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Regressive cross-linguistic influence in multilinguals: The effect of additional language acquisition on L1 and L2 syntax

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List of research articles

Article 1 (Olszewska, 2025)

Olszewska, A. (2025). Combined regressive cross-linguistic influence: How learning Ln Germanic impacts L1 Polish word order. *International Journal of Multilingualism*. Advance online publication.

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Article 2 (Olszewska & Długosz, 2025)

Olszewska, A., & Długosz, K. (2025). The acquisition of L3 Scandinavian impacts word order in advanced L2 English: Regressive cross-linguistic influence in verb-particle constructions. *Linguistic Approaches to Bilingualism*. Advance online publication.

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Article 3 (Olszewska & Długosz, 2026)

Olszewska, A., & Długosz, K. (2026). Regressive cross-linguistic influence as co-activation: Can L3 Scandinavian trigger V2 in L2 English? *Second Language Research*. In press.

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Article 4 (Olszewska, 2026)

Olszewska, A. (2026). Instructed language learning and its impact on previously acquired languages: A state-of-the-art review of regressive cross-linguistic influence across grammatical domains. *Lingua*, *336*, 104156.

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List of abbreviations

Adv–V	adverb–verb word order
AJT	acceptability judgement task
AoA	age of acquisition
CLI	cross-linguistic influence
L1	first language
L2	second language
L3	third language
L4	fourth language
Ln	any language acquired after the first language
LPM	Linguistic Proximity Model
NP	noun phrase
OPT	oral production task
Prt	particle
rCLI	regressive cross-linguistic influence
SLA	second language acquisition
SPRT	self-paced reading task
SVA	subject–verb–adverbial word order
SVO	subject–verb–object word order
TLA	third language acquisition
V2	finite verb occurring in the second position

1. Introduction

Research on language acquisition has traditionally focused on similarities and differences between first (L1) and second language acquisition (L2; SLA), paying comparatively little attention to learners acquiring additional languages beyond the L2. Over the past two decades, this imbalance has led to the emergence of third language acquisition (L3; TLA) as a field in its own right. Importantly, this shift does not imply that L2 and L3 acquisition are fundamentally different processes. Rather, it reflects the fact that L3 acquisition involves factors that are characteristic of neither L1 nor L2 acquisition, not only in quantitative but also in qualitative terms. Learners with prior language learning experience typically have more highly developed learning strategies, greater metalinguistic awareness, and – crucially – are exposed to multiple languages as potential sources of cross-linguistic influence (CLI; e.g., de Angelis, 2007; Rothman et al., 2019). Here, CLI is understood to encompass all types of interactions occurring between the languages in the multilingual learner's mind (e.g., Jarvis & Pavlenko, 2008). These considerations have motivated the development of several theoretical accounts that aim to model the initial state of L3 acquisition, as well as its full developmental trajectory. These models, primarily concerned with syntax and morphosyntax, place CLI at their core and are typically classified as either default-driven or similarity-driven (e.g., Jensen, 2023).

Default-driven approaches posit a privileged role for either L1 or L2. Although evidence for default L1 influence has been reported (e.g., Hermas, 2010; Jin, 2009), only the default role of L2 in L3 acquisition has been explicitly formalised under the L2 Status Factor (e.g., Bardel & Falk, 2007). Similarity-driven approaches, by contrast, assume that both L1 and L2 may serve as sources of CLI, provided that they share relevant similarities with the emerging L3. In this regard, the Cumulative-Enhancement Model (e.g., Flynn et al., 2004) proposes that discrete properties can be supported by either prior language, but only when the influence is facilitative. The Linguistic Proximity Model (e.g., Mykhaylyk et al., 2015; Westergaard et al., 2017) and the Scalpel Model (e.g., Slabakova, 2017) similarly argue for property-by-property influence but allow for both facilitative and non-facilitative effects to occur. In these models, CLI is gradual and guided by abstract similarity between the languages – primarily structural, but lexical and phonological cues may also contribute, particularly as more immediately accessible sources of cross-linguistic similarity at earlier stages of L3 acquisition. As a result, both prior systems remain co-activated throughout L3 development and may compete or converge as potential sources of influence. Finally, the Typological Primacy Model (e.g., Rothman et al., 2019) maintains that CLI is based on global typological similarity between the languages. The learners' subconscious linguistic parser evaluates lexical, phonological, morphological, and

syntactic cues (in this order) to determine the closest match and subsequently copies one of the available grammars in its entirety. This model therefore makes predictions primarily about the initial state of L3 acquisition.

Beyond linguistic factors such as structural or typological similarity, the strength of CLI also depends on several learner-specific variables. These include L2 and L3 proficiency levels (e.g., Sánchez & Bardel, 2017), exposure and recency of use (e.g., Castle et al., 2026), age of acquisition (e.g., Meir & Janssen, 2021), or metalinguistic awareness (e.g., Falk et al., 2015). The interplay of these and other factors adds further complexity to multilingual development and to predicting patterns of CLI.

Against this backdrop, it becomes clear that research involving multilingual learners has mostly concentrated on the occurrence of CLI in a progressive direction. In this line of work, L3 acquisition is assumed to draw on L1 and/or L2 grammars – a view that overlooks the possibility that subsequently acquired languages may impact those already known. To provide a comprehensive account of multilingual development, however, it is crucial to treat CLI as a multidirectional force – one that operates not only from L1 and/or L2 towards L3, but also between L1, L2, L3, and any additional language (Ln) in either direction.

To address this gap, the present PhD thesis investigates how the acquisition of Norwegian, Swedish, or Danish as L3 influences word order in previously acquired languages, namely L1 and L2. In one subgroup of learners, where prior knowledge of German serves as an additional reinforcing language, the Scandinavian language is chronologically classified as L4. Two experimental studies examine the influence on learners' L2 English, and one study focuses on the effects on their L1 Polish. Adopting a systematic approach, the thesis investigates multiple syntactic properties using a range of instruments. In doing so, it not only tests the existence of regressive cross-linguistic influence (rCLI) but also identifies several intra- and extralinguistic factors that modulate this phenomenon, including developing L3 proficiency, frequency and ambiguity associated with the structures in the input, and the degree of grammatical optionality permitted by the target language. Crucially, the studies examine instructed learners residing in an L1-dominant environment who, despite receiving primarily non-native input through formal language instruction, still exhibit L3-induced rCLI in both their L1 and L2. This provides novel insights into syntactic knowledge across all languages in a multilingual learner's repertoire, moving beyond the prevalent, yet somewhat reductionist, tendency to focus exclusively on L3 development. Finally, the thesis contributes new empirical evidence on rCLI with a particular emphasis on L2 English. Given the global dominance of

English and its central role in multilingual repertoires, these findings demonstrate high ecological validity, extending beyond the specific learner population investigated here.

This PhD thesis is organised as follows. It begins by defining key terminology, synthesising relevant theoretical frameworks and empirical findings, and outlining the research questions and hypotheses. The next section discusses the adopted methodology and provides justifications for the design choices. Subsequent sections present detailed descriptions of Articles 1–4, of which three report empirical studies and one constitutes a state-of-the-art review. Finally, the thesis concludes with a general discussion that integrates the findings across the conducted studies.

2. Theoretical and empirical background

This section defines the key terminology used throughout the thesis and situates the present work within existing research on rCLI. It then outlines the core assumptions of the Linguistic Proximity Model, which is adopted as the theoretical framework accounting for the effects observed in the present research.

2.1 Defining key terms

2.1.1 L1, L2, L3, and Ln

In SLA research, the distinction between *L1* and *L2* is typically uncontroversial: L1 refers to a speaker's native language, and L2 denotes any non-native language in their repertoire. In TLA research, by contrast, the terminology is considerably less uniform. The label *L3* is used variably across studies and may describe different learning situations. For example, L3 is often used to denote a genuinely second non-native language, reflecting the chronological order of acquisition (e.g., Hammarberg, 2014). In other cases, L3 refers to any non-native language beyond L2, or simply to the language under investigation – both of which may chronologically correspond to L3, L4, or L5 (e.g., Jensen, 2023). In such contexts, more inclusive labels such as *Ln* or *third or additional language* are often preferred (e.g., de Angelis, 2007). A further usage applies L3 to simultaneous bilinguals, referring to their first non-native language following the acquisition of two L1s during childhood (e.g., Kolb et al., 2022).

The present thesis examines instructed L1 Polish speakers who acquire their non-native languages sequentially. Accordingly, the languages relevant to the studies are classified based on their chronological order of acquisition. In Articles 2 and 3, where knowledge of the Scandinavian languages exerts an influence on prior knowledge of English, Scandinavian and

English are described as L3 and L2, respectively. A subset of learners also has knowledge of German; this variable is included in all analyses but does not yield significant effects. It is therefore treated as a background language and not reflected in the classification. In Article 1, however, German shows a significant influence within a quadrilingual subgroup. For these speakers, German is classified as L3 and Scandinavian as L4, reflecting the earlier onset of German acquisition.

2.1.2 Regressive cross-linguistic influence

A second terminological issue concerns the investigated phenomenon. In the progressive direction of influence, interactions between the languages of a learner have traditionally been described as either *transfer* or *cross-linguistic influence*. Transfer is the earlier term, and it has been criticised for being too narrow or for implying a literal movement or copying of a linguistic property (e.g., Sharwood-Smith, 2021). CLI is therefore regarded as a broader label that encompasses a wider range of interactions, including those affecting grammatical representations and those limited to online language processing (e.g., Sharwood-Smith, 1983). Although CLI is often preferred for its inclusiveness, some researchers use CLI and transfer interchangeably as practically more convenient (e.g., Westergaard et al., 2023). A third approach draws a clear distinction: transfer denotes literal copying and representational change, while processing-related effects fall under *cross-linguistic effects*. Within this perspective, cross-linguistic influence functions as an overarching label encompassing both phenomena (e.g., Rothman et al., 2019).

In the regressive direction, consensus on terminology is considerably less stable. Quantitatively, predominant labels across the studies include *backward transfer* (e.g., Hui, 2010), *reverse transfer* (e.g., Xiao, 2018), and *regressive transfer* (e.g., Puig-Mayenco, 2023). Sporadically, *reverse cross-linguistic influence* (Velnić et al., 2026), *attrition* (Cabrelli Amaro, 2017), and *regressive cross-linguistic influence* have been applied in single studies (Brown-Bousfield & Chang, 2023).

The use of *attrition* to describe the regressively occurring CLI warrants particular attention. Traditionally, L1 attrition has centred on bilinguals living in an L2-dominant environment, characterised by extensive L2 exposure and reduced L1 use (e.g., Schmid & Köpke, 2017). L2 attrition, in turn, has typically denoted forgetting that follows discontinued L2 exposure (e.g., Mehotcheva & Köpke, 2019). Schmid and Köpke (2017) have recently argued for expanding the notion of attrition to include both short-term manifestations of CLI and long-term representational changes attested among bilinguals, suggesting that the

traditional conceptualisation is artificially restrictive. While this broader usage has been explicitly supported as suitable for rCLI (Cabrelli, 2023), it has also been generally criticised for conflating conceptually distinct phenomena (e.g., Kupisch et al., 2017; Meisel, 2017), rendering it misleading and unproductive.

In this thesis, *regressive cross-linguistic influence* is the term used throughout. This choice reflects the assumption that drawing a sharp distinction between representational transfer and processing-related phenomena is unnecessary. Instead, L1 and L2 are assumed to remain continuously co-activated to varying degrees, such that all acquired languages can influence one another without positing the creation of a copy of an existing grammar. Rather, the underlying grammars of all languages in the multilingual repertoire jointly provide the basis for parsing incoming input (Westergaard et al., 2023). Moreover, rCLI is understood as conceptually distinct from language attrition. Although attrition may, in principle, be triggered by rCLI (e.g., Mickan et al., 2020), there are crucial contextual differences that set the present learners apart from those typically examined in attrition studies. First, they reside in an L1-dominant environment, and their daily L1 use is neither restricted nor reduced. Second, their L2, L3, and L4 exposure is instructional rather than naturalistic. As such, they receive sustained input and maintain active use of all languages in their repertoires. The rCLI observed here is therefore interpreted as a direct outcome of their multilingual development, rather than a consequence of reduced L1 use, high Ln exposure, or Ln dominance.

2.1.3 Optionality

The final core term used throughout the thesis is *optionality*, a concept that denotes different, yet related, phenomena across the linguistic literature. First, it describes cases in which advanced Ln learners continue to exhibit both target-like and residual non-target-like structures in their grammars (Sorace, 2000). Second, it may refer to situations in which a single linguistic property allows multiple options, as in the Tromsø dialect of Norwegian, where wh-questions can be formed with the verb in either the second (V2) or the third (V3) position (Westergaard, 2003). It can also denote infrequent exceptions to a general rule, as seen in English stylistic and locative inversion. Although English typically places the verb in V3 in non-subject-initial clauses, these constructions allow V2 (Rankin, 2012). In addition, optionality can sometimes be used to characterise cases where adjuncts can appear in multiple positions, such as frequency adverbs in English.

In this thesis, optionality concerns instances in which the target language (here: L1 or L2) allows two options, whereas the source language (here: L3 or L4) allows only one.

Examples include particle placement examined in Article 2, where L2 English permits the particle to either precede or follow an object noun phrase (NP), while L3 Danish and Swedish permit only one position, and clause-medial adverb placement investigated in Article 1, where L1 Polish allows both pre- and postverbal positions, whereas L2, L3, and L4 allow only one. Other examples from the literature include contrasts such as preverbal versus postverbal placement of direct object clitics in Spanish (Requena & Berry, 2021) and overt versus null subject pronoun realisation in Polish (Długosz, 2021).

2.2 Previous research on regressive cross-linguistic influence

Having outlined the key terminology adopted in this thesis, this section reviews previous empirical research on rCLI. While progressive CLI has been widely studied in both SLA and TLA, comparatively few investigations have examined regressive effects. The state-of-the-art review presented in Article 4 identified 11 studies on Ln-to-L1 influence and 15 studies on Ln-to-L2 influence.[1] In addition, 3 studies examined both L1 and L2 simultaneously, and a single study investigated L4-to-L3 influence. Although these numbers are not negligible, it is important to emphasise that the available evidence largely consists of one-off investigations. As a result, the studies involve diverse language constellations, target different linguistic phenomena, and employ a wide range of research instruments. Taken together, they demonstrate that rCLI can occur; however, the heterogeneity and limited scope of the evidence make it difficult to determine the conditions under which it emerges.

The effects reported to date can be broadly classified as facilitative, non-facilitative, or neutral. Facilitative effects constitute the largest category, accounting for half of the available evidence. In trilingual contexts, such studies typically compare trilingual experimental learners with bilingual control learners. Despite the two groups being matched for global L2 proficiency, the trilinguals nevertheless exhibit divergent performance in the L2. For instance, reported findings include facilitated relative clause formation and improved number agreement in L2 English following exposure to L3 French (Hui, 2010; Tsang, 2016a), as well as enhanced verbal agreement in L2 English after the acquisition of L3 Portuguese (Xiao, 2018). In bilingual contexts, bilinguals are usually compared to functional or actual monolinguals, with facilitative effects manifested as heightened metalinguistic awareness (Cook et al., 2003; Ewert, 2008) or more efficient L1 processing (Oliveira et al., 2017; Requena & Berry, 2021).

[1] Two of these studies are a part of the present thesis (Articles 1 and 2). Article 3 is not included in the state-of-the-art review, as it was still under evaluation at the time of the publication of Article 4.

Non-facilitative effects are reported far less frequently. In cases of L3-to-L2 influence, these include altered past tense reference in L2 English following the acquisition of L3 German or L3 French (Cheung et al., 2011; Sun, 2023), as well as over-acceptance of non-target pronoun omissions in L2 English among learners with knowledge of L3 Italian (Aysan, 2012). By contrast, no studies on L2-to-L1 influence clearly fall into this category; given the nature of the phenomena examined, such effects are more appropriately characterised as neutral. These studies document, for example, attenuated sensitivity in L1 Spanish processing when encountering superfluous – but not ungrammatical – co-referents (Martín-Villena, 2023) or increased oral production of overt subjects in L1 Chinese (Liu et al., 2020), both associated with exposure to L2 English.

Initial attempts to move beyond the identification of rCLI and towards its theoretical explanation have highlighted three potentially modulatory factors. One concerns age of acquisition, as proposed in the Differential Stability Hypothesis (Cabrelli Amaro, 2017),[2] which argues that L2 is less stable than L1 and therefore more susceptible to regressive influence from subsequently acquired languages. Building on this idea, the Sandwich Effect (Puig-Mayenco, 2023) proposes that L2 may be particularly vulnerable when L1 and L3 exhibit the same linguistic properties and exert a combined influence. More recently, typological proximity has been suggested as a decisive factor, as formulated in the Similarity Convergence Hypothesis (Brown-Bousfield & Chang, 2023), although this proposal has thus far been limited to phonology.[3]

Against this backdrop, the present thesis advances the understanding of rCLI along several dimensions. Crucially, previous research on rCLI has focused primarily on properties that are either morphosyntactic or situated at the syntax–semantics and syntax–pragmatics interfaces. By comparison, empirical evidence specifically targeting word order remains limited. Existing investigations of adverb placement (Tsang, 2016b) and verb placement (Długosz, 2021) have yielded null results, whereas research on clitic placement (Requena & Berry, 2021) has demonstrated L2-to-L1 influence. By focusing on verb, adverb, and particle placement, the thesis provides novel evidence in this underexplored domain in both L3-to-L2 and L3-to-L1 contexts. The inclusion of language-internal factors such as structure-specific

[2] The DSH's theoretical predecessor was the Phonological Permeability Hypothesis (Cabrelli Amaro & Rothman, 2010; Cabrelli Amaro, 2013), a proposal initially limited to phonology but later extended to include morphosyntactic phenomena.

[3] The authors operationalise typological similarity in relation to the Typological Primacy Model (e.g., Rothman et al., 2019), according to which lexical, phonological, morphological, and syntactic overlap is subconsciously evaluated in order to determine proximity between the languages.

frequency and ambiguity in the input, as well as grammatical optionality permitted by the language undergoing change, allows for a more detailed consideration of variables modulating the emergence of rCLI.

Second, the present studies examine the role of developing L3 proficiency. Previous research has concentrated almost exclusively on advanced Ln learners, based on the assumption that the language exerting an influence must be highly developed (e.g., Cabrelli Amaro, 2017; Park & García-Mayo, 2024). The limited cross-sectional evidence suggests that this presumption may be premature – while Tsang (2016a, 2016b) has indeed reported effects emerging at higher proficiency levels, Xiao (2018) has documented L3-to-L2 facilitation already at intermediate L3 stages. Here, studies reported in Articles 1–3 involve cross-sectional testing of learners ranging from beginner to advanced levels of L3 Scandinavian proficiency. This allows not only for the identification of rCLI at a specific proficiency level, but also for a more precise examination of its emergence over the course of L3 development.

A further contribution lies in the triangulation of research instruments. To date, rCLI research has primarily relied on acceptability judgement tasks (e.g., Aysan, 2012) and written production (e.g., Cheung et al., 2011), with comparatively few studies employing processing measures (e.g., Puig-Mayenco, 2023) and only two examining oral production (e.g., Liu et al., 2020). As reported in Article 4, acceptability judgement tasks, while widely used, yield the highest proportion of null results, whereas less frequently employed but more sensitive processing measures consistently detect rCLI. The present project therefore triangulates an offline acceptability judgement task (AJT), an online self-paced reading task (SPRT), and an oral production task (OPT) when examining influence on the L2, and employs an AJT when targeting influence on the L1.[4] This design makes it possible to examine rCLI across online and offline comprehension, as well as in oral production.

