined by what an effect carries, where it stops, and how long it lasts than by its size alone.

Keywords

Structural priming; second language acquisition; construct-i-con; construction learning; cross-structural priming; bilingual representation; implicit learning.

1. Introduction

Construction-based approaches define a construction as a learned pairing of form and function. A speaker's construct-i-con is defined as the network formed by these pairings. It includes fixed expressions, verb-specific frames, and schematic patterns, which may be related through similarities in form, meaning, discourse use, and experience (Croft, 2001; Diessel, 2019, 2023; Goldberg, 2006, 2019; Hoffmann, 2022). In an L2, this network is built from uneven input and remains open to influence from the first language (L1). The issue is therefore not only whether a learner knows a passive, dative, or caused-motion construction, but how broadly that knowledge generalizes and how selectively it is linked to other patterns.

A usage-based account gives this question a developmental direction. Early knowledge may rely heavily on familiar words, recurring strings, and item–construction associations. Experience with varied examples can support broader form–function generalizations, while further

experience teaches learners where those generalizations do not apply (Ellis, 2002; Goldberg, 2006; Gries & Wulff, 2009; Perek, 2015). Specific and schematic knowledge can coexist. Development is thus better viewed as a change in their relative weight than as the replacement of lexical frames by a single abstract grammar.

Structural priming provides an experimental way to study that changing balance. It is a change in the probability of producing, or the efficiency of processing, a structure after recent exposure to the same or a related structure (Bock, 1986; Branigan & Pickering, 2017; Pickering & Ferreira, 2008). A same-structure effect across different verbs can test whether knowledge extends beyond one lexical episode. Priming between L2 constructions can test whether processing one pattern changes access to another. Cross-language priming asks whether corresponding patterns in the two languages exchange activation. Cumulative and delayed designs can also test whether repeated experience changes later behavior.

Priming is versatile, but its interpretation is not automatic. A recent sentence may leave temporary activation, alter expectations, cue an episodic memory, or encourage a task-specific strategy. Repeated words and function words can also carry an effect that looks structural (Bock & Griffin, 2000; Chang et al., 2006; Hartsuiker et al., 2008; Jaeger & Snider, 2013; Nielsen & Christiansen, 2025). A cross-structural effect therefore does not necessarily reveal a stored link between two specific constructions by itself. Nor does cross-language priming require a fully shared bilingual representation. In this sense, the question is narrower: what information carried over, under which conditions, and for how long?

In this review, this question is therefore used to connect structural priming with L2 construction learning. To be more specific, this review addresses three issues: (1) what different priming designs reveal about the organization of L2 knowledge; (2) why their effects vary across learners, constructions, and tasks; and (3) when a priming result warrants a developmental interpretation. The central argument is that development can bring two changes at once. Learners may generalize beyond particular constructions, yet become less responsive to superficial overlap or L1 patterns that the L2 does not license. More priming is not always more development.

The review is critical and narrative. Studies were selected because they bear directly on the three questions, not through a search designed to estimate the prevalence of positive results. L1 studies are included only when they clarify what an L2 contrast can and cannot show.

2. Theoretical Framework: Construction Learning and Structural Priming

2.1. From Item-Specific Patterns to an L2 Construct-i-con

A construct-i-con is not a list of independent sentence types. It is a network in which units differ in size and schematicity. A learner may retain a partly fixed phrase, a verb-specific frame, and a more general argument-structure construction at the same time. Their accessibility depends on frequency, recency, and the fit between a lexical item and a construction (Diessel, 2019, 2023; Goldberg, 2019; Perek, 2015). Gries and Wulff (2009), for example, found construction-sensitive verb associations in advanced L2 English using corpus and experimental evidence. Such associations are part of constructional knowledge, not noise that disappears once an abstract schema is learned.

Nevertheless, usage-based learning predicts change. Repeated tokens strengthen familiar routines; varied tokens make recurring relations easier to detect. With experience, a learner may apply a construction to new lexical items while still respecting verbs that strongly favor another pattern. The result is neither wholly item-bound nor freely abstract. It is graded knowledge whose range is shaped by the learner's history. For a priming study, this means that generalization and constraint are equally important: a mature pattern should travel to appropriate new contexts but stop at relevant grammatical or functional boundaries.

2.2. An L2 Syntactic Development Account

Building on Hartsuiker and Bernolet's (2017) account, this review treats L2 development as a shift in the balance between item-based representations and more abstract representations. At early stages, learners may draw heavily on familiar L1 patterns, memorized strings, and explicit knowledge. As the L2 construct-i-con develops through experience, L2 representations may become less tied to individual lexical items, and compatible L1–L2 structures may become more closely linked. The expected pattern is therefore not universal growth in priming effects, but greater cross-lexical generalization and, where structures align, more abstract cross-language priming.

This proposal tends to make a developmental hypothesis instead of being a fixed sequence already established for all learners. Much of the evidence compares proficiency groups at one point in time. Such contrasts can reveal an association with proficiency, but not change within the same person. Evidence from intensive instruction also suggests that abstraction can emerge relatively early. In a study combining longitudinal and cross-sectional data from beginning learners in an intensive Dutch course, van Lieburg et al. (2023) found evidence for abstract passive representations and argued for both residual activation and implicit learning. The small longitudinal sample and instructional setting limit generalization to other contexts.

The account also needs a constructional refinement. Cross-language sharing is not the only endpoint, and wider activation is not always better. Experience may strengthen a licensed L1–L2 correspondence while weakening transfer from an L1 pattern that conflicts with the L2. Within the L2, learners may generalize across verbs but distinguish two surface-similar constructions more sharply. Here, integration refers to generalization across compatible lexical items, constructions, or languages. Differentiation refers to learning where that generalization must stop. Development can involve both processes at the same time, and this prediction supplies the main line for the evidence reviewed below.

2.3. Why Priming Occurs

There are two influential accounts that locate structural priming at different time scales. Residual-activation accounts hold that processing a prime temporarily increases the accessibility of a combinatorial representation and its connections to lexical heads. They easily explain adjacent-trial priming and the lexical boost produced by repeating a verb (Pickering & Branigan, 1998). The effect does not necessarily change long-term knowledge; information recently activated may simply remain easier to retrieve in the short term.