In addition, the present studies examine a novel linguistic constellation: L1 Polish, L2 English, and L3 Norwegian, Swedish or Danish. Although Polish–English–Norwegian learners have been previously studied, the findings suggested a general multilingual advantage rather than direct rCLI (Velnić et al., 2026). Beyond this study, Scandinavian languages have not yet been systematically examined in this direction, and existing research is dominated by studies involving Chinese–English or Korean–English speakers acquiring an additional Indo-European language (e.g., Cheung et al., 2011; Kim, 2023), as well as by research on English in relation to Romance languages (e.g., Cabrelli Amaro, 2017; Requena & Berry, 2021). Focusing on

[4] The full battery of tasks was administered in the L2 and the L3, while the L1 was tested using only the AJT due to practical considerations and participant time constraints.

English in combination with additional Germanic languages therefore broadens the empirical scope of rCLI research, particularly given the global dominance of English and its prevalence in multilingual repertoires.

Finally, the present thesis differs from previous work in terms of sample size and statistical approach. Many prior studies on rCLI are underpowered, with some relying on exceptionally small samples of approximately 10 participants (e.g., Kim, 2023). While most employ moderately sized groups and a few reports comparatively robust samples (e.g., Tsang, 2016a; Xiao, 2018 with 34–60 trilinguals, or Martín-Villena, 2023 with 80 bilinguals), the present research sets apart by including data from 163 trilinguals and 71 bilinguals. The data are analysed using linear mixed-effects models, which allow random effects of participants and items to be modelled simultaneously, thereby accounting for non-independence in the data and improving the generalisability of the results compared to methods traditionally employed in rCLI research (e.g., Linck & Cunnings, 2015).

2.3 The Linguistic Proximity Model

This thesis adopts the Linguistic Proximity Model (LPM; Mykhaylyk et al., 2015; Westergaard et al., 2017) as its theoretical framework. While the LPM was originally formulated to account for the course of L3 acquisition, it is not inherently tied to a specific direction of CLI. As the authors emphasise, "the learning context itself is not the central part of the LPM; instead, the linguistic properties of the three languages take central stage, as these will be responsible for the co-activation of structures in the learner's mind" (Westergaard, 2021, p. 507).

Under this model, all languages of a multilingual speaker interact at the level of individual linguistic properties. Throughout L3 development, L1 and L2 grammars compete as potential sources of CLI. The incrementally built L3 interlanguage may therefore be influenced by either or both previously acquired grammars. Importantly, the strength of this co-activation is primarily modulated by structural similarity, either abstract (i.e., whether the languages encode a linguistic property, such as case) or actual (i.e., whether they employ the same realisation of a given property, such as case marking; e.g., Mitrofanova et al., 2023). Moreover, additional factors such as frequency in the input, complexity, and proficiency may also play a role. These factors are particularly emphasised by the Scalpel Model (Slabakova, 2017), which was introduced at a similar time and shares its core assumptions with the LPM (Westergaard et al., 2023).

By placing co-activation guided by structural similarity at the core of the model, the LPM provides a principled framework for investigating not only progressive CLI, but also its

multidirectional nature. This includes regressively occurring effects, irrespective of the order in which the individual languages were acquired. Although the authors explicitly acknowledge that such co-activation "provides abundant opportunities for grammars to influence each other, and over time, this interaction may lead to representational changes, mainly in the language to be learned, *but also in the previously acquired grammars*" (Westergaard et al., 2023, p. 225, italics added), this prediction has not yet been tested directly in empirical work specifically targeting regressive CLI. The findings of the present thesis therefore extend the model to rCLI and provide empirical support for its applicability in both progressive and regressive directions of influence.

3. Research objectives

In light of the current state of empirical research on rCLI in the grammatical domain, the present studies address the following research questions:

RQ1. Does a later-acquired language (L2, L3, or L4) exert rCLI on a previously acquired language (L1 or L2)?

RQ2. Does rCLI occur among instructed learners without an immersive environment, even when the affected languages are native or highly proficient?

RQ3. Can rCLI be cumulative? If so, is it more pronounced among learners with knowledge of more than one later-acquired language?

RQ4. Are different syntactic structures – V2 with adverbial fronting, V2 with object fronting, adverb placement in main clauses, and particle placement – equally affected by rCLI?

RQ5. Is rCLI modulated by intra-linguistic factors such as frequency, ambiguity in the input, ease of acquisition, and the degree of structural optionality permitted by the target language?

RQ6. Is rCLI modulated by developing proficiency in the later-acquired languages, operationalised either as global proficiency or as knowledge of the specific linguistic structure?

RQ7. Does rCLI manifest equally in comprehension and production, or is it subject to task modality, as measured by an acceptability judgement task (AJT), a self-paced reading task (SPRT), and an oral production task (OPT)?

With respect to the predictions, rCLI was expected to manifest in previously acquired languages in the form of increased acceptability, facilitated processing, and increased production of non-target forms, all reflecting word order patterns present in later-acquired languages.

Under the LPM's assumption of continued co-activation of all languages in the multilingual mind, and given the learners' substantial instructional exposure to later-acquired languages, immersion was not considered a necessary condition for rCLI to emerge. It was further predicted that, in a subset of learners whose two later-acquired languages exhibit the same syntactic patterns in the relevant structures (L3 German and L4 Scandinavian), converging input would strengthen rCLI effects. At the same time, a single later-acquired language was expected to be sufficient to trigger rCLI.

In terms of intra-linguistic modulatory factors, the examined structures were expected to differ in their susceptibility to rCLI, in line with findings on progressive CLI (e.g., Westergaard, 2003). For the two structures involving V2, adverbial fronting is considerably more frequent in L3 Scandinavian input than object fronting and was therefore expected to result in stronger rCLI effects. Adverb placement, by contrast, is characterised by substantial input ambiguity in L2 English. Because adverb position can vary depending on discourse-related factors and the verb type, this structure was expected to pose a greater challenge to learners – both in terms of its acquisition in L3 Scandinavian, and the inhibition of non-target patterns in L2 English. Differences in the degree of structural optionality were also expected to modulate the outcomes; while these structures are optional in L1 Polish, they are much more constrained in L2 English, rendering rCLI more plausible in the former. Finally, particle placement was examined separately for the individual Scandinavian languages rather than as a unified category. Beyond structural optionality in L2 English, where particle position is variable, differences in acquisition difficulty were additionally expected to yield distinct rCLI patterns, with effects emerging earlier for Swedish – where particle placement is relatively easy to acquire – than for Danish, where the structure is more challenging.

Moreover, rCLI was assumed to strengthen with higher global proficiency in the later-acquired language (as investigated in Article 1), and to emerge once target-like knowledge of the relevant structures in L3 had been attained (as considered in Articles 2–3, where directly comparable data in both L2 and L3 was collected). This assumption aligns with earlier findings,

which have predominantly reported rCLI at advanced levels of Ln proficiency (e.g., Cabrelli Amaro, 2017). However, it is worth noting that previous research has largely been restricted to advanced L3 learners, and one of the two existing cross-sectional investigations suggested that rCLI may arise earlier in development (Xiao, 2018).

Finally, rCLI was expected to vary in its robustness across tasks rather than manifest uniformly. The SPRT targets online comprehension and was assumed to reflect short-term co-activation of L3 grammar during L2 processing (e.g., Marsden et al., 2018). The AJT reflects offline comprehension and was taken as potentially indicative of representational change (e.g., Spinner & Gass, 2019). Predictions concerning oral production were necessarily more tentative, given the lack of comparable prior studies. Two competing scenarios were considered: rCLI could be amplified by the increased cognitive demands associated with the task or attenuated by the planning time available prior to speech onset. By comparing the robustness of rCLI across the three modalities, the studies aimed at capturing the influence of varying processing demands on the emergence of the effect.

4. Methodology

Although the empirical studies reported in Articles 1–3 constitute separate investigations, data collection and procedures were carried out as part of a single, larger research project. This section outlines the overarching methodological choices and the rationale underpinning them.

4.1 Design

The studies in Articles 1–3 adopted a cross-sectional design, in which learners were at different stages of linguistic development in their L3 Scandinavian (from beginning to proficient levels), and each participant was only tested once. While this approach does not track the same individuals over time, it enables the reconstruction of a developmental pattern and makes it possible to retrace instances and transformations of CLI (Jarvis & Pavlenko, 2008, p. 37). An alternative would be a truly longitudinal design, in which participants' competence at the onset of L3 acquisition serves as a control state relative to their subsequent L3 development. However, while such design offers a unique possibility of observing the emergence of CLI within the same individuals, it requires continuous participation over several years, making it both time-consuming and susceptible to high rates of data loss. Therefore, a large-scale cross-sectional design, which enabled the collection of large quantities of data within a limited time frame, was deemed more viable and better suited to the aims of this project.

4.2 Participants

Altogether, a total of 245 participants were recruited. All were native speakers of Polish who had acquired L2 English in school settings and reported advanced proficiency prior to testing. Their further linguistic repertoires varied: some participants had acquired Norwegian, Swedish, or Danish, which were tested in a cross-sectional design, and some had additional knowledge of German, typically at beginner or intermediate levels. According to specific research questions and target structures, participants were assigned to groups differently across the three studies.

In Article 1, which examined rCLI on the L1, participants were classified as bi-, tri-, and quadrilinguals. This grouping enabled the observation of combined influence from German and one of the Scandinavian languages, detected primarily among quadrilinguals. In Article 2, which focused on rCLI on the L2 in particle placement, Norwegian learners served as a control group, as Norwegian follows the same word order pattern as English. Swedish and Danish learners, whose languages differ in this respect, constituted two experimental groups. This allowed for a controlled comparison across multilinguals with the same number of languages in their repertoires, thereby eliminating the potential effect of a multilingual advantage (e.g., Długosz, 2023). Finally, in Article 3, which investigated rCLI on the L2 in verb and adverb placement, learners of Norwegian, Swedish, and Danish were treated as a single trilingual group and contrasted with a bilingual control group. This approach capitalised on the shared syntactic patterns across the Scandinavian languages for these structures and enabled more robust statistical analyses. Importantly, in both Article 2 and Article 3, additional knowledge of German did not exert a significant effect but was nevertheless included in all analyses to control for its potential influence.

4.3 Ln proficiency

Proficiency in later-acquired languages was determined using three complementary proxy measures: the Dialang placement test (Alderson, 2005), a self-reported assessment, and an AJT-based accuracy score.

The Dialang placement test was used as an objective measure and administered in L2 English and L3 Norwegian, Swedish, or Danish. At the time of testing, it was the only tool available in all four examined languages. The placement test consists of 50 real words and 25 non-words, and participants indicate whether each item exists in the target language. In its original form, it provides results aligned with the Common European Framework of Reference for Languages (CEFR). An adapted version of the task was therefore used to obtain a more fine-

grained measure of individual proficiency (e.g., Lloyd-Smith et al., 2021).[5] In the adaptation, the same 75 items were used, but they were randomised and presented one at a time in the centre of the screen. Participants indicated whether each item was a real word in the target language by pressing Y ('yes') or N ('no') on the keyboard.[6] Each correct response counted as one point, and incorrect responses were not penalised, yielding an overall possible score from 0 to 75. Across Articles 1–3, Dialang scores were used to ensure that the groups were matched for L2 English proficiency.

In addition to the Dialang, participants provided a subjective, self-reported assessment of proficiency in all languages in their repertoire. They produced ratings on a 1–7 scale across four components (listening, speaking, reading, and writing), from which an overall average score was computed. In Articles 2 and 3, these scores served as an additional validation of group matching for L2 English proficiency. In Article 1, they functioned as a main predictor of proficiency in L2 English, L3 Scandinavian, and L4 German. This ensured comparability across all languages of interest, particularly because additional knowledge of German was not part of the original project design and only emerged as relevant during data analysis. Importantly, Dialang and self-reported scores were positively correlated – moderately for English and strongly for the Scandinavian languages.

Finally, the third proxy was the L3 Scandinavian accuracy score, employed as a main predictor of L3 proficiency in Articles 2 and 3. Since participants completed closely equivalent tasks in both English and one of the Scandinavian languages, their accuracy on the specific syntactic structures in the latter was deemed the most detailed available measure of attainment. To calculate L3 accuracy scores, ratings for grammatical items were retained, while ratings for ungrammatical items were inverted, such that a low acceptability rating score of '1' became a high accuracy score of '5'. An average score was then computed per participant for each structure (i.e., separately for particle placement, adverb placement, and verb placement) and used as a continuous predictor in the analysis of L2 English data.

4.4 Experimental tasks

The entire project consisted of three experimental tasks: an offline acceptability judgement task (AJT), an online self-paced reading task (SPRT) and an oral production task (OPT). All three tasks target the same underlying linguistic system but differ in the demands they place on

[5] Dividing continuously measured predictors, such as proficiency, into subjective groups or categories reduces important variance in the data and leads to unnecessary data loss (e.g., Plonsky & Oswald, 2017).
[6] Accordingly, J and N were used in the Scandinavian versions of the task.

participants. While the AJT and SPRT target language comprehension, the OPT focuses on language production. Consequently, the tasks vary in the amount of cognitive and processing burden, making the oral production both the most susceptible to performance errors and the most demanding out of the three (e.g., Kim & Nam, 2017).

4.4.1 Acceptability judgement task (AJT)

The acceptability judgement task is a well-established method in both SLA and TLA research, as it allows to target specific structures, including those that are ungrammatical or infrequent in spontaneous speech. Its methodological advantages have contributed to a substantial increase in its use in recent years (e.g., Plonsky et al., 2020). Because many L3/Ln studies rely on AJTs as a primary source of data providing insight into learners' competence, the task also facilitates cross-study comparisons.

Importantly, the perceived acceptability of a sentence may be influenced by multiple factors (e.g., Leivada & Westergaard, 2020). Gradience in judgements is a natural characteristic of not only emerging grammars of language learners but is also observed in other developmental contexts such as language attrition (Sorace & Keller, 2005). In the present studies, participants rated each item on a 5-point Likert scale for two main reasons. First, the sought-after effect of rCLI was expected to be rather subtle, potentially impacting learners' sensitivity to grammatical violations or their degree of confidence in evaluating sentence well-formedness. Alternatively, rCLI was hypothesised to manifest as a preference for one word order pattern over another. Crucially, this does not imply an expectation that their developing L3 Scandinavian knowledge would fully replace their L2 English grammar. The anticipated variability in judgements could therefore not be adequately captured using a clear-cut, binary response format. Second, the study targeted both syntactic and discourse-dependent word order phenomena. As a result, experimental conditions included not only clearly grammatical or ungrammatical sentences, but also structures that are grammatical yet marked or infrequent (e.g., object fronting). A scalar response format was therefore more suitable for capturing the expected variability in judgements and the potentially subtle effects of rCLI.

4.4.2 Self-paced reading task (SPRT)

The second employed instrument was a self-paced reading task, a method widely used in psycholinguistics to tap into online sentence comprehension. In this task, participants read sentences incrementally on a computer screen, while reading times are recorded for each designated segment. Each press of the space bar reveals a new segment, allowing participants

to control the pace of presentation. The rationale behind the task is that a slowdown (relative to a baseline condition) in the region of interest is reflective of processing difficulty, while shorter reaction times may indicate processing facilitation. The effect may be captured either in the critical region or in the subsequent spill-over regions (e.g., Keating & Jegerski, 2015). Therefore, the task makes it possible to identify the point at which processing difficulty or facilitation arises without referring to explicit, conscious measures.

The task is typically presented either phrase-by-phrase or word-by-word. While phrase-by-phrase presentation is often considered more ecologically valid, word-by-word presentation yields more detailed data points. Hybrid designs are also common, with some regions presented as individual words and others as phrases. In addition, presentation can be either cumulative or non-cumulative, meaning that subsequent segments remain visible until the whole sentence appears or are being successively masked. Items may also be displayed in the centre of the screen one at a time or presented in a linear format, with the latter more closely resembling natural reading. Accordingly, most studies, including the present ones, employ a non-cumulative, linear manner of presentation, commonly referred to as the moving window technique (Jegerski, 2013). The SPRT was accompanied by meaning-related comprehension questions requiring binary responses. These are typically added to divert the participants' attention away from the grammatical well-formedness and to ensure that they process the input rather than press the key without paying attention.

Phenomena that are most often targeted with SPRT encompass resolution of local and global ambiguities, detection of grammar anomalies, and processing of syntactic dependencies. A significant slow-down in the ungrammatical region relative to its grammatical equivalent is indicative of learners detecting an error incompatible with their linguistic knowledge (e.g., Jiang, 2007). The task has also been widely applied to investigate differences in processing between native and non-native speakers, as well as CLI (see Marsden et al., 2018, for a review). As the present studies concern L3-induced erroneous or non-canonical word order permutations, they fall into the categories of both anomaly detection and CLI effects.

It should be noted that although SPRT is widely used in SLA and TLA research, the interpretation of data from language learners can be less straightforward. While L1 and L2 sentence processing both proceed incrementally, bilingual (and, by extension, multilingual) online comprehension may be influenced by several factors. These include reliance on more surface-level processing routines (Clahsen & Felser, 2006, 2018), co-existence and co-activation of L1, L2, and L3 representations, restricted working memory capacity, and general overreliance on lexical-semantic cues as opposed to grammatical information (e.g.,

Hopp, 2022; Roberts, 2015). These and other factors can be reflected in learners' reading times, resulting in slower or less consistent processing patterns.

4.4.3 Oral production task (OPT)

The third task targeted oral production and was inspired by a paradigm used in the Nordic Word Order Database project (NWD; Lundquist et al., 2019). In the original experiment, participants were first visually presented with a background sentence on screen and asked to repeat it aloud. After this demonstration, one element was extracted from the sentence and presented as a cue (e.g., an extracted object). As both the trigger and the background sentence remained visible, participants were asked to produce a transformed sentence consisting of the same lexical material. The paradigm was developed to investigate syntactic structures that rarely occur in spontaneous speech, such as particle shift or V3 word order. Beyond its application in the NWD project, which examined L1 users' behaviour, the task has also been successfully employed in a study on the acquisition of subject and object placement by L2 learners of Norwegian and Swedish (Westendorp & Lundquist, 2021).

The version used in the present project retained the core reconstructive mechanism while introducing several modifications intended to minimise metalinguistic reflection during task performance. First, participants were presented with a background sentence on-screen. Instead of repeating it out loud, they read it silently and proceeded by pressing the spacebar. Following the presentation, they completed a colour-word Stroop task (Stroop, 1935) within a 4000 ms time window.[7] Only after this intervening task, they were presented with a cue accompanied by a beep sound, prompting them to reproduce the sentence aloud. Although responses were not time-constrained, the auditory prompt encouraged immediate reply. In the instructions, participants were asked to recall as much of the sentence as possible. To reduce the likelihood of developing simplifying strategies (e.g., focusing solely on sentence reproduction), they were informed that all components of the task were equally important – i.e., that indicating the correct colour of the word was essential for successful completion. An informal post-task debriefing indicated that participants primarily focused on recalling the lexical material, thereby performing the syntactic transformations in real time.

An alternative task considered during the piloting stage was an elicited imitation task (e.g., Gaillard & Tremblay, 2016), in which participants listen to a sentence and repeat it either

[7] The Stroop task required participants to press a key corresponding to the colour of the word displayed on the screen, while ignoring the word's actual meaning. The keys R, B, Y and O were used to indicate red, blue, yellow, and orange, respectively.

immediately or following a delay. The rationale behind the task is that in order to reproduce the given sentence, the participants have to first process it and reconstruct it based on their own competence in L2 (Bley-Vroman & Chaudron, 1994). Therefore, they should not be able to reproduce the structures that are not a part of their interlanguage grammar. However, the tasks' methodology has been subject to ongoing debate (e.g., Spada et al., 2015). In particular, instructing participants to repeat sentences exactly as they hear them may inhibit spontaneous correction, while explicitly requesting correction of ungrammatical stimuli draws attention to form and encourages attentional practising before repetition.

These issues clearly emerged in a small-scale pilot conducted prior to the present studies – three recruited participants did not spontaneously correct ungrammatical sentences and reported confusion regarding the requirement to repeat the sentences they perceived as ill-formed. However, informing them of the ungrammaticality, drawing their attention to form as opposed to meaning and explicitly asking for a correction was against the core assumption of the task, which is meant to minimise conscious monitoring. These limitations may have been particularly pronounced in the present participant population, namely multilingual university students with high metalinguistic awareness (e.g., Angelovska, 2018). For this group, the elicited production task prompted explicit reflection rather than unconscious correction.

The adapted OPT was therefore advantageous, as it avoids exposing participants to ungrammatical stimuli and eliminates ambiguity in the instructions, while still allowing for the elicitation of a range of specific syntactic structures through controlled sentence reconstruction.

4.4.4 Summary and rationale for triangulation

Overall, the aim of triangulating different instruments while targeting syntactic knowledge was to obtain a more comprehensive picture of the learners' competence in their L2 and L3, as it is impossible to access it directly (White, 2003, p. 17). Moreover, employing both online and offline tasks helped mitigate the limitations connected with their use as individual measures (e.g., Sagarra & Herschensohn, 2011).

The SPRT provides insight into online sentence comprehension and allows to examine the learners' sensitivity to syntactic violations while keeping their attention to form at a minimum. In terms of cross-linguistic influence, the task may reveal effects of co-activation of L1 and L3 properties while comprehending the input in L2, that would otherwise be too subtle or too transient to be captured at the final stage of processing (e.g., Hopp, 2017). By contrast, AJT without any time constraint may be indicative of representational change, while also allowing participants to engage in metalinguistic or strategic processing (e.g., Ellis, 2005).

Finally, the OPT (i) requires the participants to decode the background sentence and produce a new one following not only a delay, but an additional Stroop test, (ii) focuses on meaning and leaves little to no time to consider the items' grammatical correctness, and (iii) employs sentences of length that exceeds short-term memory capacity, thereby increasing the cognitive load. Taken together, the different task modalities enabled an investigation of rCLI under varying processing demands and across more implicit and explicit conditions.

A triangulation is implemented in Articles 2 and 3, which examine L3-to-L2 influence. Article 1, which investigates Ln-to-L1 influence, relies solely on the AJT. This decision was primarily driven by practical considerations, as L2 and L3 were tested extensively during two separate sessions, and conducting an additional, third session with a full battery of tasks in L1 was not feasible.

4.5 Procedure

Participant recruitment was uniform for all studies and followed a twofold procedure. Most participants were recruited at Adam Mickiewicz University in Poznań, Poland, and data collection took place on site. Another group was recruited online, through social media platforms (e.g., graduate groups) and e-mail invitations sent to other Polish universities offering relevant language courses. These participants connected via a video calling platform and completed the study remotely, while remaining visible on camera throughout the session. Apart from the on-site versus online mode of testing, the procedure was identical for all participants.

Participation consisted of one session for bilingual participants and two sessions for multilingual participants. The first session was always conducted in L2 English, while the second session tested the participants' L3 Scandinavian language of choice. The experiment was divided into two parts in order to keep the participants in their monolingual mode (e.g., Grosjean, 2012). At the beginning of each session, participants received instructions in Polish and were given an opportunity to ask questions. Additional task-specific instructions in the target language were presented on-screen prior to the start of each task.

The order of tasks was fixed across sessions: (1) the first block of the SPRT, (2) the Dialang placement test, (3) the second block of the SPRT, (4) the AJT, (5) the OPT. Towards the end of the first session, participants completed the Polish version of the Language History Questionnaire (Li et al., 2020). In the second session, this step was replaced by a short break followed by the AJT in Polish. Each testing session lasted approximately 90 minutes.

The two sessions were conducted over the span of two or three weeks. Participants were asked to attend the second session after a minimum of seven days, but some sessions took place at a later date due to limited participant availability.

All participants provided informed written consent and received a gift card in compensation for their participation. Prior to data collection, the project was approved by the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University (see Appendices I-J).

5. Summary of research articles

This section synthesises the research articles constituting the thesis. Table 1 provides an overview of the target and source languages for rCLI, the grammatical structures and factors examined, and the experimental tasks employed.

Table 1. Overview of studies presented in Articles 1–4.

Article	Target and source languages	Grammatical structures	Experimental tasks	Investigated factors
1	L2, L3, L4 → L1	V2 with adverbial fronting, V2 with object fronting, adverb placement in main clauses	AJT	• structural optionality in L1 • distributional frequency in L2, L3, L4 • developing proficiency in L2, L3, L4 • combined effect of L3 and L4
2	L3 → L2	verb–particle constructions	AJT, SPRT	• structural optionality in L2 • developing proficiency in L3 • differences across task modalities
3	L3 → L2	V2 with adverbial fronting, V2 with object fronting, adverb placement in main clauses	AJT, SPRT, OPT	• input ambiguity in L2 • distributional frequency in L3 • developing proficiency in L3 • differences across task modalities
4	state-of-the-art review of available findings	grammatical domain	-	• terminology • language pairings • learner proficiency levels • sample sizes • grammatical phenomena • research instruments

In what follows, Articles 1–3 are discussed with respect to their empirical results and relevance to the research objectives. The state-of-the-art review presented in Article 4 is then drawn on to situate these findings within the existing literature and to highlight their theoretical and methodological implications.

5.1 Article 1 (Olszewska, 2025)

Article 1 investigated the combined influence of non-native languages on L1 Polish. The study examined whether word order in L1 – specifically verb and adverb placement – would undergo change following exposure to L2, L3, and L4 in the absence of immersion. It further considered whether such influence would be stronger among learners with knowledge of more than one Germanic language, whether it would strengthen with developing Ln proficiency, and whether it would depend on structure-specific factors such as Ln frequency and L1 optionality.

To address these questions, participants were divided into four groups: Polish–English bilinguals (n = 27), Polish–English–German trilinguals (n = 40), Polish–English–Scandinavian trilinguals (n = 74), and Polish–English–German–Scandinavian quadrilinguals (n = 87). All participants completed an untimed AJT in the L1. Given the pervasiveness of English in the Polish education system, recruiting monolingual Polish speakers was not feasible. Therefore, judgements provided by the Polish–English bilinguals were considered a baseline, while divergences observed in other participant groups were interpreted as evidence of rCLI from German or Scandinavian languages.

The task targeted verb placement in main clauses with either a fronted adverbial (Subject–Verb–Adverbial as SVA, Adverbial–Subject–Verb as ASV, Adverbial–Verb–Subject as AVS) or a fronted object (Subject–Verb–Object as SVO, Object–Subject–Verb as OSV, Object–Verb–Subject as OVS), as well as adverb placement in subject-initial main clauses (Adverb–Verb as Adv–V, Verb–Adverb as V–Adv). Crucially, all of these word orders are grammatical in L1 Polish, although they differ in perceived naturalness. In contrast, L2 English permits only a subset of these patterns (Adv–V; ASV, OSV), whereas L3 German and L4 Scandinavian allow a different subset (V–Adv; AVS, OVS). SVA and SVO served as baseline conditions and are grammatical in all languages. Influence from L2, L3, and L4 was therefore expected to surface as inflated ratings in Polish for the Germanic-like word order. Importantly, the tested structures differed in frequency in the Ln – adverbials are routinely fronted, whereas objects rarely occur in this position. In addition, they varied in optionality permitted by the L1 – clause-medial adverbs may appear either preverbally or postverbally, while verbs occurring in second position in non-subject-initial clauses are possible but infrequent.

The data were analysed using linear mixed-effects models with L1 Polish ratings as the dependent variable. The analysis proceeded in two steps. First, separate models were fitted for each structure to compare the four participant groups and the tested conditions (three for verb placement and two for adverb placement), with self-reported proficiency in L2 English included as a predictor. Second, because diverging judgements were observed primarily in the

quadrilingual group, additional models were fitted for these learners separately. These models also included self-reported proficiency in L3 German and L4 Scandinavian, allowing for the effect of developing Ln proficiency to be examined directly.

The results reveal clear structure-specific rCLI effects. For adverb placement in main clauses, the L3/L4-like word order (V–Adv) becomes increasingly disfavoured with higher proficiency in L2 English across all four groups, but increasingly favoured with higher proficiency in L4 Scandinavian in the quadrilingual group only. For verb placement, no effects of L2 English emerge across groups. Quadrilingual participants again show more favourable ratings of the L3/L4-like pattern, indicating combined L3/L4 influence, but only in sentences with a fronted adverbial (AVS); no such effect is found in sentences with a fronted object (OVS). Moreover, this structure follows a different developmental trajectory when Ln proficiency is considered – although the quadrilingual group rates AVS significantly higher than all other groups, these ratings decrease with higher proficiency in L4 Scandinavian.

Taken together, these findings indicate that rCLI does not affect the L1 uniformly, but depends on structure-specific factors, in line with the predictions of the LPM. At the level of a single syntactic property (V2), rCLI emerges with frequently fronted adverbials, but not with rarely fronted objects, underscoring the role of L3/L4 frequency. A second factor that emerges as important concerns optionality permitted by the L1. For adverb placement, which is variable in the L1, rCLI strengthens with increasing Ln proficiency. By contrast, for verb placement – which is marked in the second position of non-subject-initial clauses – rCLI weakens with increasing Ln proficiency, possibly reflecting heightened sensitivity to non-canonical word orders. Both patterns align with previous findings showing that bilingual learners experience processing facilitation at points of L1–L2 structural overlap when the L1 allows two options and the L2 only one (e.g., Requena & Berry, 2021), as well as increased sensitivity to non-standard forms (e.g., Ewert, 2008).

The findings also highlight the role of combined rCLI. English appears to exert influence as a single source, with effects in adverb placement observed across all four participant groups. In contrast, German and Scandinavian exert influence on both verb and adverb placement only when acquired together – the effect is present in the quadrilingual group but absent in trilingual groups with knowledge of only one of these languages. This asymmetry is interpreted in terms of differences in proficiency and experience with Ln. L2 English, which the learners acquired early and to an advanced level, is sufficiently robust to act as an independent source of influence. By contrast, L3 German and L4 Scandinavian, acquired later and to a lesser extent, temporarily exert an effect only when combined.

In summary, Article 1 provides novel evidence for the influence of non-native languages on L1 of non-immersed, instructed learners. While this phenomenon has been addressed in a limited number of studies (e.g., Długosz, 2021; Martín-Villena, 2023), previous research on L1 change has largely focused on L1 attrition resulting from extensive Ln exposure and reduced L1 use. The present study demonstrates that syntactic changes, although rare, can also emerge under favourable conditions. The findings support the notion of co-activation of all languages of a multilingual and highlight the importance of a property-by-property approach to rCLI, sensitive to factors such as L3/L4 frequency and L1 optionality.

5.2 Article 2 (Olszewska & Długosz, 2025)

Article 2 examined rCLI between non-native languages, focusing on L3-to-L2 influence in verb–particle constructions. The study investigated whether different L3 particle placement patterns would affect the L2 word order preferences, whether this effect would strengthen with developing knowledge of the structure in L3, and whether rCLI would manifest differently across online and offline performance. In addition, the study tested whether L3 learners would be sensitive to subtle cues modulating particle placement in L2 English, independently of rCLI.

Only trilingual participants were considered in this study. Because English and Norwegian permit both positions of the particle, Polish–English–Norwegian (n = 65) learners served as a control group. In contrast, Polish–English–Swedish (n = 52) and Polish–English–Danish (n = 46) learners created two experimental groups, as these languages impose stricter and diverging constraints on particle placement. Comparing groups that had an equal number of languages in their repertoires reduced the risk of misattributing general effects of multilingualism to rCLI. In this study, all participants completed an untimed AJT and a SPRT in both L2 English and their respective Scandinavian L3.

In both tasks, the stimuli targeted verb–particle constructions in which the particle either preceded or followed a noun phrase (NP) object. The NP objects were either short or long, creating four conditions in a 2×2 design. Although both particle positions are grammatical in English and Norwegian, adjacent particle placement is generally preferred due to its lower processing cost (e.g., Hawkins, 1994), with this preference increasing as the intervening element – here, the NP – becomes longer (e.g., Lohse et al., 2004). Swedish restricts the particle to the verb-adjacent position, while Danish requires it to follow the object. Based on these contrasts, rCLI effects were expected among learners acquiring Swedish or Danish, but not among those acquiring Norwegian.

The data were analysed using linear mixed-effects models, with L2 English ratings in the AJT and L2 English reading times in the SPRT as the dependent variables. The analyses examined group differences, the effects of particle position and NP length, and L3 accuracy,[8] while controlling for L2 English proficiency (measured using Dialang) and self-reported knowledge of German where relevant.

The results show that the addition of different L3s influences both acceptability judgements and online processing in L2 English. Across groups, learners generally prefer verb-adjacent particle placement. For Danish learners, however, this contrast between particle positions gradually diminishes: the Danish-like post-posed particle becomes increasingly more acceptable and is processed more easily in L2 English as learners approach target-like performance in the L3. For Swedish learners, the opposite is observed. An increased preference for the Swedish-like pre-posed particle emerges at intermediate stages of L3 accuracy (arguably because it constitutes the default), and advanced learners exhibit greater sensitivity to the non-adjacent option in L2 English. Both Norwegian and Swedish learners experience processing difficulty following the non-adjacent particle, with this effect being stronger for the latter group. In addition, Norwegian learners rate both particle positions in L2 English increasingly higher, which may reflect continued development towards the L2 target or possible facilitation from the L3. By contrast, advanced Swedish and Danish learners show greater variability, pointing to heightened uncertainty resulting from competing grammatical options. Importantly, rCLI effects converge across offline and online measures, suggesting that the observed changes are not limited to short-term co-activation during processing, but may reflect representational change.

These findings are interpreted as supportive of the LPM, according to which the languages of a multilingual remain co-activated, with sustained interaction between them potentially leading to representational change over time. In the progressive direction of CLI, learners parse incoming L1/L2 input and incrementally build L2/L3 representations. In the regressive direction examined here, by contrast, it is the L3 syntax that is co-activated during L2 syntactic processing. However, because L1 and L2 are typically more developed than a subsequent L3, their representations are less underspecified and therefore less prone to parsing failure. As a result, learners are generally able to suppress L3 during L1 or L2 processing. The present study therefore introduces optionality as an additional factor that is particularly relevant to the regressive direction of influence, alongside structural similarity, which has been proposed

[8] L3 accuracy was calculated using the AJT ratings in the L3 and served as a continuous predictor of particle placement knowledge.

as a key modulator of the strength of co-activation in the LPM. Specifically, when structural similarity co-occurs with optionality in the target language, the parser may treat L3-like structures as suitable for parsing one of the options available in L1 and/or L2.

The findings also contribute to the limited understanding of the role of developing L3 proficiency in rCLI. While previous research has largely focused on advanced L3 learners (e.g., Aysan, 2012; Puig-Mayenco, 2023), the present study shows that rCLI can emerge at different developmental stages depending on the complexity of the L3 structure. Danish learners, who had to acquire the dispreferred non-adjacent particle placement, exhibited rCLI only at advanced L3 levels, once target-like L3 knowledge was in place. Swedish learners, for whom the grammatical adjacent position overlaps with a general and more easily processed preference, rCLI effects emerged already at intermediate L3 stages. These results suggest that proficiency effects are not clear-cut but instead interact with the complexity of the L3 structure to be acquired.

In summary, to the best of my knowledge, Article 2 provides the first evidence for L3-to-L2 syntactic rCLI. While earlier studies have reported such influence for phonology (e.g., Cabrelli Amaro, 2017) or morphosyntax (e.g., Cheung et al., 2011), and a single investigation on adverb placement found no effects (Tsang, 2016b), the present findings demonstrate that word order may be equally vulnerable to rCLI. Crucially, these effects emerge in non-immersive contexts with instructional L3 exposure and continued L2 use, and they converge across online and offline measures, indicating that rCLI can affect both short-term processing and the underlying representations.

5.3 Article 3 (Olszewska & Długosz, 2026)

Article 3 extended the investigation of L3-to-L2 rCLI to syntactic structures related to second-position finite verb placement (V2), previously examined in Article 1 for L1 Polish: V2 with adverbial fronting, V2 with object fronting, and adverb placement in main clauses. The study examined whether rCLI would be modulated by structure-dependent frequency in the L3 and input ambiguity in the L2, whether it would strengthen with developing knowledge of the relevant structures in the L3, and how the effects would be conditioned by different task modalities.

The study relied on a comparison between two participant groups. Polish–English–Danish, Polish–English–Swedish, and Polish–English–Norwegian learners were grouped together as trilinguals (n = 171), while Polish–English learners without knowledge of Scandinavian constituted a bilingual control group (n = 71). This grouping was motivated by

the fact that the three Scandinavian languages pattern identically with respect to the syntactic structures under investigation, thereby allowing for more robust statistical analyses. All participants completed an AJT, an SPRT, and an OPT. For trilingual learners, the tasks were administered in both the L2 and the L3, while bilinguals completed them in the L2 only.

Across the AJT and the SPRT, the stimuli targeted three structures: verb placement in main clauses with a fronted adverbial (SVA, ASV, AVS), verb placement in main clauses with a fronted object (SVO, OSV, OVS), and adverb placement in subject-initial main clauses (Adv–V vs. V–Adv). ASV, OSV, and Adv–V represented target-like English word orders, and AVS, OVS, and V–Adv corresponded to target-like Scandinavian patterns. SVA and SVO served as control conditions, as they are grammatical in both L2 English and L3 Scandinavian languages. The OPT relied on the same lexical material and structural contrasts but differed procedurally in that participants were presented with sentences in canonical word order and prompted to reformulate them by initiating the utterance with a different element. L3-to-L2 influence was expected to manifest as inflated acceptability ratings, facilitated processing, and increased production of word orders resembling those of L3 when exposed to L2 English stimuli. As in Article 1, the two fronting structures differed in L3 frequency – adverbials commonly occur clause-initially, while objects rarely occupy this position. Moreover, adverb placement in English is characterised by input ambiguity – although adverbs typically appear in clause-medial position preceding the lexical verb, they may also occur clause-initially or clause-finally. Taking these distributional and input-related factors into account, the three structures were expected to differ in their susceptibility to rCLI, with the strongest effects predicted for V2 with adverbial fronting, weaker and less consistent effects for adverb placement, and no effects for V2 with object fronting.