Implicit-learning accounts consider experience as a gradual modification of the production system. Persistence across intervening material motivated Bock and Griffin's (2000) learning interpretation. Error-based models add a specific prediction: an unexpected prime produces a larger update than an expected one (Chang et al., 2006; Jaeger & Snider, 2013). This account can explain cumulative effects and inverse patterns, but immediate priming alone is not evidence that durable learning occurred.

The accounts do not have to be mutually exclusive. For instance, Reitter et al. (2011) modeled longer-term adaptation by base-level learning and short-term priming by spreading activation. Explicit or episodic retrieval can also provide yet another route, particularly when words, pictures, or tasks are repeated. Effect size is unable to determine the mechanism. Direct variation must be done on lag, lexical overlap, cumulative exposure, expectation, and delayed transfer.

2.4. What Different Priming Designs Can Show

The limit of the conclusion is determined by the contrast which is constructed into an experiment. In case where prime and target use the same construction but different verbs, persistence helps in knowledge that goes beyond one memorized utterance. In L2-internal

cross-structural priming, an A-to-B effect demonstrates that processing A altered access to information useful for B. It does not find a direct A-B link, since the effect can be mediated by shared wording, event structure, thematic mapping, or a more general pattern. Cross-language priming establishes exchange between the tested language systems, not necessarily a single shared representation (Van Gompel & Arai, 2018).

L1 work makes the problem concrete. Apparent transfer of a broad thematic pattern can divide into more specific, event-sensitive relations when form and meaning are controlled (Chang et al., 2003; Ziegler & Snedeker, 2018; Ziegler et al., 2018). Likewise, much of the classic by-locative-to-passive effect was reduced once repetition of 'by' was controlled (Bock & Loebell, 1990; Ziegler et al., 2019). These findings do not make priming uninformative. They show why local form, function, and task context must be separated before an effect is used to describe a constructional relation.

Timing poses a second limit. An adjacent prime-target contrast measures access in the current task. Change across a block shows adaptation to the local distribution. An immediate posttest removes the last prime but not the materials, instructions, or memory of the session. Delayed testing, transfer to new lexical items, and transfer to another task rule out different alternatives; they are most informative when combined. These outcomes should be named by their timing and design rather than placed on one vague scale of 'long-term priming' (Cai & Zhao, 2024; Jackson, 2018). Table 1 states the narrowest inference licensed by common designs.

Table 1. Priming designs and the claims they license about the L2 construct-i-con

Evidence	Strongest warranted inference	What it does not establish by itself	Stronger design requirement
Within-L2 A→A across new lexical items	The L2 construction is available beyond one memorized token	A relation between different constructions	Cross verb and item overlap; include an unprimed baseline
L2-internal A→B	Processing A changed access to information useful for B	A direct A-B edge or a shared mother construction	Orthogonalize form and function; add A→A, B→B, B→A, and unrelated primes
L1 A→L2 A or L2 A→L1 A	The language systems exchanged activation for the tested pattern	A single fully shared bilingual representation	Compare within- and cross-language effects; control switching and direction
Facilitation, inhibition, or asymmetry	The relation is condition dependent and may be directional	A unique inheritance, excitatory, or inhibitory link	Calibrate against neutral baselines, frequency, difficulty, and expectancy
Cumulative or same-session posttest change	The experimental distribution changed later behavior in the session	Durable acquisition	Add delayed, new-item, and cross-task transfer
Delayed/new-item or cross-task effect	Learning-related change generalized beyond adjacent trials or practiced items	A mechanism-pure change in one stored representation	Include no-priming controls and test which lexical and structural information transferred
Online gaze or reading effect	Activated knowledge affected incremental processing	Convergence with production or offline knowledge	Pair online comprehension with production and delayed measures

Note. A and B denote distinct constructions. Arrows indicate tested prime-target directions, not structural or causal links. The interpretations are the present review's synthesis.

3. What Priming Reveals About the Developing L2 Construct-i-con

3.1. Within-Construction Priming: Item Support and Abstraction

Reliable L2 priming first reveals that subsequent decision can be informed by recent structural experience. The interaction study conducted by McDonough (2006) discovered an immediate rise in English prepositional-object datives in one of the experiments, but not in both experiments when using double-object priming. The study thus established conditional access to one dative alternative, not equal strength or abstraction of both alternatives. The more practical test of abstraction is the ability of an effect to withstand a verb or item change.

Same-verb and cross-verb effects cannot be considered as competing developmental stages. Repeating a verb can reactivate a learned verb–construction link, while priming across verbs is consistent with information that is not tied to one lexical head. The two effects may simultaneously occur, and the lexical boost tends to decay quicker than abstract priming (Hartsuiker et al. , 2008; Mahowald et al. , 2016; Pickering and Branigan, 1998). In this way, a lexical boost does not indicate that a learner lacks a schema. Conversely, cross-verb priming can still draw on shared semantics or a recurring task.

The study of proficiency generally falls within a shift towards broader generalization. Bernolet et al. (2013) discovered that there is greater syntactic sharing and less lexical dependence at higher proficiency. The result is consistent with the developmental account, yet the design was cross-sectional. Van Lieburg et al. (2023) present longitudinal data on beginning learners in an intensive Dutch course demonstrating that abstract representations can emerge relatively early, although the small longitudinal sample and instructional setting limit generalization to other learning contexts. Collectively, these studies favor coexistence and reweighting: item-specific knowledge remains available as generalization broadens.

The demand of memory further complicates a simple lexical-to-abstract shift. Coumel et al. (2024) found that priming was decreased in both groups of French learners when an intervening memory task was performed. There was no interaction between proficiency and load in the preregistered categorical analysis; only an exploratory continuous model showed a relationship between greater proficiency and weaker priming under high load. Since verb overlap was not manipulated, but kept constant, the study is relevant to memory demand, rather than to whether one group had an abstract construction or not.

The pattern is then qualified and yet clear. Cross-lexical priming can be a helpful evidence of generalization, particularly when lexical, semantic, and task overlap are controlled. It does not directly measure abstraction. Development can be more reliably deduced by a developing profile: less reliance on a repeated item, consistent transfer to appropriate new items, and ongoing sensitivity to item-specific constraints.

3.2. Cross-Structural Priming: Selective Relations Within the L2

Cross-structural priming asks whether one L2 construction affects another. The evidence is still limited, but it has an important advantage: it can test the boundaries of generalization rather than only the strength of a repeated construction. L1 studies show why polarity alone is not enough. Caused-motion and resultative sentences can inhibit each other, and other construction families yield facilitation, inhibition, asymmetry, or null effects (Bouso et al., 2024; Ungerer, 2021, 2023). These outcomes show interaction under the tested conditions. They do not, without controls, distinguish direct links from competition, shared features, or unequal expectations.

Hong and Ma (2024) brought this logic into L2 comprehension. In a maze task with 115 Chinese learners of English, caused-motion, resultative, and into-causative primes produced a mix of facilitation, inhibition, and directional asymmetry. The pattern is compatible with distinct but related L2 constructions. Yet it cannot determine whether the relation is direct or is mediated

by shared form, event meaning, or expectancy. The contribution lies in showing that the construction family did not behave as one undifferentiated pattern.

Hopp et al. (2026) reveal another kind of selectivity. Locatives influenced later dative choices in the L1 group, but infinitives did not. Higher-proficiency L2 learners showed priming only from datives. Lower-proficiency learners also produced more prepositional-object datives after infinitival primes that repeated 'to'. Verb repetition did not magnify this cross-structural effect, so the authors attributed it to memory for a local surface cue rather than a shared syntactic representation. The finding shows how surface repetition can overestimate constructional connectivity.

The proficiency contrast also changes how a null effect should be read. The narrower pattern among higher-proficiency learners may reflect stronger syntactic constraints, not weaker L2 knowledge. Because the groups were compared at one time point, the study cannot show this differentiation unfolding within learners. Still, it supports a crucial prediction: construction learning can reduce transfer across a grammatical boundary even as abstraction within a construction grows.

Cross-structural priming is thus most informative when relatedness is specified before the experiment. Both directions should be tested, each construction should prime itself, and a neutral condition should separate facilitation from inhibition. If form and function are varied independently, the method can show which feature supports transfer and where the L2 network draws a boundary.

3.3. Cross-Language Priming: Partial and Structure-Specific Coupling

Cross-language priming shows that structural experience in one language can alter a later choice in the other. It does not force a choice between a single shared syntax and two isolated systems. Separate representations may be linked, or they may overlap at one level while remaining distinct at another (Van Gompel & Arai, 2018). The amount of observed sharing also depends on lexical repetition, switching, language mode, and the alternatives available in each language. Ahn and Ferreira (2024), for example, found that some cumulative within-language effects persisted more clearly than cross-language effects. This is compatible with linked but nonidentical representations.

Proficiency is often associated with closer coupling. Bernolet et al. (2013) found greater sharing at higher proficiency, and Hartsuiker and Bernolet (2017) proposed that links to L1 counterparts strengthen once abstract L2 representations have developed. Artificial-language studies add controlled evidence but also show that integration is construction specific. Muylle et al. (2020) found cross-language priming for transitives, but not ditransitives, in three artificial-language versions that differed in word order and case marking. In a five-session study, several cross-language effects were already present on Day 1, whereas some conditions—especially Dutch-to-artificial-language ditransitives—emerged later (Muylle et al., 2021a).

The same program shows how recent distributions and structural compatibility shape the link. Immediate choices in the artificial language remained sensitive to L1 history, while cumulative production increasingly followed frequencies experienced during training (Muylle et al., 2021c). When the artificial language allowed both orders, cross-language priming was weaker from SOV than from SVO primes. Priming without verb overlap was not reliable in Experiment 1 but emerged in Experiment 2 after participants had experienced a verb-overlap condition (Muylle et al., 2021b). These findings support graded, construction-specific coupling rather than a global shift to shared syntax.

Natural-language studies point in the same direction. Cumulative experience within and between Mandarin and English shifted later choices in Hwang and Shin (2019). German-to-English primes increased grammatical shared word orders in Hopp and Jackson (2023), with

post-priming persistence among the more highly proficient learners, but did not increase dispreferred or ungrammatical L1-based orders. Hwang (2022) likewise found that Korean learners increased a grammatical English causative while reducing a competing ungrammatical analysis. These results show that cross-language activation can aid both integration and differentiation.

The recurring pattern is selective exchange. L1 and L2 knowledge can influence each other, but the effect varies by construction, direction, and context. Proficiency alone cannot explain that pattern. A convincing account must specify which form–function correspondences should support transfer and which competing option each language makes available.

3.4. Production, Online Processing, and Persistence

A construction may guide a production choice before it supports rapid prediction in comprehension. It may also prime the next trial without changing behavior after the session. These differences matter because immediate access, persistent production, and online availability are not interchangeable signs of learning.

Jackson and Ruf (2017) found comparable immediate adverb-first priming for temporal and locative fronting, but only temporal fronting increased in the post-priming phase. In their 2018 study, learners who repeated primes showed larger immediate priming and a same-session posttest effect than the listening-only group in the earlier study. Because the studies used different samples, the comparison cannot establish repetition as the cause, nor did either study test temporal-to-locative transfer.

Other studies provide stronger evidence that production change can persist. In Shin and Christianson (2012), explicit instruction combined with priming accelerated short-term gains, but only the long-lag implicit condition maintained increased double-object production one day later. Passive production changes lasted one week in Coumel et al. (2023). Hurtado and Montrul (2021) likewise found one-week effects for Spanish dative clitics among L2 and heritage speakers. These results are compatible with learning-related change, but its reach differed by construction, group, and measure.

The Mandarin dative studies show why measures must be combined. Zhu and Grüter (2024) found priming-related changes in learner production and acceptability judgments, including an inverse-frequency pattern for GIVE verbs, but no evidence of statistical preemption in the tested context. Their later study found a one-day production effect without matching immediate or delayed change in anticipatory eye movements (Zhu & Grüter, 2026). Production learning did not automatically yield online predictive adaptation.