The data were analysed using linear mixed-effects models, with L2 English ratings in the AJT, reading times in the SPRT, and binary accuracy scores (0–1) in the OPT as dependent variables. Items resembling SVA and SVO word order were ultimately excluded to enable the fitting of a unified model across the entire dataset. The model relied on a V2 vs. V3 distinction while controlling for the presence of three related but distinct structures. The analyses examined group differences, structure effects (V2 with adverbial fronting, V2 with object fronting, V2 with adverb placement), condition effects (V2 vs. V3), and the role of L3 accuracy,[9] while

[9] Similarly to the analysis reported for Article 2, L3 Accuracy was created using the equivalent ratings from the AJT in the L3. For V2 with a fronted element, the control SVA and SVO items were excluded to calculate subject-verb inversion accuracy (based on ASV/AVS and OSV/OVS, respectively).

controlling for L2 English proficiency (measured using Dialang) and, where relevant, L3 German proficiency (based on self-reports).

The results indicate that the addition of a Scandinavian L3 can exert an influence on L2 English, with rCLI being dependent on task modality. In the AJT, rCLI is structure-specific: in the L2–L3 group comparison, it is observed for V2 with adverbial fronting but not for V2 with object fronting, reflecting differences in their distribution and underscoring the role of L3 frequency. For V2 with adverb placement, the effect is marginal, possibly due to ambiguity in the input associated with this structure. Crucially, when L3 accuracy is taken into account, non-target L2 English word orders – specifically, V2 with adverbial fronting and V2 with adverb placement – receive inflated ratings at intermediate L3 levels, but this pattern is no longer attested at advanced L3 levels. This suggests that, despite short-term destabilisation of the grammar, learners draw on their metalinguistic knowledge and become more increasingly aware of differences in verb placement between English and the Scandinavian languages, ultimately leading to the rejection of L3-like V2 order in L2 English.

In the SPRT, rCLI is neither structure-specific nor modulated by L3 accuracy. Reaction time data suggests that both bilingual and trilingual learners are sensitive to grammatical violations, but they differ in the degree of sensitivity. Specifically, the difference in reaction times between V2 and V3 items is larger in the bilingual group than in the trilingual group, indicating reduced sensitivity to non-target V2 in L2 English among learners with knowledge of a Scandinavian L3.

In the OPT, production accuracy is near ceiling overall for both groups. Trilinguals are substantially less accurate than bilinguals, and this effect is likewise not structure-specific, suggesting a more global disadvantage in the L2 stemming from L3 Scandinavian acquisition. Descriptively, for V2 with a fronted element, trilingual learners commit non-target V2 errors, while bilinguals do not. For V2 with adverb placement, both groups produce occasional non-target instances, further corroborating the role of input ambiguity in influencing the pace of acquisition of this structure. Crucially, 62 out of 162 trilingual learners and 9 out of 71 bilingual learners produce at least one illicit V2 structure in L2 English, suggesting that the observed oral production patterns may depend on individual differences in inhibitory control. In addition, this overall reduction in L2 accuracy is positively associated with higher levels of L3 accuracy. The effects observed in the OPT are therefore interpreted as evidence for rCLI as short-term V2 co-activation, amplified by high cognitive demands of the task – demands that may override learners' metalinguistic awareness of the ill-formedness of V2 in L2 English.

Taken together, the divergent effects observed across offline and online measures point to short-term co-activation of L3 syntax during L2 processing, without evidence for representational restructuring. These findings further support the application of the LPM in the regressive direction, as the strength of co-activation is modulated not only by structural similarity, but also by structure-specific factors such as frequency and input ambiguity. This is reflected in the results from judgement data, in which V2 with a frequently fronted adverbial shows the most robust rCLI; V2 with a rarely fronted object shows no influence; and adverb placement, characterised by ambiguity in L2 English, yields weaker and less consistent effects that are primarily confined to intermediate stages of L3 development and only marginally detectable in L2–L3 comparisons.

In Article 2, structural optionality in the target language has been identified as a necessary condition for rCLI to emerge and extend beyond online processing. When L2 allows competing parses – as in variable particle placement – co-activation of L3 syntax can reinforce one of the existing options, resulting in persistent rCLI. By contrast, the V2-related properties examined in Article 3 do not exhibit optionality and do not permit L3-like parsing without yielding grammatical violations in L2. Under these conditions, rCLI is restricted to short-term effects observable in judgements at intermediate levels of L3 accuracy, which recede at more advanced stages as L3 representations stabilise. Co-activation is nonetheless evident in online processing regardless of L3 accuracy – as both learner groups remain sensitive to violations, with this sensitivity being stronger among bilinguals, as well as in oral production – where co-activation amplified by increased cognitive demands renders trilinguals more prone to errors despite overall near-ceiling accuracy.

In summary, Article 3 corroborates the earlier findings from Article 2 that word order is susceptible to L3-to-L2 rCLI, while demonstrating that this effect in judgement data is property-specific and dependent on factors such as L3 frequency or ambiguity in the L2 input, rather than affecting all syntactic structures uniformly. Crucially, it shows that in the absence of structural optionality – as in V2-related properties – rCLI remains largely confined to the online processing domain and to occasional deviations in oral production under high processing load, but it does not give rise to lasting changes in L2 grammar representations.

5.4 Article 4 (Olszewska, 2026)

Article 4 aimed to provide a comprehensive account of the current findings on rCLI in the grammatical domain and to situate Articles 1–3 within this broader research context. Focusing on adults in instructed learning environments, a literature search identified 30 empirical studies

(including the two reported in this thesis), spanning journal articles, book chapters, monographs, and master's and doctoral theses. Given the heterogeneity of the available evidence, the review adopted a narrative state-of-the-art methodology to synthesise reported findings, terminology, grammatical phenomena, and study design choices.

The review showed that most studies report facilitative rCLI effects (e.g., Hui, 2010), although non-facilitative (e.g., Cheung et al., 2011) and neutral outcomes (e.g., Liu et al., 2020) were also attested. Overall, the literature reveals a clear asymmetry, with a greater number of studies investigating rCLI effects on the L2 as the target language rather than the L1.

Among the factors proposed to mediate rCLI, proficiency in the source language emerges as a particularly important yet under-researched variable. In many studies, proficiency is either insufficiently reported, or the participant pool is restricted to advanced Ln learners (e.g., Cabrelli Amaro, 2017). By contrast, the few cross-sectional investigations available suggest that L3-to-L2 rCLI may also arise at early stages of L3 development (e.g., Xiao, 2018).

With respect to the grammatical phenomena examined to date, the most substantial body of research targets structures at the syntax–semantics and syntax–pragmatics interfaces (e.g., Martín-Villena, 2023), although some evidence indicates that morphosyntax may also be affected (e.g., Puig-Mayenco, 2023). Situating the present thesis within this literature, purely syntactic phenomena have thus far been shown to be affected only in L1 (e.g., Requena & Berry, 2021), while other studies targeting syntax have yielded null results in both L1 (Długosz, 2021) and L2 (Tsang, 2016b). The findings reported here demonstrate, however, that this domain is not exempt from rCLI in either L1 or L2.

From a methodological perspective, the review highlights a bias towards typologically similar language pairings, leaving rCLI effects in more distant constellations comparatively unexplored. Moreover, rCLI has predominantly been investigated using acceptability judgement tasks (e.g., Aysan, 2012) and written production measures (e.g., Hui, 2010), with comparatively fewer studies employing processing-based measures (e.g., Puig-Mayenco, 2023) or oral production tasks (e.g., Liu et al., 2020).

A recurrent limitation across the reviewed literature concerns insufficient statistical power. Several studies rely on notably small sample sizes, in some cases involving as few as 10 participants (e.g., Kim, 2023), with most studies recruiting 20–25 learners (e.g., Aysan, 2012). In addition, many analyses do not adequately model variability at the level of the individual participants and experimental items, potentially obscuring subtle rCLI effects.

In summary, Article 4 demonstrates that rCLI is not a marginal phenomenon, but rather a common aspect of multilingual development. At the same time, existing evidence largely

derives from heterogeneous and isolated investigations rather than sustained research programmes. By identifying recurring empirical patterns and methodological choices, the review situates Articles 1–3 within the broader rCLI literature, underscores the importance of replication, and outlines methodological and theoretical directions whose incorporation would benefit future studies on rCLI.

6. General discussion

The present section provides a general discussion of the key findings emerging from Articles 1–3 and relates them to the overarching research questions of the project. While each article presents a detailed discussion of its respective results, this section synthesises these findings and organises them into thematic subsections. It concludes by addressing potential limitations and outlining directions for future research.

6.1 rCLI as co-activation

The findings across the studies reported in Articles 1–3 converge on a key observation: multilingual learners have access to all their languages at all stages of development, and co-activation of structurally similar grammars lies at the core of CLI. Within the LPM framework, such co-activation is not accidental but structure-specific and constrained by a range of additional modulators. As demonstrated by the studies reported here, the same mechanism applies in the regressive direction: the observed influence is neither global nor accidental, but incremental and systematic, with the same factors re-emerging as relevant regardless of whether the target language is the L1 or the L2. Crucially, rCLI does not occur at a uniform or fixed point in time, indicating that these interactions are not confined to a particular developmental window. Even after a substantial level of attainment in L1 and L2 has been achieved, these languages remain susceptible to influence from additional language acquisition. As learners parse input in L1, L2, or L3, they draw on representations from other grammars, thereby creating opportunities for the languages to influence one another in both facilitatory and non-facilitatory manner. From this perspective, immersion in a particular environment is not a prerequisite for rCLI – rather, the strength of co-activation is guided by the linguistic input, and extensive exposure to corroborating or non-facilitatory input in instructional environments may suffice.

Given that the LPM is adopted as the central explanatory framework, earlier proposals addressing the occurrence of rCLI also warrant consideration. One such account is the Differential Stability Hypothesis (Cabrelli Amaro, 2017), which proposes that, due to

differences in age of onset, L1 is inherently less susceptible to rCLI than a later-acquired L2. In light of the present investigations of comparable syntactic properties in L1 (Article 1) and L2 (Article 3), this assumption does not seem to be fully supported. Although the findings are not directly comparable due to the involvement of an additional factor – namely, that the relevant structures are optional in L1 Polish but grammatically fixed in L2 English – the results nevertheless suggest that rCLI can arise in both L1 and L2, provided that relevant structure-specific conditions are met. Establishing whether L1 and L2 differ systematically in their susceptibility to influence, however, would require a more targeted investigation.

A related proposal is the Sandwich Effect (Puig-Mayenco, 2023), which predicts increased susceptibility to rCLI in L2 structures subject to combined influence from both L1 and L3, while allowing for the possibility that structures not exposed to such combined influence may be affected at comparatively later stages. Here, this prediction can be explored by contrasting particle placement – absent in the L1 and therefore susceptible only to the L3 influence – with V2-related properties, which, given the high permissibility of L1 Polish, could be argued to pattern similarly in the L1 and the L3. While this distinction is compatible with the logic behind the Sandwich Effect, the present data do not straightforwardly point to stronger or more immediate rCLI effects under conditions of combined L1–L3 influence.

Finally, the Similarity Convergence Hypothesis (Brown-Bousfield & Chang, 2023) posits stronger susceptibility to rCLI between typologically similar languages (i.e., ones characterised by lexical, phonological, morphological and syntactic overlap). Given that the present studies primarily examined influence between English and other Germanic languages – German or Scandinavian – this prediction appears to be supported. At the same time, evidence of influence was also observed in the typologically more distant L1 Polish. In this case, however, additional variables are again likely to be involved, particularly the greater permissibility of word order in L1 Polish.

The conclusions drawn with respect to these proposals must remain tentative. Importantly, they are intended as informed suggestions rather than direct tests, as the studies reported in this thesis were not designed to evaluate the premises of these accounts. Accordingly, more systematic investigations – directly juxtaposing the susceptibility of L1 and L2, comparing structures that are subject to combined L1–L3 influence with those that are not, and examining typologically proximate versus distant languages – are required to assess these proposals more rigorously.

6.2 Input-related factors and structural optionality

Building on the directly supported LPM, the findings are compatible with the view that language learners are sensitive to fine-grained distinctions present in the input (e.g., Westergaard, 2021), which condition the strength of co-activation and, in turn, rCLI.

While abstract structural similarity is a prerequisite, the observed effects are further modulated by several structure-specific factors. These include (i) frequency – with strong effects for frequent V2 with adverbial fronting and no effects for V2 with object fronting in both the L1 and the L2 (Articles 1 and 3); (ii) ambiguity – with consistent effects for unambiguous V2 but more variable outcomes for ambiguous adverb placement in the L2 (Article 3); and (iii) ease of acquisition – with earlier effects in the L2 for comparatively easy verb-adjacent particles in Swedish and later effects for more challenging verb non-adjacent particles in Danish (Article 2). Crucially, however, the key modulatory factor concerns structural optionality in the target language.

Across the reported studies, optional structures consistently emerged as the most susceptible to rCLI. Optional adverb placement in the L1 (Article 1) was affected by both individual L2 influence and combined L3/L4 influence, with rCLI effects strengthening as Ln proficiency increased. Similarly, optional particle placement in the L2 (Article 2) proved more susceptible to influence as learner proficiency increased. By contrast, verb-second in the L1 (Article 1), which is to an extent acceptable but strongly disfavoured, was generally rated higher by L3/L4 quadrilingual learners; however, higher L3 proficiency led to greater rejection rather than acceptance. Likewise, both adverb and verb placement in the L2 (Article 3), which are not optional, showed short-term effects which were either limited to processing, or – again – appeared for intermediate L3 learners and decreased with higher proficiency. Taken together, the present dataset suggests that rCLI is particularly robust when the source language strengthens an existing option in the target language. Otherwise, its presence leads to heightened attentiveness to non-standard forms, sharper metalinguistic awareness, and – consequently – to rejection of non-target structures.

6.3 Proficiency and accuracy in the source language

With respect to language proficiency, the studies reported here relied on a self-assessed proficiency (Article 1) or on a novel, structure-specific measure of L3 accuracy derived from L3 data (Articles 2–3). Prior findings, reported predominantly for advanced learners (e.g., Park & García-Mayo, 2024), have led to the prediction that higher Ln proficiency in the source language should uniformly result in stronger rCLI effects. However, the present findings

indicate that Ln proficiency alone does not predict the occurrence of rCLI, irrespective of whether it is indexed by global or structure-specific measures. Rather, the effects of Ln proficiency emerge through interactions with structural optionality in the target language, ease of acquisition, and the availability of multiple source languages.

In particular, Ln proficiency interacts with structural optionality by either amplifying or attenuating rCLI effects. Optional structures tend to show increasingly stronger rCLI with higher proficiency (e.g., particle placement in Article 2), whereas non-optional or strongly constrained structures may exhibit weaker effects at higher proficiency levels (e.g., V2-related properties in Article 3).

Proficiency further interacts with ease of acquisition – structures that are comparatively easy to acquire, such as Swedish adjacent particle placement (Article 2) show rCLI already at intermediate L3 stages, whereas more challenging structures, such as Danish non-adjacent particle placement (Article 2), exhibit rCLI only among advanced L3 learners.

Against this background, reports of rCLI restricted to advanced L3 learners in earlier studies may reflect a range of methodological factors. These include (i) participant samples limited to advanced speakers, (ii) the examination of single rather than multiple grammatical structures, (iii) coarse operationalisations of proficiency, often based on group-level proxies such as years of study. By contrast, the present studies employed a cross-sectional design, multiple grammatical structures, and detailed, structure-specific accuracy measures – arguably a prerequisite for rCLI research, as they establish that there is a representation available for CLI. At the same time, this methodological choice complicates direct comparisons with earlier work relying on different proficiency metrics. Notably, however, Xiao (2018) stands out as a cross-sectional investigation reporting facilitative rCLI on the L2 shortly after the L3 onset, a pattern compatible with the present findings demonstrating rCLI at different stages of L3 development.

A final proficiency-related consideration concerns combined rCLI. As shown in Article 1, Ln influence on the L1 was variable – while L2 English functioned as an individual source language, L3/L4 German–Scandinavian exerted an influence only among learners with knowledge of both languages. As discussed therein, this pattern suggests that, provided that structure-specific conditions are met, well-established languages give rise to more robust rCLI effects, whereas the lesser-known languages may require additional support before becoming independent sources of rCLI.

6.4 Differences across task modalities

Lastly, rCLI was expected to vary in its robustness as a function of task modality. While Article 1 relied on a single measure and Articles 2–3 employed task triangulation, the findings across the studies nevertheless indicate that rCLI does not manifest uniformly in different experimental modalities.

Judgement data, reflecting offline comprehension, prove informative in all three studies. Although inflated ratings first emerged at different stages of L3 development (intermediate vs. advanced), judgements consistently captured rCLI effects. Importantly, because these tasks were untimed, the observed effects cannot be attributed solely to short-term processing difficulty, especially when they persisted rather than diminished at higher L3 proficiency levels. At the same time, while statistically significant, the changes in ratings were not large in magnitude. This suggests that any representational change is gradual and subtle, reflecting shifts in preferences and increased competition between grammatical options rather than a replacement of the previously acquired grammar by the L3.

Self-paced reading data indicate that online processing measures are highly sensitive to short-term rCLI effects, even in the absence of a lasting representational change. Across studies, structurally similar non-target grammars were co-activated during L2 processing, as reflected in elevated reading times following the critical regions, pointing to short-term interference.

Oral production data revealed a complementary pattern. Although the overall performance in L2 English was near ceiling, trilingual learners were more prone to L3-like errors than bilinguals. This suggests that in production, co-activation of an additional grammar is amplified by the heavy cognitive demands of the task, increasing the probability of non-target utterances even when overall accuracy remains very high.

Overall, these findings suggest that online processing measures are the most sensitive indicators of short-term co-activation, while acceptability judgements provide insight into potential restructuring of L2 representations. In Article 2, convergence between online and offline measures points to more stable influence in contexts of structural optionality, whereas in Article 3, divergence across modalities reflects the short-term nature of rCLI in non-optional V2-related structures. Moreover, oral production appears to capture amplified vulnerability under a high cognitive load. While these results offer an indirect window into the pervasiveness of rCLI, definite conclusions regarding long-term representational change would require longitudinal testing of the same learners after a period of reduced or discontinued L3 exposure.

6.5 Limitations and future research directions

Having outlined the main contributions of this thesis, the following section offers a critical evaluation of the findings by identifying limitations that can inform both their interpretation and directions for future research.

First, the studies were conducted within an institutional context, where instructional hours served as an approximation of learners' exposure to Ln input. While this approach allows for group-level comparisons, it is less sensitive to individual variation. A learner-specific assessment of daily language exposure and use would therefore provide a more accurate picture. Although the questionnaire employed in the studies included a self-estimated measure of daily use in hours, some participants misinterpreted the question, resulting in reported use across languages exceeding 24 hours per day. Consequently, these data could not be reliably interpreted. Future research should implement a more fine-grained assessment method, such as a Likert scale, which is less prone to misinterpretation and more readily comparable across participants. More broadly, future work would benefit from incorporating a wider range of individual-difference variables, including not only language use and exposure but also recency (e.g., Castle et al., 2026) or working memory capacity, which may modulate learners' ability to suppress non-target languages.

Relatedly, although the studies deliberately focused on a relatively homogeneous group of instructed learners, future work comparing instructed and immersed learners would help clarify how learning environment modulates the occurrence of rCLI. While initial evidence suggests that rCLI manifests in both learner groups (e.g., Martín-Villena, 2023), further research could examine how environmental effects interact with age of acquisition, age of immersion, and simultaneous versus sequential mode of acquisition.

With respect to language dominance, the current investigation focused on highly proficient L2 English learners who acquired their L3 incrementally. This controlled dominance configuration facilitated clear interpretation of rCLI effects. Future studies could extend this approach by examining whether rCLI patterns differ when this dominance is shifted, for instance in cases where the L3 becomes more advanced than the L2.

Regarding proficiency development, the findings reported here suggest that rCLI can already emerge at intermediate stages of L3 development and may either strengthen or weaken with increasing L3 proficiency. While these patterns point to an interaction between source language development and structure-specific optionality, they are based on cross-sectional data. Although the relatively large group sizes lend support to this interpretation, future research would benefit from examining rCLI using a truly longitudinal design. As demonstrated by the

review in Article 4, no longitudinal study of rCLI in the grammatical domain has so far been conducted. Tracking the same learners across stages of L3 development, with initial L3 competence serving as a baseline for subsequent development, would be methodologically challenging but clearly warranted.

In addition, effects observed in the offline acceptability judgement task and supported by converging evidence from online measures were interpreted as reflecting representational change (Article 2). Effects observed in judgements at intermediate, but not advanced L3 stages, and otherwise limited to online measures, were instead interpreted as reflecting co-activation of L3 grammar during online L2 processing (Article 3). However, longitudinal testing of the same learners across contexts with varying degrees of exposure – for instance, during and after periods of intensive language instruction – would provide valuable insights into the extent to which rCLI leads to representational change.

Furthermore, the present project focused exclusively on word order phenomena. Although multiple structures served as fillers for one another and additional non-syntactic fillers were included, this focus may nevertheless have heightened participants' awareness of experimental manipulation. Future research would benefit from a systematic comparison of other grammatical structures that differ in intra-linguistic factors such as complexity, frequency, difficulty of acquisition, and structural optionality. Extending the investigation to properties across different linguistic domains within the same learners (e.g., Jensen et al., 2023) would further enhance our understanding of rCLI.

Finally, while the studies on L3-to-L2 influence (Articles 2–3) relied on equivalent data collected in both the L2 and L3 – allowing for a detailed assessment of structure-specific accuracy – this was not possible in the study on Ln-to-L1 influence (Article 1), where additional knowledge of German in the quadrilingual group exerted converging influence. Future research should therefore assess not only the target language but also the potential source language(s) to ensure that the relevant structure is available for rCLI. Such control over linguistic knowledge across the entire repertoire would allow rCLI to be distinguished from more general additive effects of multilingualism (e.g., Długosz, 2023; Velnić et al., 2026). Additional measures could include recruiting control groups that are equally multilingual but lack the relevant structure, or testing properties that are absent from L3 and therefore incapable of exerting an influence.

7. Conclusion

In summary, the present PhD project demonstrates that instructional acquisition of additional languages can lead to changes in previously acquired L1 and L2 grammars, even in the absence of immersion. Crucially, the findings show that syntax is not exempt from rCLI.

In line with the LPM, rCLI arises as a consequence of the continued co-activation of all languages in the multilingual repertoire, with this co-activation guided by abstract structural similarity. The present studies extend this account by showing that, in the regressive direction, structural similarity alone is not sufficient for lasting influence to occur. Instead, structural optionality in the target language emerges as a key condition for sustained rCLI, allowing later-acquired languages to reinforce an existing grammatical option in an earlier-acquired language. When such optionality is absent, rCLI is short-term and largely confined to online processing and occasional errors in oral production under high cognitive load.

Beyond optionality, the findings demonstrate that rCLI is further modulated by structure-specific factors such as frequency, input ambiguity, and ease of acquisition, underscoring the importance of a nuanced, property-by-property approach. Moreover, rCLI varies as a function of Ln proficiency – strengthening for optional structures but weakening for non-optional ones. It also manifests differently across task modalities – convergence between online and offline measures characterises optional structures, whereas divergence across modalities points to short-term co-activation effects for non-optional structures.

Taken together, the present thesis provides novel empirical evidence for CLI as a multidirectional phenomenon that extends into the domain of syntax and can arise in instructional contexts. By demonstrating how rCLI is modulated by intra- and extralinguistic factors, these findings contribute to a more comprehensive understanding of CLI in multilingual grammars.

Abstract in English

While a substantial body of research on multilingualism has examined progressive cross-linguistic influence, focusing on the impact of the first (L1) and/or the second language (L2) on the third language (L3; e.g., Rothman et al., 2019), considerably less attention has been given to how the acquisition of an additional language can affect the languages known prior. Existing work on regressive cross-linguistic influence (rCLI) has identified factors such as age of acquisition, L1–L3 structural similarity, and typological proximity as potential modulators (e.g., Puig-Mayenco, 2023). However, previous studies have mainly reported facilitative effects associated with L3 acquisition (e.g., Xiao, 2018) and have not provided evidence for L3-induced regressive influence in syntax.

This PhD project addresses this gap by examining rCLI among adult instructed learners of Scandinavian languages (L3 Norwegian, Swedish, or Danish). It investigates L3-to-L2 and L3-to-L1 influence on word order in L2 English and L1 Polish, with a subset of participants additionally possessing knowledge of German. The studies examine whether rCLI can emerge in non-immersive contexts, whether it is reinforced by converging input from later-acquired languages, and how its effects are modulated by intra-linguistic factors such as structure-specific frequency, input ambiguity, ease of acquisition, and structural optionality in the target language. The role of developing proficiency in the Scandinavian languages is assessed cross-sectionally, and the robustness of rCLI is compared across an acceptability judgement task, a self-paced reading task, and an oral production task. The thesis comprises three empirical studies (Articles 1–3), complemented by a state-of-the-art review (Article 4).

The empirical studies demonstrate that rCLI can arise in both L1 and L2. Crucially, it is most robust in the presence of structural optionality, i.e., when influence from a later-acquired language reinforces an existing grammatical option in the target language. In such cases, effects are observable across both online and offline measures and strengthen with increasing L3 proficiency. By contrast, when the target structure is not optional, rCLI is largely confined to processing and oral production, and tends to diminish with increasing L3 proficiency. Across studies, rCLI is further modulated by structure-specific factors: effects are more likely to emerge for frequent structures, show greater variability under conditions of input ambiguity, and arise earlier for structures that are comparatively easier to acquire.

These findings are interpreted within the Linguistic Proximity Model (e.g., Mykhaylyk et al., 2015; Westergaard et al., 2017), according to which cross-linguistic influence arises from

continued co-activation of structurally similar grammars in the multilingual mind. The thesis extends this framework by demonstrating that, in the regressive direction, structural similarity alone is insufficient for lasting influence to occur. Instead, optionality in the target language constitutes a key condition for sustained rCLI. Taken together, the thesis provides novel empirical evidence that cross-linguistic influence is a multidirectional phenomenon that extends into syntax and can arise in both L1 and L2, even in non-immersive instructional contexts.

Abstract in Polish. Abstrakt w języku polskim

Współczesne badania nad wielojęzycznością skupiają się na progresywnych wpływach międzyjęzykowych, czyli na oddziaływaniu wcześniej przyswojonych języków pierwszego i drugiego (L1 i L2) na proces nabywania języka trzeciego (L3). Znacznie mniej uwagi poświęcono natomiast temu, w jaki sposób nabywanie kolejnego języka może wpływać na języki przyswojone wcześniej. Dotychczasowe badania wskazują, że proces ten może być zależny od takich czynników, jak wiek pierwszego kontaktu z językiem, podobieństwo strukturalne między L1 a L3 oraz podobieństwo typologiczne między językami (np. Puig-Mayenco, 2023). Badania te koncentrują się jednak głównie na obecności wpływów o charakterze pozytywnym (np. Xiao, 2018) i nie dostarczają dowodów na występowanie zwrotnych wpływów międzyjęzykowych w obrębie składni, które wynikają ze znajomości L3.

Niniejszy projekt podejmuje tę problematykę poprzez zbadanie zwrotnych wpływów międzyjęzykowych u dorosłych uczących się języków skandynawskich (norweskiego, szwedzkiego lub duńskiego) jako L3 w warunkach nauczania formalnego. Badaniu został poddany wpływ L3 na L2 angielski oraz wpływ L3 na L1 polski. Część uczestników posługiwała się dodatkowo językiem niemieckim. Celem badań było ustalenie, czy zwrotne wpływy międzyjęzykowe mogą występować również poza środowiskiem immersyjnym, czy są one silniejsze u osób posługujących się dwoma językami wykazującymi podobieństwo strukturalne oraz czy są zależne od czynników wewnątrzjęzykowych, takich jak częstotliwość występowania, niejednoznaczność w zajmowaniu określonej pozycji w zdaniu, stopień trudności przyswajania oraz zakres opcjonalności gramatycznej dopuszczanej przez język docelowy. Przekrojowy charakter badań umożliwił ponadto zbadanie roli rosnącego poziomu zaawansowania w L3, a zastosowanie trzech zadań eksperymentalnych (*acceptability judgement task, self-paced reading task* oraz *oral production task*) pozwoliło określić, w jakim stopniu typ zadania warunkuje intensywność tych efektów. Rozprawa obejmuje trzy badania empiryczne (Artykuły 1–3) oraz przegląd literatury osadzający uzyskane wyniki w szerszym kontekście badawczym (Artykuł 4).

Wyniki badań empirycznych wskazują, że zwrotne wpływy międzyjęzykowe mogą występować zarówno w L1, jak i w L2. Szczególnie istotną rolę odgrywa obecność opcjonalności gramatycznej, rozumianej jako sytuacja, w której wpływ języka źródłowego wzmacnia jedną z opcji w gramatyce języka docelowego. W takich przypadkach obserwowane efekty są spójne w różnych zadaniach eksperymentalnych oraz nasilają się wraz ze wzrostem

poziomu zaawansowania w L3. Z kolei w odniesieniu do struktur nieopcjonalnych wpływy te ograniczają się do krótkotrwałych efektów obserwowanych na poziomie przetwarzania i produkcji ustnej, a ich intensywność słabnie wraz z rozwojem kompetencji w L3. Ponadto, wpływy zwrotne są zależne od czynników wewnątrzjęzykowych: pojawiają się w przypadku struktur o wysokiej częstotliwości występowania, wykazują większą zmienność w warunkach niejednoznaczności obecnej w inpucie językowym oraz są obserwowane na wcześniejszym etapie rozwoju L3 w odniesieniu do struktur względnie łatwiejszych do przyswojenia.

Wyniki zostały zinterpretowane w ramach *Linguistic Proximity Model* (np. Mykhaylyk i in., 2015; Westergaard i in., 2017), zgodnie z którym wpływy międzyjęzykowe wynikają ze stałej koaktywacji języków w umyśle osoby wielojęzycznej. Rozprawa rozwija to ujęcie, pokazując, że samo podobieństwo strukturalne nie jest wystarczające do zaistnienia trwałych wpływów międzyjęzykowych w kierunku zwrotnym. Warunkiem kluczowym dla zaistnienia silnych wpływów zwrotnych okazuje się obecność opcjonalności gramatycznej w języku docelowym. Całościowo praca pokazuje, że wpływy międzyjęzykowe mają charakter wielokierunkowy, obejmują struktury składniowe oraz występują w L1 i L2 nawet w warunkach nauczania formalnego.

Extended summary in Polish. Streszczenie w języku polskim

Zwrotne wpływy międzyjęzykowe u osób wielojęzycznych:
Wpływ nabywania kolejnego języka na składnię języka pierwszego i drugiego

Kontekst pracy i uzasadnienie podjęcia problemu badawczego

Współczesne badania nad wielojęzycznością opierają się na założeniu, że proces nabywania języka trzeciego lub kolejnego różni się od nabywania języka drugiego. Do czynników różnicujących te procesy należą m.in. większe doświadczenie osób uczących się, bardziej rozwinięta wiedza metajęzykowa oraz – przede wszystkim – dostęp do więcej niż jednego języka jako potencjalnego źródła wpływów międzyjęzykowych. Z tego względu jednym z głównych zagadnień w badaniach nad nabywaniem języka trzeciego (L3) jest ustalenie źródła tych wpływów oraz wykazanie, który język – pierwszy (L1) czy drugi (L2) – odgrywa w tym procesie kluczową rolę, a także opisanie tego zjawiska w ramach modelu teoretycznego.

Pierwszą z możliwości stanowi skupienie się na kolejności nabywanych języków oraz założenie uprzywilejowanej roli L1 lub L2. Chociaż niektóre badania wykazują oddziaływanie L1 na L3 (np. Jin, 2009), nie istnieje sformalizowany model, który wykazywałby jego wyłączność. Dominujący wpływ L2 na L3 został natomiast ujęty w ramach *L2 Status Factor Model* (Bardel & Falk, 2007). Drugą z możliwości jest skupienie się na podobieństwie między językami. W zależności od ujęcia wpływy międzyjęzykowe mogą mieć charakter wyłącznie pozytywny (*Cumulative-Enhancement Model*, Flynn i in. 2004), obejmować cały system językowy na etapie początkowym (*Typological Primacy Model*, Rothman 2011) lub następować stopniowo w zależności od podobieństwa strukturalnego między konkretnymi zjawiskami językowymi (*Scalpel Model*, Slabakova 2017 oraz *Linguistic Proximity Model*, Mykhaylyk i in., 2015; Westergaard i in. 2017). Szczególnie istotny dla niniejszej pracy jest ostatni z wymienionych modeli, zgodnie z którym wszystkie systemy językowe pozostają w stanie koaktywacji i mogą zarówno konkurować, jak i współdziałać jako źródła wpływu na każdym etapie nabywania L3.

Mimo że model ten dopuszcza wielokierunkowość wpływów międzyjęzykowych, większość poświęconych mu dotychczas badań koncentrowała się na wpływach w kierunku progresywnym, tj. na oddziaływaniu języków już przyswojonych (L1 i L2) na proces nabywania języków kolejnych (L3, L4, Ln). To podejście nie uwzględnia jednak możliwości, w ramach której języki nabywane na późniejszych etapach mogą wpływać na języki nabywane

wcześniej. Tym samym, badania poświęcone zagadnieniu zwrotnych wpływów międzyjęzykowych pozostają nieliczne. Pełny opis wielojęzyczności wymaga tymczasem ujęcia wpływów międzyjęzykowych jako zjawiska wielokierunkowego, zachodzącego pomiędzy wszystkimi językami obecnymi w repertuarze osoby wielojęzycznej.

Niniejsza praca wypełnia tę lukę badawczą poprzez poddanie analizie wpływu przyswajania języków skandynawskich (norweskiego, szwedzkiego lub duńskiego) jako L3 na szyk wyrazów w wybranych strukturach składniowych w języku pierwszym (L1 polskim) oraz w języku drugim (L2 angielskim). Badania te nie tylko potwierdzają istnienie takich wpływów, lecz także identyfikują szereg czynników warunkujących ich występowanie. Co istotne, dotychczasowe badania skupiały się głównie na zjawiskach morfoskładniowych (np. Puig-Mayenco, 2023) lub na zagadnieniach będących na pograniczu składni, semantyki i pragmatyki (np. Martín-Villena, 2023), podczas gdy badania składniowe nie wykazały istotnego wpływu L3 na L2 (np. Tsang, 2016b) bądź ograniczały się do analizy oddziaływania L2 na L1 (Requena & Berry, 2021). Niniejsze badania jako pierwsze dostarczają dowodów na istnienie wpływów zwrotnych w obrębie składni, które wynikają ze znajomości L3. Istotną innowację badań stanowi również zbadanie roli zmieniającego się poziomu zaawansowania w L3. W przeciwieństwie do wcześniejszych badań, które skupiały się przede wszystkim na użytkownikach zaawansowanych i zakładały konieczność opanowania języka na wysokim poziomie jako warunku wystąpienia wpływu (np. Park & García-Mayo, 2024), niniejsze badanie ma charakter przekrojowy i obejmuje uczących się na wszystkich poziomach zaawansowania L3. Pozwala to nie tylko na identyfikację wpływów, lecz także na określenie momentu ich pojawienia się w trakcie rozwoju L3.

Kolejnym ważnym wkładem pracy jest triangulacja trzech zadań eksperymentalnych, w tym zastosowanie rzadko wykorzystywanych w tym obszarze zadań badających przetwarzanie oraz produkcję ustną, a także ujęcie nowej, dotychczas nieanalizowanej w tym kontekście konfiguracji językowej. Uzyskane wyniki są również szczególnie istotne z uwagi na globalną dominację języka angielskiego oraz jego centralną rolę w repertuarach językowych osób wielojęzycznych. Praca wyróżnia się także na tle wcześniejszych badań wielkością próby, która obejmowała 234 osoby dwu- lub wielojęzyczne, oraz zastosowaniem zaawansowanych metod analizy statystycznej. Tym samym przedstawione w niej wyniki znacznie przyczyniają się do rozumienia wpływów międzyjęzykowych jako zjawiska wielokierunkowego.

Cel pracy i pytania badawcze

Głównym celem niniejszej pracy było zbadanie zwrotnych wpływów międzyjęzykowych zachodzących u osób wielojęzycznych posługujących się językiem polskim (L1) oraz zaawansowanym językiem angielskim (L2) na skutek nabywania jednego z kontynentalnych języków skandynawskich (norweskiego, szwedzkiego lub duńskiego; L3). W badaniu skupiłam się na wpływach zachodzących w obrębie następujących struktur składniowych:

- szyk partykuły przyczasownikowej,
- pozycja czasownika finitywnego na drugim miejscu w zdaniu (V2) po inicjalnym okolicznik u czasu,
- pozycja czasownika finitywnego na drugim miejscu w zdaniu (V2) po inicjalnym dopełnieniu,
- pozycja okolicznika wewnątrzzdaniowego w zdaniu głównym.

Struktury te wybrałam ze względu na różnice występujące pomiędzy badanymi językami w uporządkowaniu składniowym. W pracy postawiłam następujące pytania badawcze:

1. Czy język nabywany później (L2, L3 lub L4) może wywierać zwrotny wpływ międzyjęzykowy na język nabywany wcześniej (L1 lub L2)?
2. Czy zwrotne wpływy międzyjęzykowe występują u osób uczących się w warunkach nauczania formalnego, bez środowiska immersyjnego, nawet gdy języki podlegające wpływowi są językami natywnymi lub są na wysokim poziomie zaawansowania?
3. Czy zwrotne wpływy międzyjęzykowe mogą mieć charakter kumulatywny? Jeśli tak, czy są silniejsze u osób znających więcej niż jeden język nienatywny?
4. Czy różne struktury składniowe są w równym stopniu podatne na zwrotne wpływy międzyjęzykowe?
5. Czy zwrotne wpływy międzyjęzykowe są zależne od czynników wewnątrzjęzykowych, takich jak częstotliwość występowania, niejednoznaczność w zajmowaniu określonej pozycji w zdaniu, łatwość przyswajania oraz stopień opcjonalności gramatycznej dopuszczanej przez język docelowy?
6. Czy zwrotne wpływy międzyjęzykowe są warunkowane przez rozwijający się poziom zaawansowania w językach nienatywnych, rozumiany całościowo lub jako znajomość konkretnej struktury językowej?

7. Czy zwrotne wpływy międzyjęzykowe przejawiają się w równym stopniu w rozumieniu i produkcji, czy też ich intensywność zależy od użytego zadania eksperymentalnego? Czy wyniki uzyskane w *acceptability judgement task* (AJT), *self-paced reading task* (SPRT) oraz *oral production task* (OPT) są tożsame?