Online measures remain valuable. Şafak and Hopp (2025) found that prediction error and verb-conditioned expectations shaped prepositional-object priming in advanced learners of English; comprehension experience also affected later unprimed production. The result locates where distributional knowledge enters processing, but it does not make comprehension a purer measure of representation. Convergence is informative, and so is dissociation.

4. Why L2 Priming Varies and What the Variation Means

4.1. Frequency, Baseline Use, and Prediction Error

Many priming differences are predicted by proficiency, but not explained. A single score combines lexical knowledge, construction-specific exposure, processing speed, literacy, immersion, and test familiarity. Learners with the same score may have encountered the target construction in very different distributions. Global proficiency should therefore be modelled along with construction-specific experience and current language use. Differences between cross-sectional groups are evidence of association, rather than learning.

Table 2. Core L2 structural-priming evidence and developmental interpretations

Study	Population and task	Priming contrast	Main finding	Developmental interpretation
McDonough (2006)	English L2 speakers; interaction and picture description	Dative primes → dative production	Immediate PO priming in one experiment; no reliable DO effect	Establishes conditional L2 node availability, not uniform abstraction of both alternatives
Shin & Christianson (2012)	Korean learners of English; picture description and judgments	No-lag comparison, long-lag implicit priming, and explicit reinforcement	Explicit reinforcement accelerated short-term gains; only long-lag implicit priming maintained increased double-object-dative production one day later	Supports delayed L2 change while showing structure- and task-specific transfer
Bernolet et al. (2013)	Bilingual production across proficiency	Within-/cross-language structure with lexical variation	Greater sharing and reduced lexical dependence at higher proficiency	Consistent with increasing abstraction and coupling; cross-sectional rather than longitudinal
Jackson & Ruf (2017, 2018)	Intermediate L2 German production	Temporal or locative fronting; listening or repetition across studies	The 2018 repetition sample showed larger immediate priming and an immediate-posttest effect than the 2017 listening-only sample	Shows that shared order does not guarantee identical persistence; the repetition contrast was cross-study
Muylle et al. (2020, 2021a, 2021b, 2021c)	Dutch speakers learning artificial languages	Within- and cross-language priming of transitive and ditransitive structures	Effects varied by structure, direction, training, frequency, and word-order compatibility	Supports partial, structure-specific coupling rather than a global shared grammar
Hwang & Shin (2019)	Mandarin-English bilingual production	Cumulative within- and between-language experience	Prior distributions affected later syntactic choices	Shows that local experience can reweight bilingual structural use
Hwang (2022)	Korean learners of English; causative production	Repeated grammatical L2 causatives	Target causatives increased and a competing ungrammatical analysis decreased	Illustrates integration of a target mapping with differentiation from L1-compatible competition
Coumel et al. (2023)	235 L1/L2 English users; passive production	Listening- or reading-to-writing priming	Immediate, same-session, and one-week change; modality affected only immediate priming	Separates short-lived modality sensitivity from persistent learning
Coumel et al. (2024)	200 lower-/higher-proficiency learners of French	Low versus high memory load with verb overlap held constant	Both groups primed less under high load; no simple categorical stage interaction	Supports memory involvement without assigning a unique mechanism to each proficiency stage
Hong & Ma (2024)	115 Chinese EFL learners; maze comprehension	Caused-motion/resultative/into-causative cross-priming	Facilitative, inhibitory, and directional effects across the family	Compatible with selective L2 constructional relations; polarity does not identify topology
Hopp et al. (2026)	68 L1 English speakers; 144 German learners of English	Dative, locative, or infinitival primes → datives	Lower-proficiency infinitive-to-dative priming was attributed to local surface overlap in 'to'; higher-proficiency priming was narrower	Consistent with stronger syntactic selectivity, not richer connectivity at lower proficiency
Hopp & Jackson (2023)	Less-/more-proficient German learners of English	L1 primes → grammatical or incompatible L2 orders	Grammatical shared orders increased; incompatible L1-based orders did not	Cross-language activation can facilitate correspondence and constrain negative transfer
Şafak & Hopp (2025)	Advanced learners of English; visual-world and production tasks	PO exposure under differing verb biases	Prediction error enhanced priming, while target-verb constraints limited transfer	Links abstract adaptation to verb-conditioned expectations
Zhu & Grüter (2024, 2026)	Learners and L1 users of Mandarin; production, judgment, and eye tracking	Dative alternatives with differing verb constraints	Production learning, including a one-day posttest, did not entail parallel predictive adaptation	Demonstrates why production and online network availability must be measured separately
Hwang (2025)	Mandarin L1 and English L2 passive production	Equal frequencies with active- or passive-recent ordering	Recency reliably changed the same-session L2 posttest effect	Supports memory-sensitive adaptation without providing delayed evidence

Note. The final column reports the present review's interpretation rather than necessarily the original authors' conclusion. DO = double object; EFL = English as a foreign language; L1 = first language; L2 = second language; PO = prepositional object.

Frequency affects both baseline choice and response to a prime. To make it clearer, this review refers to inverse frequency effect for stronger priming of the less frequent member of a structural alternation. The inverse preference effect is more local: priming is stronger when the prime combines a verb with a structure that it normally disfavors. Earlier work sometimes used the labels interchangeably (Jaeger & Snider, 2013), whereas recent L2 work separates them (Şafak & Hopp, 2025).

Neither effect is the same as a low baseline. Low use merely provides more numerical room for an increase; an inverse effect must involve the size of priming to vary with prior frequency or local preference. Coumel et al. (2023), for example, discovered that L2 participants generated more passives in immediate priming and exhibited a better one-week learning than L1 participants. Frequency and verb bias were not manipulated in the study. It rather demonstrates why a larger L2 effect fails to alone prove a stronger pre-existing representation. Error-based accounts predict greater updating following less expected input, but an inverse asymmetry is only a measure of prediction error (Chang et al., 2006; Jaeger & Snider, 2013). Jackson and Hopp (2020) discovered the largest immediate priming in the L2 group, but not the largest baseline-to-posttest gain. Montero-Melis and Jaeger (2020) also demonstrated that adaptation in L2 production followed expectations shaped by experience in both languages. Immediate responsiveness and sustained change must therefore be analyzed separately.

4.2. Lexical Overlap, Memory, and Task

Lexical repetition can help in more than one way. Repeating a content word might retrieve its learned association with a construction. Repeating a function word or short sequence may cue memory for a recent sentence even when the two constructions differ. The quicker decay of the lexical boost compared to abstract priming suggests an episodic component (Hartsuiker et al., 2008). The infinitive-to-dative effect for 'to' in Hopp et al. (2026) exhibits the same risk across structures.

Memory load changes how readily these traces are used. Priming weakened under greater load in Coumel et al. (2024), but the preregistered analysis did not assign a different mechanism to each proficiency group. This result is compatible with a hybrid account in which base-level learning and spreading activation contribute differently across timescales (Reitter et al., 2011). A repeated word should therefore be treated as an experimental factor, not merely as a way to make priming easier to detect.

Tasks also dictate what is encoded and retrieved. In Coumel et al. (2023), listening resulted in more immediate passive priming than reading, but modality did not affect learning at the later tests. The repetition sample of Jackson and Ruf (2018) demonstrated greater same-session and immediate change than the previous listening-only sample, but this was not a randomized comparison. Different demands are created by picture description, maze reading, sentence completion, judgments and visual-world tasks. Context is included as part of the explanation, rather than something to be disregarded (Nielsen & Christiansen, 2025).

4.3. Congruence, Verb Constraints, and Recency

L1–L2 congruence is a property of a constructional comparison, not of a language pair as a whole. Two languages may share constituent order but differ in case marking, thematic mapping, information structure, or which verbs license that order. Muylle et al. (2020, 2021b) show that the combination of structure and word order matters. Hopp and Jackson (2023) likewise found transfer for grammatical shared orders but not for incompatible L1-based alternatives. A transfer claim should specify the form–function correspondence expected to carry activation.

Verb constraints supply a local test of that correspondence. Zhu and Grüter (2024) reported an inverse-frequency production pattern for Mandarin GIVE verbs: after equal exposure to double-

object and *gei*-object datives, classroom learners increased the initially less expected GIVE–*gei*-object pairing, while the change in GIVE–double-object production was only numerical. Şafak and Hopp (2025) directly manipulated verb-conditioned expectations in advanced German learners of English. Prepositional-object priming was stronger than double-object priming and was larger with double-object-biased than with prepositional-object-biased prime verbs.

Target-side grammar still limited that adjustment. With nonalternating target verbs that categorically licensed only the prepositional-object form, prime-driven effects were smaller and shorter-lived (Şafak & Hopp, 2025). This is the combination expected in a developing construct-i-con: sensitivity to unexpected input together with respect for lexical constraints. Because the prime-verb biases were normed with native speakers, future work should estimate the learners' own expectations rather than assume that the two distributions match.

Recency adds a final source of variation. Hwang (2025) held prime frequency constant but changed the order of active and passive primes. English responses in an immediate posttest within the same session were more strongly affected when passive primes occurred most recently; the Mandarin difference was numerical only. The research favors memory-sensitive adaptation, rather than retention over days. Frequency, spacing, and order all need to be reported since equal numbers can result in different learning histories.

5. Developmental Synthesis and Research Agenda

5.1. The Pattern: Broader Generalization and Stronger Constraints

There are five patterns that can be argued more than one developmental sequence. First, lexical and schematic knowledge coexist. Priming can be reinforced by repeating a verb, but priming can also persist after the verb changes (Hartsuiker et al., 2008; Mahowald et al., 2016). Second, broader L2 experience is often associated with transfer across relevant lexical items (Bernolet et al., 2013; van Lieburg et al., 2023). The clearest evidence is therefore not merely a larger effect, but transfer to new items alongside continued sensitivity to verb-specific restrictions.

Third, transfer is selective. Within the L2, related constructions can facilitate, inhibit, or fail to affect one another (Hong & Ma, 2024; Hopp et al., 2026). Across languages, grammatical correspondences may support transfer, whereas incompatible L1 mappings may not (Hopp & Jackson, 2023; Hwang, 2022). Fourth, effect size alone is ambiguous: baseline use, prior frequency, lexical expectations, and memory can all affect observed priming (Jackson & Hopp, 2020; Jaeger & Snider, 2013; Reitter et al., 2011). Fifth, immediate production, delayed production, and online prediction can diverge (Coulmeil et al., 2023; Zhu & Grüter, 2026). These measures should not be collapsed.

The present review therefore treats these findings as consistent with a construct-i-con that may become both more integrated and more differentiated. Integration is visible when knowledge generalizes across suitable verbs or converges with a grammatical L1 counterpart; differentiation is visible when carry-over stops at a grammatical boundary or an incompatible L1 mapping (Hopp & Jackson, 2023; Hopp et al., 2026; Hwang, 2022). A more developed profile is therefore not the one with the widest priming. It is one in which generalization follows learned form–function constraints and remains available beyond a single trial (Coulmeil et al., 2023; Shin & Christianson, 2012). Because much of the evidence is cross-sectional, this remains a testable developmental account rather than a settled sequence.

5.2. Limits of the Existing Evidence

The complete developmental course is not yet defined in the literature. Key proficiency comparisons are cross-sectional (Bernolet et al., 2013; Hopp et al., 2026), and thus group differences alone cannot indicate change within learners. Van Lieburg et al. (2023) provide longitudinal evidence, but their sample size was small due to an intensive Dutch course. Artificial-

language studies offer more strict control and demonstrate that construction-specific links can change over several sessions (Muylle et al., 2021a), yet compressed exposure may not resemble natural L2 learning. Delayed tests are also less prevalent than immediate or same-session measures among the studies reviewed here, which restricts the assertions regarding long-term change (Jackson, 2018).

There are also some representational claims that go beyond what can be determined by their designs. Cross-structural studies are not necessarily bidirectional, self-priming controls, and a neutral baseline, making facilitation and inhibition difficult to isolate (Hong and Ma, 2024; Hopp et al., 2026). The lexical material may appear wider than it is when repeated: the classic effect of by and the L2 effect of to both demonstrate that a common surface cue can cross a constructional boundary (Bock and Loebell, 1990; Hopp et al., 2026; Ziegler et al., 2019). Shared word order can also mask functional or lexical distribution mismatches in artificial-language work (Muylle et al., 2020, 2021b).