Akceptacja, przetwarzanie i produkcja zdań niepoprawnych lub nacechowanych w językach polskim (L1) i angielskim (L2), odzwierciedlających szyk zdania, który byłby prawidłowy w wybranym języku skandynawskim (L3), miały stanowić przesłankę do stwierdzenia, że jest to efekt koaktywacji systemów językowych u osób wielojęzycznych i wynikających z niej zwrotnych wpływów międzyjęzykowych.

Opierając się na założeniu o stałej koaktywacji języków w umyśle osoby wielojęzycznej (*Linguistic Proximity Model*; Mykhaylyk et al., 2015, Westergaard et al., 2017) oraz biorąc pod uwagę znaczną ekspozycję na języki dodatkowe w warunkach nauczania formalnego, w projekcie przyjęłam, że immersja nie jest warunkiem koniecznym dla zaistnienia wpływów zwrotnych. Założyłam również, że pojedynczy język nienatywny jest wystarczający, aby wywrzeć te wpływy; równocześnie częścią spodziewanego rezultatu było także założenie, że w grupie uczących się ze znajomością dwóch języków wykazujących te same wzorce składniowe (L3 niemiecki i L4 skandynawski) zbieżność inputu językowego wzmocni obserwowane efekty. W odniesieniu do czynników wewnątrzjęzykowych badanych w projekcie przewidziałam, że analizowane struktury będą różnić się podatnością na wpływy zwrotne. W badaniu założyłam również, że intensywność tych wpływów będzie wzrastać wraz z rosnącym poziomem zaawansowania w językach nienatywnych. W związku z tym spodziewałam się, że wpływy te nie będą przejawiały się w jednakowym stopniu we wszystkich zadaniach eksperymentalnych.

Metodologia

W badaniu wzięło udział łącznie 245 osób, będących użytkownikami języka polskiego jako pierwszego oraz posługujących się zaawansowaną znajomością języka angielskiego jako drugiego. Część uczestników i uczestniczek posługiwała się również jednym z kontynentalnych języków skandynawskich (norweskim, szwedzkim lub duńskim), a część dodatkowo znała język niemiecki. W celu odtworzenia procesu nabywania języków skandynawskich jako kolejnych przeprowadzono badanie poprzeczne. Oznacza to, że osoby badane były na różnych poziomach zaawansowania językowego (od początkującego do zaawansowanego), a każda z nich wzięła udział w badaniu jedynie raz.

Zróżnicowanie repertuaru językowego pozwoliło na wyodrębnienie grup eksperymentalnych i kontrolnych w zależności od konkretnych pytań badawczych. W artykule 1 osoby badane podzieliłam na grupy osób dwujęzycznych, trójjęzycznych oraz czterojęzycznych, co umożliwiło wykazanie kumulatywnego wpływu języków kolejnych na język pierwszy. W artykule 2 wykorzystałam istniejące różnice składniowe pomiędzy językami skandynawskimi. Osoby trójjęzyczne posługujące się językiem norweskim stanowiły grupę kontrolną, podczas gdy osoby ze znajomością języka duńskiego lub szwedzkiego stanowiły dwie grupy eksperymentalne. W artykule 3 skupiłam się na strukturach charakteryzujących się podobieństwem składniowym między językami skandynawskimi. Osoby posługujące się wybranym językiem skandynawskim stanowiły trójjęzyczną grupą eksperymentalną i zostały porównane do osób dwujęzycznych bez znajomości języka skandynawskiego, aby wyizolować jego efekt. W Artykułach 2 i 3 znajomość języka niemieckiego była kontrolowana w analizach statystycznych, jednak nie wywarła istotnego wpływu na obecność wpływów zwrotnych.

W ramach badania poprzecznego przeprowadziłam trzy zadania eksperymentalne:

1. *Acceptability judgement task (AJT):* W tym zadaniu osoby badane oceniały zdania poprawne i niepoprawne gramatycznie, a także nacechowane i nienacechowane pragmatycznie. Tak skonstruowanie zadanie umożliwiło pozyskanie informacji dotyczących konkretnych badanych struktur. Zdania były prezentowane na ekranie komputera w losowej kolejności, a ich ocena na skali od 1 (zupełnie nieakceptowalne) do 5 (zupełnie akceptowalne) odbywała się poprzez wybór odpowiedniego klawisza na klawiaturze. Zadanie nie było ograniczone czasowo. Zastosowanie pięciostopniowej skali było istotne dla przebiegu badania, ponieważ pozwoliło uchwycić subtelne różnice przejawiające się jako zmniejszona lub zwiększona wrażliwość na błędy gramatyczne, obniżona pewność ocen czy tendencja do akceptowania określonego szyku wyrazów.
2. *Self-paced reading task (SPRT):* W tym zadaniu osobom badanym były prezentowane na ekranie kolejno następujące po sobie fragmenty zdania. Odsłonięcie kolejnego elementu, a zarazem ukrycie poprzedniego, zależało od momentu wybranego przez osobę badaną poprzez wybór klawisza na klawiaturze. Zabieg ten dostarczył informacji o czasie potrzebnym do przetworzenia danego fragmentu. Zadanie opierało się na założeniu, że wydłużony czas reakcji wskazuje na trudności w przetwarzaniu, podczas gdy krótszy czas sugeruje ułatwienie tego procesu (np. Jegerski, 2014). Celem zadania było wykrycie efektów subtelnych lub krótkotrwałych, takich jak koaktywacja systemów językowych podczas przetwarzania.

3. *Oral production task (OPT):* W tym zadaniu osoby badane zostały poproszone o rekonstrukcję zdań w taki sposób, aby zawierały docelowe zjawiska składniowe. Na ekranie komputera zaprezentowano im zdanie bazowe. Następnie wykonywały one test Stroopa, którego celem było skłonienie do przetwarzania znaczeniowego, zwiększenie obciążenia poznawczego oraz ograniczenie świadomej kontroli wypowiedzi. W kolejnym etapie prezentowano jeden z elementów zdania, a osoby badane zostały poproszone o rekonstrukcję całego zdania. Przykładowo, zdanie bazowe miało szyk SVO, a jako bodziec inicjujący produkcję ustną zaprezentowano wyłącznie dopełnienie. Wyprodukowane zdania nagrałam, przetranskrybowałam oraz otagowałam pod względem poprawności na skali binarnej.

Triangulacja metod badawczych, obejmująca trzy typy zadań, pozwoliła uchwycić zwrotne wpływy międzyjęzykowe na różnych poziomach: w ocenie poprawności bez ograniczenia czasowego, w przetwarzaniu w czasie rzeczywistym oraz podczas produkcji ustnej. Wszystkie trzy zadania badały te same struktury językowe, lecz różniły się pod względem wymagań poznawczych. Dzięki temu możliwe było uzyskanie bardziej złożonego obrazu kompetencji językowej, której nie da się zaobserwować bezpośrednio ani przy użyciu pojedynczej metody.

Poziom biegłości językowej w poszczególnych językach określiłam przy użyciu trzech wskaźników: (i) testu poziomującego Dialang (Alderson, 2005), (ii) oceny własnej obejmującej cztery sprawności językowe na skali od 1 do 7, (iii) poprawności w zakresie badanych struktur, ustalonej na podstawie wyników AJT przeprowadzonego w języku skandynawskim.

Procedura badawcza była tożsama dla wszystkich uczestników i obejmowała jedną sesję (dla osób dwujęzycznych) lub dwie sesje (dla osób trój- i czterojęzycznych), przeprowadzone w odstępie co najmniej tygodnia. Pierwsza sesja była ukierunkowana na zbadanie języka angielskiego, a druga – języka skandynawskiego. W każdej sesji prezentowałam zadania w tej samej kolejności: pierwszy blok SPRT, test Dialang, drugi blok SPRT, AJT, OPT. Dodatkowo podczas drugiej sesji przeprowadziłam AJT w języku polskim. Dane zbierałam zarówno stacjonarnie, jak i zdalnie podczas połączenia online, przy zachowaniu identycznych procedur.

Wyniki badań

Wyniki niniejszej pracy przedstawiłam w czterech artykułach, z których trzy stanowią badania eksperymentalne (Artykuły 1–3), a jeden – przegląd literatury osadzający badania w szerszym kontekście (Artykuł 4).

Artykuł 1 (Olszewska, 2025)

Badanie, które przedstawiłam w artykule 1, dotyczyło wpływu języków nienatywnych (L2, L3, L4) na szyk wyrazów w języku pierwszym (L1) u osób uczących się w warunkach formalnych, bez immersji. Skupiło się ono na pozycji czasownika finitywnego (w zdaniach z inicjalnym dopełnieniem lub okolicznikiem czasu) oraz na pozycji okolicznika w zdaniu głównym. Celem badania było ustalenie, czy zwrotne wpływy międzyjęzykowe są silniejsze u osób znających więcej niż jeden język germański, czy nasilają się wraz z wzrostem poziomu zaawansowania w tych językach, oraz czy są zależne od częstotliwości występowania struktur w Ln i ich opcjonalności gramatycznej w L1.

Osoby badane podzieliłam na cztery grupy: dwujęzyczną, trójjęzyczną ze znajomością niemieckiego, trójjęzyczną ze znajomością jednego z języków skandynawskich oraz czterojęzyczną. Zastosowałam *acceptability judgement task* w języku polskim, bez presji czasu. Ze względu na powszechność angielskiego, grupa dwujęzyczna stanowiła punkt odniesienia, a różnice w pozostałych grupach interpretowałam jako efekt nabywania języków germańskich.

Wyniki pokazały, że zwrotne wpływy międzyjęzykowe są selektywne i zależne od struktury. W przypadku pozycji okolicznika szyk typowy dla języków skandynawskich i niemieckiego był oceniany niżej wraz ze wzrostem zaawansowania w angielskim we wszystkich grupach, natomiast wyżej wraz ze wzrostem zaawansowania w języku skandynawskim w grupie czterojęzycznej. W przypadku pozycji czasownika finitywnego nie zaobserwowałam wpływu języka angielskiego, natomiast w grupie czterojęzycznej pojawił się wpływ kumulatywny, ograniczony do zdań z inicjalnym okolicznikiem (AVS), a nieobecny w zdaniach z inicjalnym dopełnieniem (OVS). Co więcej, choć grupa czterojęzyczna oceniała AVS wyżej niż pozostałe grupy, akceptowalność struktury malała wraz z rosnącym poziomem zaawansowania w języku skandynawskim.

Wyniki wskazują, że zwrotne wpływy międzyjęzykowe nie mają charakteru globalnego, lecz są selektywne i zależne od czynników wewnątrzjęzykowych, zgodnie z założeniami *Linguistic Proximity Model*. Jednym z nich jest częstotliwość danej struktury w Ln – wpływy zaobserwowałam w zdaniach z często występującym inicjalnym okolicznikiem (AVS), lecz nie występowały one z rzadko występującym dopełnieniem (OVS). Drugim czynnikiem jest opcjonalność gramatyczna w L1. W przypadku okoliczników wewnątrzzdaniowych, które w języku polskim mogą zajmować różne pozycje w zdaniu, wpływy nasilały się wraz ze wzrostem zaawansowania w Ln. W przypadku czasowników finitywnych, których zajmowanie drugiej pozycji w zdaniu jest w języku polskim możliwe, lecz nacechowane, wpływy malały wraz ze wzrostem zaawansowania w Ln, wskazując tym samym na zwiększoną wrażliwość na szyk

niekanoniczny. Wyniki wykazują również, że wpływy mogą mieć charakter kumulatywny – angielski oddziałuje samodzielnie, podczas gdy języki skandynawskie wywierają wpływy zwrotne jedynie w połączeniu z językiem niemieckim. Tę asymetrię można wyjaśnić różnicami w poziomie zaawansowania i doświadczeniu językowym.

Artykuł 2 (Olszewska & Długosz, 2025)

Badanie, które przedstawiłam w artykule 2, dotyczyło wpływów między językami nienatywnymi. Koncentrowało się ono na szyku partykuły przyczasownikowej i miało na celu sprawdzenie, czy wzorce jej położenia charakterystyczne dla języków skandynawskich (L3) powodują zmiany w sposobie ich oceniania w języku angielskim (L2), czy wpływy te nasilają się wraz ze wzrostem poziomu zaawansowania w L3, oraz czy przejawiają się one zarówno w ocenie akceptowalności gramatycznej, jak i podczas przetwarzania w czasie rzeczywistym.

W badaniu wzięły udział osoby trójjęzyczne. Grupę kontrolną stanowiły osoby ze znajomością języka norweskiego (L3), który – podobnie jak angielski – dopuszcza zmienną pozycję partykuły. Dwie grupy eksperymentalne obejmowały osoby ze znajomością szwedzkiego lub duńskiego, które dopuszczają wyłącznie jedną, lecz odmienną pozycję partykuły: w szwedzkim partykuła występuje przed dopełnieniem bliższym, a w duńskim – po dopełnieniu. W badaniu zastosowałam *acceptability judgement task* oraz *self-paced reading task* w L2 angielskim i wybranym L3 skandynawskim. Efektów wynikających ze znajomości L3 spodziewałam się w grupach szwedzkiej i duńskiej, lecz nie w grupie norweskiej.

Wyniki pokazały, że znajomość L3 wpływa zarówno na ocenę akceptowalności, jak i na przetwarzanie w L2 angielskim. We wszystkich grupach zaobserwowałam ogólną tendencję do akceptowania pozycji partykuły przed dopełnieniem. U osób uczących się języka duńskiego kontrast między pozycjami stopniowo się zacierał: partykuła po dopełnieniu (odzwierciedlająca wzorzec duński) była w coraz większym stopniu akceptowana i łatwiej przetwarzana wraz ze wzrostem zaawansowania w L3. U uczących się języka szwedzkiego wyższa akceptowalność pozycji partykuły przed dopełnieniem (odzwierciedlająca wzorzec szwedzki) pojawiła się już na poziomie średniozaawansowanym, natomiast osoby bardziej zaawansowane wykazywały niższą akceptację wobec pozycji przeciwnej. W grupie norweskiej zaobserwowałam ogólny wzrost ocen dla obu pozycji partykuły wraz z poziomem zaawansowania w L3, co może odzwierciedlać rozwój L2 lub pozytywny wpływ L3. Dodatkowo, większe zróżnicowanie ocen w grupach szwedzkiej i duńskiej wskazywały na wzrost niepewności wynikającej z konkurujących systemów gramatycznych. Co istotne, zwrotne wpływy międzyjęzykowe

zaobserwowałam w obu zadaniach eksperymentalnych, co sugeruje, że zmiany dotyczyły nie tylko przetwarzania, lecz także reprezentacji językowych.

Wyniki te są zgodne z założeniami *Linguistic Proximity Model*, według którego wszystkie języki w umyśle osoby wielojęzycznej pozostają koaktywne. Co się z tym wiąże, składnia L3 może być aktywowana podczas przetwarzania L2. Bardziej rozwinięte systemy L1 i L2 są jednocześnie zwykle bardziej stabilne, co wspomaga hamowanie wpływu L3. Dlatego też wyniki wskazują na istotną rolę opcjonalności jako czynnika warunkującego zaistnienie zwrotnych wpływów międzyjęzykowych: gdy podobieństwo strukturalne współwystępuje z opcjonalnością, struktury charakterystyczne dla L3 mogą być interpretowane jako dopuszczalne podczas przetwarzania L2.

Co znaczące dla prezentowanego badania, efekty te pojawiają się na różnych etapach w zależności od złożoności struktury w L3: u uczących się duńskiego są one widoczne dopiero na poziomie zaawansowanym, natomiast u uczących się szwedzkiego obserwuje się je już na poziomie średniozaawansowanym. Sugeruje to, że wpływ poziomu zaawansowania nie ma charakteru jednolitego, lecz zależy od złożoności i łatwości przyswajania danej struktury.

Badanie dostarcza tym samym pierwszych dowodów na obecność zwrotnych wpływów międzyjęzykowych pomiędzy L3 a L2 w zakresie składni oraz pokazuje, że mogą one oddziaływać zarówno na przetwarzanie, jak i na reprezentacje językowe.

Artykuł 3 (Olszewska & Długosz, 2026)

Badanie, które przedstawiłam w artykule 3, rozszerzyło analizę zwrotnych wpływów międzyjęzykowych z L3 na L2 o struktury składniowe związane z pozycją czasownika finitywnego na drugim miejscu w zdaniu (V2). Zbadałam V2 z (i) inicjalnym okolicznikiem, (ii) inicjalnym dopełnieniem oraz (iii) okolicznikiem wewnątrzzdaniowym w zdaniu głównym. Celem było ustalenie, czy wpływy te są warunkowane przez częstotliwość struktur w L3 i niejednoznaczność powiązaną z pozycją okolicznika w inpucie L2, czy nasilają się wraz ze wzrostem zaawansowania w L3, oraz czy przejawiają się w taki sam sposób w trzech zadaniach eksperymentalnych.

W badaniu porównałam grupę trójjęzyczną (ze znajomością duńskiego, norweskiego lub szwedzkiego jako L3) oraz grupę dwujęzyczną. Języki skandynawskie poddałam analizie łącznie ze względu na ich zbliżone uporządkowanie składniowe. Zastosowałam *acceptability judgement task*, *self-paced reading task* oraz *oral production task* w L2 oraz w wybranym L3. Założyłam, że wpływy międzyjęzykowe przejawią się w postaci wyższych ocen

akceptowalności, ułatwionego przetwarzania oraz częstszej produkcji szyku wyrazów przypominających wzór skandynawski w języku angielskim.

Wyniki pokazały, że znajomość L3 może wpływać na L2, jednak zakres tych wpływów różni się w zależności od zadania. W *acceptability judgement task* wpływy zwrotne miały charakter selektywny: zaobserwowałam je dla V2 z inicjalnym okolicznikiem oraz marginalnie dla V2 z okolicznikiem wewnątrzzdaniowym, natomiast nie wystąpiły one dla V2 z inicjalnym dopełnieniem. Wzorzec ten odzwierciedla różnice w częstotliwości oraz stopniu niejednoznaczności związanym z daną strukturą w inpucie językowym. Co istotne, uwzględnienie poziomu zaawansowania w L3 wykazało, że wyższe oceny skandynawskiego szyku dotyczą przede wszystkim osób badanych na poziomie średniozaawansowanym w L3. Osoby na poziomie zaawansowanym w L3 oraz osoby dwujęzyczne bez znajomości języka skandynawskiego nie różniły się między sobą, co wskazuje na przejściowy charakter destabilizacji systemu. W *self-paced reading task* wpływy zwrotne nie były zależne ani od struktury składniowej, ani od poziomu zaawansowania w L3. Zarówno grupa trójjęzyczna, jak i dwujęzyczna wykazały wrażliwość na nieprawidłowe konstrukcje V2 w języku angielskim. Wrażliwość ta była jednak istotnie silniejsza wśród osób dwujęzycznych, co wskazuje na jej osłabienie u osób ze znajomością języka skandynawskiego. W *oral production task* poziom ogólnej poprawności był bardzo wysoki, jednak osoby trójjęzyczne produkowały istotnie więcej błędnych wypowiedzi zawierających szyk V2. Błędy te nie były zależne od struktury. Biorąc pod uwagę zwiększone obciążenie poznawcze związane z zadaniem oraz bardzo wysoką ogólną poprawność, wynik ten można interpretować jako efekt krótkotrwałej koaktywacji składni L3 podczas przetwarzania L2. Znaczne zróżnicowanie między uczestnikami wskazało ponadto na ważną rolę różnic indywidualnych w hamowaniu języka niedocelowego podczas produkcji.