Lastly, the evidence discussed above is limited to a few alternations and mostly in production tasks (Jackson, 2018). Processing-production studies reveal why the measures must be kept distinct: they can be correlated within a session (Şafak & Hopp, 2025), but production can vary without corresponding online prediction (Zhu & Grüter, 2026). The responses to learner-specific input distributions should also be related to future work; experience-based analyses already demonstrate that expectations of both languages are important (Montero-Melis and Jaeger, 2020). Being a narrative review, the current article is able to detect common patterns, but not to estimate publication bias or an overall effect. It is now time to design experiments where alternative explanations will make different predictions, as opposed to providing additional demonstrations that a prime can have an impact.

5.3. Testing Development Rather Than Mere Priming

Longitudinal evidence of the same learners and constructions is given first priority. Van Lieburg et al. (2023) demonstrate that it is possible to repeat testing throughout an L2 course, while Bernolet et al. (2013) identify item-specific and cross-lexical contrasts worth following over time. The question of whether surface-based transfer decreases with increasing grammatical generalization should be tested in future research. Untrained lexical items should be introduced during delayed phases, and, where feasible, a new task; current one-day and one-week results offer good starting points (Coumel et al., 2023; Hurtado and Montrul, 2021; Shin and Christianson, 2012).

Second, the contrasts that are needed in a network claim should be included in experiments. A suggested relationship between A and B requires A-to-A and B-to-B controls, cross-directions and a neutral or unrelated prime. The 'by'-locative and 'to'-based results show why form and function must be separated in advance (Bock & Loebell, 1990; Hopp et al., 2026; Ziegler et al., 2019). Since expectations are based on language experience (Montero-Melis and Jaeger, 2020), the frequency of constructions and verb bias should be estimated using learner-specific corpora or norming rather than borrowing native-speaker values.

Third, production and comprehension should be measured in parallel. Zhu and Grüter (2026) observed a one-day change in production without an immediate or delayed effect of comprehension; Şafak and Hopp (2025) demonstrated that comprehension can influence same-session production. The location of information is determined by eye movements or reading times, selection of alternatives is determined by production, persistence is determined by delayed transfer. A discrepancy between them is not a failed replication. Alternative explanations of residual activation, implicit learning, and memory should then be evaluated using the same trial data (Chang et al., 2006; Pickering & Branigan, 1998; Reitter et al., 2011). Based on the L2 syntactic development account proposed by Hartsuiker and Bernolet (2017), the reformulation developed in the current review is a falsifiable construction-learning

prediction. It does not just anticipate larger effects but a reallocation of them: more transfer across suitable lexical contexts (Bernolet et al. , 2013; van Lieburg et al. , 2023), less transfer between incidental surface cues (Hopp et al. , 2026), and structure-specific L1L2 coupling (Hopp and Jackson, 2023; Muylle et al. , 2021b). These results would aid in differentiating successful differentiation and loss of a useful relation, and entrenchment and ceiling compression.

Fourth, a bigger priming does not always mean that there is a stronger stored representation. The numerical effect varies with baseline availability, rarity, prediction error, memory and ceiling effects. Fifth, there can be a difference between immediate production, delayed production, and online prediction. They show various access states and cannot be reduced to one.

Collectively, these patterns define a construct-i-con that is increasingly becoming more integrated and differentiated. Integration is visible when knowledge travels across suitable verbs, episodes, constructions, or languages. Differentiation is visible when carry-over stops at a grammatical boundary or an incompatible L1 mapping. A more developed profile is therefore not simply the widest possible spread of priming. It is a profile where generalization follows the form-function knowledge of the learner and is accessible beyond one single trial.

6. Conclusion

Structural priming can illuminate the developing L2 construct-i-con when its target and timescale are explicit. Within-construction priming tests whether a pattern is available beyond a particular item. L2-internal cross-structural priming tests selective influence among constructions. Cross-language priming tests structure-specific coupling between languages. Online and delayed measures ask when knowledge becomes available and whether change persists. No one effect uniquely reveals a permanent network link.

Across these designs, the clearest developmental hypothesis is a joint increase in useful generalization and grammatical selectivity. Learners may extend constructions to new, compatible contexts while becoming less responsive to repeated strings and L1 patterns that mislead in the L2. The evidence remains uneven, but it gives future research a sharper target. What matters is not how much priming appears, but what carries over, where the effect stops, and whether it survives a change in items, tasks, or time.

References

- [1] Ahn, S., & Ferreira, V. S. (2024). Shared vs. separate structural representations: Evidence from cumulative cross-language structural priming. *Quarterly Journal of Experimental Psychology*, 77(1), 174–190. <https://doi.org/10.1177/17470218231160942>
- [2] Bernolet, S., Hartsuiker, R. J., & Pickering, M. J. (2013). From language-specific to shared syntactic representations: The influence of second language proficiency on syntactic sharing in bilinguals. *Cognition*, 127(3), 287–306. <https://doi.org/10.1016/j.cognition.2013.02.005>
- [3] Bock, J. K. (1986). Syntactic persistence in language production. *Cognitive Psychology*, 18(3), 355–387. [https://doi.org/10.1016/0010-0285\(86\)90004-6](https://doi.org/10.1016/0010-0285(86)90004-6)
- [4] Bock, K., & Griffin, Z. M. (2000). The persistence of structural priming: Transient activation or implicit learning? *Journal of Experimental Psychology: General*, 129(2), 177–192. <https://doi.org/10.1037/0096-3445.129.2.177>
- [5] Bock, K., & Loebell, H. (1990). Framing sentences. *Cognition*, 35(1), 1–39. [https://doi.org/10.1016/0010-0277\(90\)90035-I](https://doi.org/10.1016/0010-0277(90)90035-I)