Rozbieżności między wynikami uzyskanymi w poszczególnych zadaniach sugerują, że wpływy zwrotne w V2 mają charakter krótkotrwały i ujawniają się przede wszystkim na poziomie przetwarzania i produkcji, a także – w ograniczonym zakresie – w ocenach dokonywanych przez osoby badane na poziomie średniozaawansowanym. Wyniki te są zgodne z założeniami *Linguistic Proximity Model* i podkreślają znaczenie czynników takich jak częstotliwość występowania oraz niejednoznaczność powiązana ze strukturą w inpucie językowym.

W artykule 2 wykazałam, że opcjonalność gramatyczna stanowi kluczowy warunek dla zaistnienia zmian na poziomie reprezentacji językowej. Wnioski płynące z Artykułu 3 potwierdzają to założenie: w przypadku struktur nieopcjonalnych takich, jak V2, wpływy

ograniczają się do krótkotrwałej koaktywacji składni L3 podczas przetwarzania L2 i nie prowadzą do dalszych zmian. Tym samym Artykuł 3 potwierdza podatność składni L2 na wpływy wynikające ze znajomości L3, jednocześnie pokazując, że mają one charakter selektywny.

Artykuł 4 (Olszewska, 2026)

W artykule 4 przedstawiłam przegląd badań nad zwrotnymi wpływami międzyjęzykowymi w obrębie gramatyki w celu osadzenia Artykułów 1–3 w szerszym kontekście badawczym. Analiza skupiła się na badaniach dotyczących dorosłych uczących się w warunkach nauczania formalnego i objęła 30 badań empirycznych. Ze względu na zróżnicowany charakter dostępnych danych przeprowadziłam przegląd narracyjny, który umożliwił syntetyczne ujęcie wyników, stosowanej terminologii, badanych zjawisk oraz rozwiązań metodologicznych.

Przegląd pokazał, że większość badań wskazuje na występowanie wpływów o charakterze pozytywnym, dzięki którym poprawność gramatyczna w L2 jest większa na skutek ekspozycji na L3. Odnotowałam jednak również występowanie wpływów o charakterze negatywnym lub neutralnym. Literatura wskazuje ponadto na asymetrię – wpływy zwrotne są częściej badane w odniesieniu do L2 jako języka docelowego niż w odniesieniu do L1.

Jednym z kluczowych czynników warunkujących zaistnienie wpływów okazał się poziom zaawansowania w języku źródłowym. Pomimo jego znaczenia, pozostaje on niedostatecznie zbadany jako zmienna: wiele prac nie dostarcza wystarczającej ilości informacji na ten temat lub skupia się wyłącznie na uczących się na poziomie zaawansowanym. Dostępne badania przekrojowe sugerują jednak, że wpływy L3 na L2 mogą być obecne również na wcześniejszych etapach rozwoju L3.

W zakresie badanych zjawisk dominują struktury na pograniczu składni i semantyki oraz składni i pragmatyki, choć istnieją także dowody na wpływy w obrębie morfoskładni. Zjawiska składniowe były przedmiotem pojedynczych badań, często prowadzących do wyników niejednoznacznych lub zerowych.

Z perspektywy metodologicznej przegląd ukazał wyraźną dominację badań nad językami typologicznie zbliżonymi, przy niewielkiej liczbie analiz obejmujących bardziej odległe kombinacje językowe. Ponadto dominują badania wykorzystujące *acceptability judgement task* oraz produkcję pisemną, podczas gdy miary przetwarzania w czasie rzeczywistym oraz produkcji ustnej należą do rzadkości. Innym ograniczeniem wielu badań jest niska moc statystyczna. Badania te często opierają się na niewielkich próbach badawczych i nie uwzględniają zmienności między uczestnikami i bodźcami w wystarczającym stopniu.

Artykuł 4 pokazuje, że zwrotne wpływy międzyjęzykowe są naturalną częścią rozwoju osób wielojęzycznych, jednak dostępne dowody mają charakter fragmentaryczny. Przedstawiony w nim przegląd podkreśla tym samym konieczność replikacji oraz wskazuje kierunki dalszego rozwoju badań.

Dyskusja i interpretacja wyników

Wyniki badań przedstawionych w Artykułach 1–3 sugerują, że zwrotne wpływy międzyjęzykowe są wynikiem stałej koaktywacji wszystkich języków w umyśle osoby wielojęzycznej. Zgodnie z *Linguistic Proximity Model*, koaktywacja nie ma charakteru przypadkowego ani globalnego, lecz jest selektywna, stopniowa i zależna od podobieństwa strukturalnego między językami. Wyniki pokazują, że mechanizm ten działa nie tylko w kierunku progresywnym, lecz również zwrotnym, co oznacza, że języki nabywane później mogą wpływać na języki nabywane wcześniej – zarówno na L1, jak i na L2. Co istotne, obserwowane efekty nie ograniczają się do określonego etapu rozwoju językowego. Nawet po osiągnięciu wysokiego poziomu kompetencji w L1 i L2 języki te pozostają podatne na wpływy wynikające ze znajomości L3, L4 lub Ln. Podczas przetwarzania któregokolwiek z języków aktywowane są również reprezentacje pozostałych systemów, co stwarza warunki dla zaistnienia wpływów zarówno pozytywnych, jak i negatywnych. Oznacza to również, że immersja nie stanowi warunku koniecznego dla wystąpienia tych efektów. Ponieważ siła koaktywacji jest zależna od intensywności ekspozycji na input językowy, wpływy zwrotne można zaobserwować także w warunkach nauczania formalnego.

Wyniki te są zgodne z założeniem, że osoby uczące się są wrażliwe na subtelne różnice obecne w inpucie językowym (np. Westergaard, 2021), które warunkują siłę koaktywacji, a w konsekwencji – obecność wpływów. Oprócz podobieństwa strukturalnego, wpływy międzyjęzykowe są zależne od kilku czynników. Należą do nich: (i) częstotliwość – V2 z często występującym w tej pozycji inicjalnym okolicznikiem czasu prowadzi do silnych wpływów zarówno w L1, jak i w L2, podczas gdy V2 z rzadkim w tej pozycji dopełnieniem nie wywołuje podobnych efektów; (ii) niejednoznaczność – V2 z elementem inicjalnym prowadzi do stale obserwowalnych efektów, podczas gdy efekty związane z okolicznikami wewnątrzzdaniowymi, które mogą zajmować różne pozycje w zdaniu w zależności od typu czasownika, są trudniejsze do zaobserwowania; (iii) łatwość przyswajania – efekty są obserwowalne wcześniej dla stosunkowo łatwo przyswajalnego położenia partykuły w języku szwedzkim (na poziomie średniozaawansowanym), natomiast później dla trudniejszego do przyswojenia położenia w języku duńskim (na poziomie zaawansowanym).

Najważniejszym czynnikiem okazuje się jednak opcjonalność gramatyczna w języku docelowym. Struktury opcjonalne (np. pozycja partykuły w języku angielskim) wykazują wpływy zwrotne, które nasilają się wraz z rosnącym poziomem zaawansowania w L3. Natomiast struktury nieopcjonalne lub nacechowane (np. V2 w języku angielskim i polskim) wykazują jedynie ograniczone lub krótkotrwałe efekty, które wraz z rozwojem poziomu zaawansowania w L3 słabną i objawiają się niższym stopniem akceptacji. Wyniki te wskazują, że zwrotne wpływy międzyjęzykowe są najsilniejsze wtedy, gdy język źródłowy wzmacnia istniejącą już opcję w gramatyce języka docelowego. W przeciwnym razie może on zwiększać świadomość wobec form niestandardowych i prowadzić do ich odrzucenia.

Istotnym zagadnieniem jest również rola poziomu zaawansowania w języku źródłowym. Chociaż wcześniejsze badania sugerowały, że zwrotne wpływy międzyjęzykowe nasilają się wraz ze wzrostem zaawansowania, wyniki niniejszej pracy wskazują na bardziej złożoną rolę tej zmiennej. W przypadku struktur opcjonalnych wyższy poziom zaawansowania sprzyjał silniejszym wpływom, podczas gdy w strukturach nieopcjonalnych zaobserwowałam osłabienie tych efektów. Znaczenie miała również łatwość przyswajania danej struktury – łatwiejsze struktury prowadziły do pojawienia się wpływów zwrotnych już na poziomie średniozaawansowanym, a struktury trudniejsze stawały się przedmiotem wpływów dopiero po osiągnięciu poziomu zaawansowanego w L3. Dodatkowo, wyniki Artykułu 1 wskazują, że wpływ może mieć charakter kumulatywny. W takim ujęciu angielski, opanowany na bardzo wysokim poziomie, funkcjonuje jako samodzielne źródło wpływu, a w przypadku mniej rozwiniętych języków niemieckiego i skandynawskiego konieczne jest ich współdziałanie.

Wyniki badań pokazują również, że zwrotne efekty międzyjęzykowe ujawniają się odmiennie w zależności od typu zadania badawczego. Dane z *acceptability judgement task*, które odzwierciedlają rozumienie bez ograniczenia czasowego, konsekwentnie wskazywały na obecność wpływów w obrębie struktur składniowych. Różnice w ocenach były jednak numerycznie niewielkie, co sugeruje stopniowe i subtelne zmiany w zakresie akceptowalności badanych struktur. Dane z *self-paced reading task* pokazały natomiast, że zadanie to jest szczególnie wrażliwe i zdolne do uchwycenia krótkotrwałej koaktywacji języków podczas przetwarzania w czasie rzeczywistym. Z kolei w *oral production task* zaobserwowałam, że przy dużym obciążeniu poznawczym osoby uczące się są bardziej skłonne do popełniania błędów wynikających ze znajomości L3, nawet jeśli ich ogólna poprawność pozostaje bardzo wysoka. Oznacza to, że trzy zadania eksperymentalne ujawniają różne aspekty zwrotnych wpływów międzyjęzykowych, a zbieżność ich wyników wskazuje na potencjalne zmiany na poziomie reprezentacji językowych.

Podsumowując, niniejsza praca pokazuje, że nabywanie kolejnych języków może wpływać na wcześniej nabyte L1 i L2 nawet w warunkach nauczania formalnego, oraz że zjawiska składniowe również są podatne na tego typu oddziaływanie. Wyniki wskazują ponadto, że zwrotne wpływy międzyjęzykowe są konsekwencją stałej koaktywacji języków, warunkowanej podobieństwem strukturalnym. Warunkiem kluczowym dla zaistnienia silnych wpływów okazuje się opcjonalność gramatyczna w języku docelowym – gdy jest ona obecna, wpływy wzmacniają jedną z istniejących opcji. W przeciwnym razie, mają one charakter krótkotrwały i ograniczają się głównie do poziomu przetwarzania i produkcji ustnej. Na siłę i zakres wpływów zwrotnych oddziałują również takie czynniki, jak częstotliwość i niejednoznaczność obecna w inpucie językowym, łatwość przyswajania danej struktury oraz poziom zaawansowania w L3. Ich obserwowalność zależy ponadto od zastosowanego zadania eksperymentalnego.

Całościowo niniejsza praca pokazuje, że wpływy międzyjęzykowe mają charakter wielokierunkowy, obejmują zjawiska składniowe oraz występują także poza środowiskami immersyjnymi. Tym samym przyczynia się ona do pełniejszego rozumienia systemów językowych osób wielojęzycznych.

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Appendix A: Article 1 (Olszewska, 2025), Author Contribution Statement (Polish)

Poznań, 08.05.2026

Oświadczenie o wkładzie autorów i autorek

Olszewska, A. (2025). Combined regressive cross-linguistic influence: how learning Ln Germanic impacts L1 Polish word order. *International Journal of Multilingualism*. Publikacja Online First. https://doi.org/10.1080/14790718.2025.2570201

Autorka deklaruje następujący wkład w powstanie artykułu:

Anna Olszewska (100%): konceptualizacja, metodologia, przeprowadzenie badania, przechowywanie danych, analiza formalna, wizualizacja danych, interpretacja wyników, pisanie manuskryptu – przygotowanie oryginalnego tekstu, pisanie manuskryptu – recenzowanie i redagowanie.

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Appendix B: Article 1 (Olszewska, 2025), Author Contribution Statement (English)

Poznań, 08.05.2026

Author contribution statement

Olszewska, A. (2025). Combined regressive cross-linguistic influence: how learning Ln Germanic impacts L1 Polish word order. *International Journal of Multilingualism*. Advance online publication. https://doi.org/10.1080/14790718.2025.2570201

The author declares the following contribution to the research article:

Anna Olszewska (100%): conceptualisation, methodology, investigation, data curation, formal analysis, data visualisation, interpretation of results, writing – original draft, writing – review & editing.

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Appendix C: Article 2 (Olszewska & Długosz, 2025), Author Contribution Statement (Polish)

Poznań, 08.05.2026

Oświadczenie o wkładzie autorów i autorek

Olszewska, A., & Długosz, K. (2025). The acquisition of L3 Scandinavian impacts word order in advanced L2 English: Regressive cross-linguistic influence in verb-particle constructions. *Linguistic Approaches to Bilingualism*. Publikacja Online First. https://doi.org/10.1075/lab.24095.ols

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Appendix D: Article 2 (Olszewska & Długosz, 2025), Author Contribution Statement (English)

Poznań, 08.05.2026

Author Contribution Statement

Olszewska, A., & Długosz, K. (2025). The acquisition of L3 Scandinavian impacts word order in advanced L2 English: Regressive cross-linguistic influence in verb-particle constructions. *Linguistic Approaches to Bilingualism*. Advance online publication. https://doi.org/10.1075/lab.24095.ols

The co-authors declare the following contribution to the research article:

Anna Olszewska (70%): conceptualisation, methodology, investigation, data curation, interpretation of results, writing – original draft, writing – review & editing.

Kamil Długosz (30%): supervision, formal analysis, data visualisation, interpretation of results, writing – original draft, writing – review & editing.

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Appendix E: Article 3 (Olszewska & Długosz, 2026), Author Contribution Statement (Polish)

Poznań, 08.05.2026

Oświadczenie o wkładzie autorów i autorek

Olszewska, A., & Długosz, K. (2026). Regressive cross-linguistic influence as co-activation: Can L3 Scandinavian trigger V2 in L2 English? *Second Language Research.* W druku.

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Kamil Długosz (30%): nadzór, analiza formalna, wizualizacja danych, interpretacja wyników, pisanie manuskryptu – przygotowanie oryginalnego tekstu, pisanie manuskryptu – recenzowanie i redagowanie.

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Appendix F: Article 3 (Olszewska & Długosz, 2026), Author Contribution Statement (English)

Poznań, 08.05.2026

Author Contribution Statement

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The co-authors declare the following contribution to the research article:

Anna Olszewska (70%): conceptualisation, methodology, investigation, data curation, interpretation of results, writing – original draft, writing – review & editing.

Kamil Długosz (30%): supervision, formal analysis, data visualisation, interpretation of results, writing – original draft, writing – review & editing.

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Appendix G: Article 4 (Olszewska, 2026), Author Contribution Statement (Polish)

Poznań, 08.05.2026

Oświadczenie o wkładzie autorów i autorek

Olszewska, A. (2026). Instructed language learning and its impact on previously acquired languages: A state-of-the-art review of regressive cross-linguistic influence across grammatical domains. *Lingua*, *336*, 104156.

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Appendix H: Article 4 (Olszewska, 2026), Author Contribution Statement (English)

Poznań, 08.05.2026

Author contribution statement

Olszewska, A. (2026). Instructed language learning and its impact on previously acquired languages: A state-of-the-art review of regressive cross-linguistic influence across grammatical domains. *Lingua*, *336*, 104156.

The author declares the following contribution to the research article:

Anna Olszewska (100%): conceptualisation, methodology, funding acquisition, investigation, data curation, formal analysis, writing – original draft, writing – review & editing.

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Appendix I: Ethics Committee Approval (Polish)

UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU
Komisja Etyczna ds. badań naukowych prowadzonych z udziałem ludzi

Uchwała nr 10/2023/2024
Komisji Etycznej Uniwersytetu im. Adama Mickiewicza w Poznaniu
ds. badań naukowych prowadzonych z udziałem ludzi
z dnia 2 lutego 2024 roku

w sprawie projektu badawczego:
Transfer zwrotny na poziomie składni: oddziaływanie języka duńskiego, szwedzkiego lub norweskiego jako trzeciego (L3) na angielski (L2) u użytkowników polskiego (L1)

Na podstawie § 4 ust. 5 Regulaminu Komisji Etycznej Uniwersytetu im. Adama Mickiewicza w Poznaniu ds. badań naukowych prowadzonych z udziałem ludzi (zarządzenie Rektora Uniwersytetu im. Adama Mickiewicza w Poznaniu nr 74/2020/2021) Komisja Etyczna Uniwersytetu im. Adama Mickiewicza w Poznaniu ds. badań naukowych prowadzonych z udziałem ludzi, zwana dalej Komisją, uchwala, co następuje:

1. Na podstawie złożonego przez Panią **mgr Annę Olszewską** wniosku, Komisja **opiniuje pozytywnie** projekt badawczy: Transfer zwrotny na poziomie składni: oddziaływanie języka duńskiego, szwedzkiego lub norweskiego jako trzeciego (L3) na angielski (L2) u użytkowników polskiego (L1).
2. Uchwała została podjęta jednogłośnie i wchodzi w życie z dniem podjęcia.

Przewodnicząca
Komisji Etycznej ds. badań naukowych prowadzonych z udziałem ludzi

prof. dr hab. Katarzyna Dziubalska-Kołaczyk

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Appendix J: Ethics Committee Approval (English)

ADAM MICKIEWICZ UNIVERSITY, POZNAŃ
Ethics Committee for Research Involving Human Participants

Resolution No. 10/2023/2024
of the Ethics Committee for Research Involving Human Participants
at the Adam Mickiewicz University in Poznań
adopted on 2 February 2024

regarding the research project:
Transfer zwrotny na poziomie składni: oddziaływanie języka duńskiego, szwedzkiego lub norweskiego jako trzeciego (L3) na angielski (L2) u użytkowników polskiego (L1)

With reference to § 4 (5) of the Regulations of the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University in Poznań (Ordinance No. 74/2020/2021 of the Rector of Adam Mickiewicz University Poznań), the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University in Poznań, hereinafter referred to as the Ethics Committee, approves the following:

1. On the basis of the application submitted by **mgr Anna Olszewska**, the Ethics Committee **grants an approval** of the research project: Transfer zwrotny na poziomie składni: oddziaływanie języka duńskiego, szwedzkiego lub norweskiego jako trzeciego (L3) na angielski (L2) u użytkowników polskiego (L1).
2. The resolution was adopted unanimously and comes into force from on the day of its adoption.

In addition, the Ethics Committee notes that the informed consent forms in Polish have been approved by the Ethics Committee and that any translation of these forms into languages other than Polish must not contain changes to their content.