- [6] Bouso, T., Hundt, M., & Van Driessche, L. (2024). A sisterhood of constructions? A structural priming approach to modelling links in the network of objoid constructions. *Cognitive Linguistics*, 35(3), 313–344. <https://doi.org/10.1515/cog-2023-0103>
- [7] Branigan, H. P., & Pickering, M. J. (2017). An experimental approach to linguistic representation. *Behavioral and Brain Sciences*, 40, e282. <https://doi.org/10.1017/S0140525X16002028>
- [8] Cai, Z. G., & Zhao, N. (2024). Structural priming: An experimental paradigm for mapping linguistic representations. *Language and Linguistics Compass*, 18(2), e12507. <https://doi.org/10.1111/lnc3.12507>
- [9] Chang, F., Bock, K., & Goldberg, A. E. (2003). Can thematic roles leave traces of their places? *Cognition*, 90(1), 29–49. [https://doi.org/10.1016/S0010-0277\(03\)00123-9](https://doi.org/10.1016/S0010-0277(03)00123-9)
- [10] Chang, F., Dell, G. S., & Bock, K. (2006). Becoming syntactic. *Psychological Review*, 113(2), 234–272. <https://doi.org/10.1037/0033-295X.113.2.234>
- [11] Coumel, M., Muylle, M., Messenger, K., & Hartsuiker, R. J. (2024). The role of explicit memory across second language syntactic development: A structural priming study. *Language Learning*, 74(2), 402–435. <https://doi.org/10.1111/lang.12604>
- [12] Coumel, M., Ushioda, E., & Messenger, K. (2023). Second language learning via syntactic priming: Investigating the role of modality, attention, and motivation. *Language Learning*, 73(1), 231–265. <https://doi.org/10.1111/lang.12522>
- [13] Croft, W. (2001). *Radical construction grammar: Syntactic theory in typological perspective*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198299554.001.0001>
- [14] Diessel, H. (2019). *The grammar network: How linguistic structure is shaped by language use*. Cambridge University Press. <https://doi.org/10.1017/9781108671040>
- [15] Diessel, H. (2023). *The construct-i-con: Taxonomies and networks*. Cambridge University Press. <https://doi.org/10.1017/9781009327848>
- [16] Ellis, N. C. (2002). Frequency effects in language processing: A review with implications for theories of implicit and explicit language acquisition. *Studies in Second Language Acquisition*, 24(2), 143–188. <https://doi.org/10.1017/S0272263102002024>
- [17] Goldberg, A. E. (2006). *Constructions at work: The nature of generalization in language*. Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199268511.001.0001>
- [18] Goldberg, A. E. (2019). *Explain me this: Creativity, competition, and the partial productivity of constructions*. Princeton University Press. <https://doi.org/10.1515/9780691183954>
- [19] Gries, S. T., & Wulff, S. (2009). Psycholinguistic and corpus-linguistic evidence for L2 constructions. *Annual Review of Cognitive Linguistics*, 7, 163–186. <https://doi.org/10.1075/arcl.7.07gri>
- [20] Hartsuiker, R. J., & Bernolet, S. (2017). The development of shared syntax in second language learning. *Bilingualism: Language and Cognition*, 20(2), 219–234. <https://doi.org/10.1017/S1366728915000164>
- [21] Hartsuiker, R. J., Bernolet, S., Schoonbaert, S., Speybroeck, S., & Vanderelst, D. (2008). Syntactic priming persists while the lexical boost decays: Evidence from written and spoken dialogue. *Journal of Memory and Language*, 58(2), 214–238. <https://doi.org/10.1016/j.jml.2007.07.003>
- [22] Hoffmann, T. (2022). *Construction grammar: The structure of English*. Cambridge University Press. <https://doi.org/10.1017/9781139004213>
- [23] Hong, X., & Ma, Z. (2024). Zhongguo Yingyu xuexizhe de goushi biao Zheng lian jie: Laizi kuagoushi qidong de zhengju [On links between constructional representations for Chinese EFL learners:

- Evidence from cross-constructural priming]. *Foreign Language Teaching and Research*, 56(3), 381–393, 479. <https://doi.org/10.19923/j.cnki.fltr.2024.03.006>
- [24] Hopp, H., & Jackson, C. N. (2023). Asymmetrical effects of cross-linguistic structural priming on cross-linguistic influence in L2 learners. *Applied Psycholinguistics*, 44(2), 205–236. <https://doi.org/10.1017/S0142716423000164>
- [25] Hopp, H., Şafak, D. F., & van Dijk, C. (2026). Syntactic constraints on structural priming in L2 development: Effects of lexical overlap within and across structures. *Second Language Research*. Advance online publication. <https://doi.org/10.1177/02676583261417943>
- [26] Hurtado, L. M., & Montrul, S. (2021). Priming dative clitics in spoken Spanish as a second and heritage language. *Studies in Second Language Acquisition*, 43(4), 729–752. <https://doi.org/10.1017/S0272263120000716>
- [27] Hwang, H. (2022). L2 learners' adaptation to an L2 structure that is different from L1: Priming of an English causative structure in Korean learners. *Studies in Second Language Acquisition*, 44(4), 1181–1193. <https://doi.org/10.1017/S0272263121000620>
- [28] Hwang, H. (2025). Long-term structural priming involves a memory-based mechanism. *Applied Psycholinguistics*, 46, e28. <https://doi.org/10.1017/S0142716425100234>
- [29] Hwang, H., & Shin, J.-A. (2019). Cumulative effects of syntactic experience in a between- and within-language context: Evidence for implicit learning. *Journal of Memory and Language*, 109, 104054. <https://doi.org/10.1016/j.jml.2019.104054>
- [30] Jackson, C. N. (2018). Second language structural priming: A critical review and directions for future research. *Second Language Research*, 34(4), 539–552. <https://doi.org/10.1177/0267658317746207>
- [31] Jackson, C. N., & Hopp, H. (2020). Prediction error and implicit learning in L1 and L2 syntactic priming. *International Journal of Bilingualism*, 24(5–6), 895–911. <https://doi.org/10.1177/1367006920902851>
- [32] Jackson, C. N., & Ruf, H. T. (2017). The priming of word order in second language German. *Applied Psycholinguistics*, 38(2), 315–345. <https://doi.org/10.1017/S0142716416000205>
- [33] Jackson, C. N., & Ruf, H. T. (2018). The importance of prime repetition among intermediate-level second language learners. *Studies in Second Language Acquisition*, 40(3), 677–692. <https://doi.org/10.1017/S0272263117000365>
- [34] Jaeger, T. F., & Snider, N. E. (2013). Alignment as a consequence of expectation adaptation: Syntactic priming is affected by the prime's prediction error given both prior and recent experience. *Cognition*, 127(1), 57–83. <https://doi.org/10.1016/j.cognition.2012.10.013>
- [35] Mahowald, K., James, A., Futrell, R., & Gibson, E. (2016). A meta-analysis of syntactic priming in language production. *Journal of Memory and Language*, 91, 5–27. <https://doi.org/10.1016/j.jml.2016.03.009>
- [36] McDonough, K. (2006). Interaction and syntactic priming: English L2 speakers' production of dative constructions. *Studies in Second Language Acquisition*, 28(2), 179–207. <https://doi.org/10.1017/S0272263106060098>
- [37] Montero-Melis, G., & Jaeger, T. F. (2020). Changing expectations mediate adaptation in L2 production. *Bilingualism: Language and Cognition*, 23(3), 602–617. <https://doi.org/10.1017/S1366728919000506>

- [38] Muylle, M., Bernolet, S., & Hartsuiker, R. J. (2020). The role of case marking and word order in cross-linguistic structural priming in late L2 acquisition. *Language Learning*, 70(S2), 194–220. <https://doi.org/10.1111/lang.12400>
- [39] Muylle, M., Bernolet, S., & Hartsuiker, R. J. (2021a). The development of shared syntactic representations in late L2-learners: Evidence from structural priming in an artificial language. *Journal of Memory and Language*, 119, 104233. <https://doi.org/10.1016/j.jml.2021.104233>
- [40] Muylle, M., Bernolet, S., & Hartsuiker, R. J. (2021b). On the limits of shared syntactic representations: When word order variation blocks priming between an artificial language and Dutch. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 47(9), 1471–1493. <https://doi.org/10.1037/xlm0000997>
- [41] Muylle, M., Bernolet, S., & Hartsuiker, R. J. (2021c). The role of L1 and L2 frequency in cross-linguistic structural priming: An artificial language learning study. *Bilingualism: Language and Cognition*, 24(4), 767–778. <https://doi.org/10.1017/S1366728921000110>
- [42] Nielsen, Y. A., & Christiansen, M. H. (2025). Context, not grammar, is key to structural priming. *Trends in Cognitive Sciences*, 29(8), 703–714. <https://doi.org/10.1016/j.tics.2025.05.016>
- [43] Perek, F. (2015). Argument structure in usage-based construction grammar: Experimental and corpus-based perspectives. *John Benjamins*. <https://doi.org/10.1075/cal.17>
- [44] Pickering, M. J., & Branigan, H. P. (1998). The representation of verbs: Evidence from syntactic priming in language production. *Journal of Memory and Language*, 39(4), 633–651. <https://doi.org/10.1006/jmla.1998.2592>
- [45] Pickering, M. J., & Ferreira, V. S. (2008). Structural priming: A critical review. *Psychological Bulletin*, 134(3), 427–459. <https://doi.org/10.1037/0033-2909.134.3.427>
- [46] Reitter, D., Keller, F., & Moore, J. D. (2011). A computational cognitive model of syntactic priming. *Cognitive Science*, 35(4), 587–637. <https://doi.org/10.1111/j.1551-6709.2010.01165.x>
- [47] Şafak, D. F., & Hopp, H. (2025). Learning L2 grammar from prediction errors? Verb biases in structural priming in comprehension and production. *Bilingualism: Language and Cognition*, 28(5), 1249–1265. <https://doi.org/10.1017/S1366728925000033>
- [48] Shin, J.-A., & Christianson, K. (2012). Structural priming and second language learning. *Language Learning*, 62(3), 931–964. <https://doi.org/10.1111/j.1467-9922.2011.00657.x>
- [49] Ungerer, T. (2021). Using structural priming to test links between constructions: English caused-motion and resultative sentences inhibit each other. *Cognitive Linguistics*, 32(3), 389–420. <https://doi.org/10.1515/cog-2020-0016>
- [50] Ungerer, T. (2023). Structural priming in the grammatical network. *John Benjamins*. <https://doi.org/10.1075/cal.35>
- [51] Van Gompel, R. P. G., & Arai, M. (2018). Structural priming in bilinguals. *Bilingualism: Language and Cognition*, 21(3), 448–455. <https://doi.org/10.1017/S1366728917000542>
- [52] van Lieburg, R., Sijyeniyo, E., Hartsuiker, R. J., & Bernolet, S. (2023). The development of abstract syntactic representations in beginning L2 learners of Dutch. *Journal of Cultural Cognitive Science*, 7(3), 289–309. <https://doi.org/10.1007/s41809-023-00131-5>
- [53] Zhu, Y., & Grüter, T. (2024). Structural priming facilitates L2 learning of the dative alternation in Mandarin. *Studies in Second Language Acquisition*, 46(4), 1094–1116. <https://doi.org/10.1017/S027226312400041X>

- [54] Zhu, Y., & Grüter, T. (2026). Priming ditransitives in native speakers and learners of Mandarin: Error-driven learning affects production but not real-time predictive processing. *Language Learning*. Advance online publication. <https://doi.org/10.1111/lang.70012>
- [55] Ziegler, J., Bencini, G., Goldberg, A. E., & Snedeker, J. (2019). How abstract is syntax? Evidence from structural priming. *Cognition*, 193, 104045. <https://doi.org/10.1016/j.cognition.2019.104045>
- [56] Ziegler, J., & Snedeker, J. (2018). How broad are thematic roles? Evidence from structural priming. *Cognition*, 179, 221–240. <https://doi.org/10.1016/j.cognition.2018.06.019>
- [57] Ziegler, J., Snedeker, J., & Wittenberg, E. (2018). Event structures drive semantic structural priming, not thematic roles: Evidence from idioms and light verbs. *Cognitive Science*, 42(8), 2918–2949. <https://doi.org/10.1111/cogs.12687>