Chair of the Ethics Committee

Prof. Katarzyna Dziubalska-Kołaczyk

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Appendix K: Article 1 (Olszewska, 2025)

Olszewska, A. (2025). Combined regressive cross-linguistic influence: How learning Ln Germanic impacts L1 Polish word order. *International Journal of Multilingualism*. Advance online publication. https://doi.org/10.1080/14790718.2025.2570201

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Combined regressive cross-linguistic influence: How learning Ln Germanic impacts L1 Polish word order

Abstract: This study investigates how learning L2, L3, or L4 Germanic in a non-immersed, instructed context influences L1 Polish word order. It focuses on three word-order patterns: adverb placement, verb placement with adverbial fronting, and verb placement with object fronting. While these constituents have fixed positions in Germanic languages, their ordering in Polish is determined by pragmatic and semantic factors. The structures additionally differ in frequency in Ln and degree of optionality in L1, providing a productive setting for exploring factors driving cross-linguistic influence. The study reports data from an offline acceptability judgement task, collected from 228 participants divided into four groups: Polish–English bilinguals (n = 27), Polish–English–German trilinguals (n = 40), Polish–English–Scandinavian trilinguals (n = 74), and Polish–English–German–Scandinavian quadrilinguals (n = 87). Analysis using linear mixed-effects models reveals regressive cross-linguistic influence, which is most apparent in the quadrilingual group, highlighting the combined impact of two non-native languages working in parallel. The influence is driven by increasing proficiency in Ln and manifests differently across structures, underscoring the importance of frequency in Ln input and the degree of optionality that the language undergoing change allows. This provides novel evidence of the regressive influence of non-native languages on L1 syntax in non-immersed contexts.

Keywords: regressive cross-linguistic influence; combined cross-linguistic influence; word order; Germanic; Polish

1. Introduction

It is widely recognised that the languages of a multilingual are in a state of continuous co-activation, often leading to interaction (e.g., Kroll & Bialystok, 2013). This, combined with varying levels of a learner's ability to suppress the language not in use, gives rise to cross-linguistic influence (CLI; Jarvis & Pavlenko, 2008). Importantly, it has also been established that this influence is not unidirectional, and not only non-native languages but also one's native language can be impacted (e.g., Długosz, 2023). This effect of Ln on L1 has been approached from different angles. Some scholars tend to view both processing-related and representational changes as a developmental continuum and collapse them under one umbrella term of attrition (e.g., Cabrelli, 2023; Schmid & Köpke, 2017). This approach reflects both the

difficulty of establishing an exact cut-off point between these two endpoints and a reluctance to consider them as independent, as doing so could limit the generalisability of findings on similar phenomena or learner populations. In contrast, other scholars call for a distinction, as they consider attrition to be tied to language disuse and possible erosion, which are far from the occurrences of CLI regularly attested among multilinguals (e.g., Meisel, 2017; Tsimpli, 2017). Notwithstanding the conceptual discussion, it is evident that following exposure to an additional language, the first language might become affected. Thus far, this has been mainly attested in phonetics and phonology (e.g., Chang, 2013), as well as the lexicon (e.g., Długosz, 2023). The extent to which L1's morphosyntax can be impacted, however, remains debated, as changes at this level are plausible, yet notably rare (Cabrelli, 2023, p. 321).

The current study investigates how Germanic languages acquired as L2, L3, or L4 regressively influence L1 Polish during an offline acceptability judgement task. The study considers instructed learners residing in a native context, who receive Ln input during language instruction. The focus lies on word order, which is relatively flexible in Polish, but considerably more rigid in Germanic languages. The influence of L2 English is juxtaposed with that of L3 German and L4 Norwegian, Swedish, or Danish, as they exhibit different word order patterns. Additionally, the three considered structures vary in terms of frequency in Ln input and the degree of optionality allowed by L1, creating a productive setting for exploring factors that have been proposed to drive progressive cross-linguistic influence (Slabakova, 2017; Westergaard et al., 2017).

2. Theoretical underpinnings

Currently, there are three proposals that model regressive cross-linguistic influence (rCLI) in multilingual contexts. All employ a mirror-image group design, in which the L3 is kept constant, while L1s and L2s are inverted to probe the differential vulnerability of native and non-native languages. In this respect, the Differential Stability Hypothesis (Cabrelli Amaro, 2017) posits that age of acquisition is the driving factor, as the supporting evidence shows that both L1 and L2 undergo change following the acquisition of the same L3, but the effect on the L2 is more pronounced. Expanding on this hypothesis, Puig-Mayenco (2023) reports that an early-acquired L2 may also be affected, while L1 in this study remains unchanged. Following a closer examination of the structures, he advances the Sandwich effect, suggesting that rCLI on L2 may occur more easily when L1 and L3 follow the same pattern. Recently, the Similarity Convergence Hypothesis (Brown-Bousfield & Chang, 2023) has centred on typological similarity, showing L3 influence on a typologically close L1, while leaving a more distant L2

unaffected. These three accounts, although highly relevant for the underexplored subfield of rCLI, are of limited explanatory power with regard to this study centred around Ln influence on L1, as opposed to the differential impact of Ln on L2/L1.

Additionally, a small body of research on rCLI from L3 to L2 (e.g., Tsang, 2016) builds upon the notion of multicompetence, defined as "the compound state of a mind with two grammars" (Cook, 1991, p. 112). This holistic approach presupposes that all languages acquired by an individual form a unitary system, in which all manifestations of CLI in both directions are a natural consequence of the interdependence of the grammars. It follows that acquiring a new language inevitably alters the already existing system. However, this widely established view has been contested, as these effects could equally be attributed to the existence of "separate, but interrelated systems" (Genesee & White, 2024, p. 85), which the authors extend to the context of third language acquisition (TLA). Since the currently advanced models emphasise the importance of CLI from L1/L2 to L3 as precise, theoretically predictable, and governed by typological and structural similarity, their premises will serve as a point of departure for elucidating CLI in the regressive direction.

Considering this alternative perspective, two TLA models are particularly relevant to this study, as they both propose that CLI occurs at the level of individual linguistic properties rather than language as a whole. The Linguistic Proximity Model (LPM; Westergaard et al., 2017) assumes that all languages of a multilingual remain available throughout the process of L3 acquisition, and CLI arises as a consequence of the co-activation of the grammars. Under this view, abstract structural similarity can be revealed between L3 and L1, L2, or both of these languages, allowing for combined CLI. Consequently, LPM also predicts that each property can exhibit a different developmental pattern. While abstract structural similarity is the key factor, other aspects can impact the strength of grammar co-activation. This is particularly highlighted by the Scalpel Model (SM; Slabakova, 2017), which argues that CLI is affected by variable frequency of the structure, input ambiguity, and processing complexity.

Regarding factors affecting specifically regressive CLI, Pavlenko (2000, p. 196) suggests that it is most expected when learners actively engage with an L2 community, experiencing high L2 exposure alongside limited L1 exposure. While this is less likely in native contexts, it could arise given high levels of L2 proficiency. Cabrelli (2023) adds to this list by considering a more nuanced picture of language experience and usage, as some data link L1 usage with enhanced L1 stability, while other data associate it with enhanced L1 vulnerability as a result of frequent co-activation.

An often-discussed aspect is the apparent resilience of L1 morphosyntax, as L2 influence is most evident in phonology and lexicon. This observation has been linked to the Interface Hypothesis (e.g., Sorace, 2011), which posits that linguistic properties that interface with domains that are external to language (such as discourse or pragmatics) are more vulnerable to influence than those confined to domains that are language-internal (such as syntax–semantics). Properties that are purely syntactic, integrate less information, and impose lower processing demands, should be both easier to acquire and more resistant to emerging optionality. Although this study focuses on syntax, it must be noted that word order in L1 Polish is primarily governed by pragmatic and semantic factors. While changes in constituent ordering can affect the perceived naturalness, they do not directly presuppose a grammar violation. Therefore, as Polish syntax requires the integration of interfaces, and this takes place globally rather than at the structural level, expecting rCLI induced by more restrictive Ln is not unreasonable, even amid otherwise scarce findings in this domain.

3. Empirical studies on cross-linguistic influence from Ln to L1

As the three studies on rCLI outlined in the previous section (Brown-Bousfield & Chang, 2023; Cabrelli Amaro, 2017; Puig-Mayenco, 2023) focused on the inversion of L1s and L2s, participants were either immersed in a non-native environment or shared the country of residence, with the immersion context not tightly controlled. It follows that the influence of Ln on L1 in a native context has not received much attention, particularly with regard to syntax. In the few studies on the topic, learners have been found to use more complex syntactic structures in essays produced in L1 (Kecskes, 1998), or to be more attentive to non-standard forms and exhibit enhanced metalinguistic awareness when judging sentences in L1 (Cook et al., 2003; Ewert, 2008), suggesting a more global effect of L2 acquisition. In a more direct exploration of rCLI, Długosz (2021) employed a judgement task among Polish learners of English and German and considered two phenomena. In the study, Polish, a pro-drop language, was influenced by the more restrictive non-native languages, in which pronouns in a non-topic position are necessarily overt. Conversely, the fixed verb position in wh-questions present in non-native languages did not affect the relatively free word order in Polish. Importantly, these results highlighted the possibility of combined CLI, as enhanced acceptability of overt pronouns could have equally come from both English and German.

Regarding online measures, evidence suggests that non-immersed learners process structures in L1 more easily at a point of L1–L2 overlap, particularly when L1 allows two options and L2 only permits one. Oliveira et al. (2017) found such an effect among Brazilian

Portuguese–English learners, using a battery of tasks targeting resultative and depictive constructions. While the former construction is only licensed in English, the latter is present in both languages. Similarly, Requena and Berry (2021) observed this pattern in an investigation of clitics, which can be placed both before and after the verb in L1 Spanish, but which are only postverbal in L2 English.

Moreover, learners may adopt L2-like relative clause attachment strategies while reading in L1 (Dussias & Sagarra, 2007) or experience an overall facilitative effect on processing speed (Cedden & Aydın, 2019). Though scarce, these findings indicate that the L1 of instructed learners is susceptible to influence from later-acquired Ln, even without immersion. The study will contribute to this line of enquiry by exploring specific factors driving CLI such as structure frequency, L1 optionality, and Ln proficiency.

4. Word order in the examined languages

The investigation focuses on three word-order patterns related to the V2 constraint, i.e., adverb placement, verb placement with adverbial fronting, and verb placement with object fronting.

Norwegian, Swedish, Danish, and German are all considered V2 languages as they share the word order in which the finite verb obligatorily occupies the second position in main clauses. The V2 rule is particularly manifested in non-subject-initial clauses, which require verb–subject inversion (see 1, in Norwegian). It also affects the placement of adverbs, which are located post-verbally (see 2, in Danish).

(1) *Hver morgen **spiser hun** frokost.*
every morning eats she breakfast
'Every morning **she eats** breakfast.'

(2) *Han **fortæller ofte** mærkelige historier.*
he tells often weird stories
'He **often tells** weird stories.'

While the subject is the most common clause-initial constituent, other elements can be placed in this position. Specifically, adverbials are easily fronted, while fronting of objects is marked and expresses topic or contrast (e.g., Holmberg, 2015). Informal corpus data reflect these proportions but highlight certain differences in constituent frequencies between the Germanic languages. In Swedish, subjects appear clause-initially in 73% of instances, adverbials in 23%,

and objects in only 3%, while in German, initial subjects account for 50% of cases, adverbials for 42%, and objects for 7% (Bohnacker & Rosén, 2007, p. 36). Although there are no comparable corpus data for Danish and Norwegian, this lack of preference for objects in the fronted position, as well as the ease of fronting different adverbials is generally shared between the Mainland Scandinavian languages (e.g., Faarlund, 2019).

Shifting focus to English, it is often termed a residual V2 language as it displays the given word order in certain constructions as a remnant of an earlier V2 system (Holmberg, 2015). In modern English, subject–verb inversion does not occur in non-subject-initial clauses (see the English translation in 1), and adverbs accompanying transitive lexical verbs are placed in the preverbal position, making the patterns distinct from other Germanic languages (see the English translation in 2).

Lastly, in Polish, the position of sentential constituents is not predetermined by strict syntactic constraints. It is, however, dependent on pragmatic and semantic factors, and different word order patterns vary in frequency and perceived naturalness. Siewierska and Uhlířová (1998) report that SVO is the most commonly used transitive word order, accounting for 69.1% of corpus occurrences. OVS is a much less frequently applied alternative (9.0%), while OSV is notably rare (1.6%). Importantly, adverbs can be placed both before and after the verb they modify, though postverbal placement is slightly more marked than preverbal placement (Żychliński et al., 2025). To date, there are no corpus data specifically addressing verb placement relative to adverbs and fronted adverbials in Polish, which are also examined herein. Therefore, acceptability judgements provided by a bilingual group with knowledge of L1 Polish and L2 English are instead used as the baseline (n = 27; see Table 1). Consequently, significant divergences from these patterns, observable in groups with knowledge of additional languages (see the Participants section), are seen as a result of regressive cross-linguistic influence. Polish examples illustrating all examined word orders are provided in the Materials section.

A summary of all conditions examined in the study is included in Table 2.

Table 1. Judgements on a 1–5 scale provided by the L1 Polish L2 English control group.

Examined structure	Word order	*M*	*SD*
Adverb placement in main clauses	Adv–V	4.90	0.41
	V–Adv	3.85	1.06
Verb placement with adverbial fronting	SVA	4.73	0.69
	ASV	4.57	0.82
	AVS	3.01	1.09
Verb placement with object fronting	SVO	4.89	0.46
	OSV	2.78	1.11
	OVS	2.81	1.06

Note: S, subject; V, transitive verb; O, object; A, adverbial; Adv, adverb.

Table 2. Summary of word order across the examined languages.

Examined structure	Word order	Polish	English	Norwegian, Swedish, Danish, German
Adverb placement in main clauses	Adv–V	YES	YES	NO
	V–Adv	YES	NO	YES
Verb placement with adverbial fronting	SVA	YES	YES	YES
	ASV	YES	YES	NO
	AVS	YES	NO	YES
Verb placement with object fronting	SVO	YES	YES	YES
	OSV	YES	YES (infrequent)	NO
	OVS	YES	NO	YES (infrequent)

Note: S, subject; V, transitive verb; O, object; A, adverbial; Adv, adverb.

5. Research questions

To advance the understanding of rCLI on L1, the study addresses the following questions:

RQ1. Does word order in L1 undergo change following significant exposure to Ln, even in non-immersed, L1-speaking environments?

RQ2. Is the effect of Ln on L1, if present, combined? That is, more pronounced among learners who know more than one Germanic language?

RQ3. Does the effect of Ln on L1, if present, depend on developing Ln proficiency?

RQ4. Are the examined word order patterns equally affected, given their differing frequencies in Ln and degrees of optionality in L1?

Considering the previously outlined work on rCLI, the study hypothesises that the learners will show increased acceptability of Polish items that mirror the Germanic pattern. As all languages remain co-activated and the Ln input is frequent, immersion should not be necessary for the effect to emerge. Additionally, rCLI is expected to be combined and, therefore, more robust among learners who speak more than one Germanic language, but there are no a priori reasons to assume that a singular Ln language will be insufficient to exert influence. The effect is predicted to become stronger with developing Ln proficiency, as more stable linguistic representations are more likely to become activated. In line with LPM and SM, the structures are expected to be affected differently, given their varied frequency in Ln and optionality in L1.

6. Methods

6.1 Participants

Overall, 241 university students were recruited. The overarching inclusion criteria for all participants were (i) native knowledge of L1 Polish, and (ii) advanced knowledge of L2 English, which was acquired to high proficiency during school education.[1] The further division concerned knowledge of L3 German, which was also acquired in school, but to a different degree. Out of 127 participants reporting German, 84 evaluated it as beginner proficiency (A1–A2 descriptively, $M_{\text{self-report}} = 2.39/7$, $SD = 0.82$) and 43 as intermediate or higher (B1–C1 descriptively, $M_{\text{self-report}} = 4.95/7$, $SD = 0.71$).

Ten out of the 241 participants were excluded for having two native languages or having lived abroad. 3 were removed for misunderstanding the response scale. The final sample consisted of 228 participants divided into four groups:

- 27 L1 Polish L2 English speakers (noGS group),
- 40 L1 Polish L2 English L3 German speakers (G group),
- 74 L1 Polish L2 English L3 Scandinavian speakers (S group),
- 87 L1 Polish L2 English L3 German L4 Scandinavian speakers (GS group).

The participants in the noGS and G groups were recently enrolled first-year university students from three different language majors.[2]

[1] In the Polish education system, learning a foreign language is obligatory, and 96.1% of students choose English (Statistics Poland, 2024). Additionally, participants for the study were recruited among students for whom the final English exam results play a decisive role in university enrolment. This initially ensured advanced English proficiency, which was later confirmed through both objective and subjective measures.

[2] The students were enrolled in programmes for absolute beginners. As testing for the study took place at the beginning of the academic year, the participants had not yet received any university-level instruction in the target languages. This choice was guided by the goal of ensuring comparable demographic backgrounds across groups.

A necessary note concerns the Scandinavian languages consolidated under one label. Participants in the S and GS groups were students or graduates of Scandinavian Studies, who majored in either Norwegian ($n = 64$), Swedish ($n = 52$), or Danish ($n = 45$) and began acquiring these languages at university. As students of all years were recruited, their developing proficiency in Scandinavian is considered cross-sectionally. Importantly, all learners had the same instructors and used similar teaching materials, ensuring that their input was comparable. Given the close structural similarity of the Scandinavian languages, this grouping enabled a single, yet more powerful analysis. Hereafter, Norwegian, Swedish, and Danish proficiency (depending on the target language) will be collectively referred to as Scandinavian proficiency.

To control for proficiency in all Lns, participants provided self-assessed ratings for listening, speaking, reading, and writing on a scale from 1 to 7. An average from these components produced an overall score. Additionally, they completed a modified Dialang placement test (Alderson, 2005), in which they were presented with 50 words and 25 non-words and had to identify which exist in a given language. Each correct assessment equalled one point, with 75 being the maximum score (e.g., Lloyd-Smith et al., 2021). This test was only done in English and Scandinavian, as they were the initial focus of a larger research project that this study is situated within, and German emerged as relevant only after data collection. Between the Dialang scores and self-reports, there was a strong positive correlation for Scandinavian ($\rho = 0.50, p < 0.001$) and a moderate positive correlation for English ($\rho = 0.34, p < 0.001$), validating the use of the latter as a credible measure. Therefore, all analyses rely on the self-reported ratings, collected equally for all languages. Dialang scores were only used to ensure that the groups were matched in English and Scandinavian proficiency and are reported in Table 3 alongside additional information from the Language History Questionnaire (Li et al., 2020).

Table 3. Participants' characteristics.

	noGS group	G group	S group	GS group
n	27	40	74	87
Chronological age	19.48 (1.99)	19.95 (1.65)	21.85 (2.83)	22.83 (3.64)
Gender	18 female, 7 male, 2 other	27 female, 8 male, 5 other	59 female, 13 male, 2 other	66 female, 16 male, 5 other
AoA: English	6.12 (2.14)	6.30 (1.59)	6.43 (2.00)	6.40 (2.09)
Dialang: English	67.44 (5.19)	68.95 (5.08)	67.96 (4.33)	66.92 (5.05)
Self-report: English	6.18 (0.48)	5.98 (0.55)	6.01 (0.72)	6.01 (0.70)
AoA: German	N/A	12.18 (2.27)	N/A	12.14 (2.84)
Self-report: German	N/A	2.91 (1.24)	N/A	3.40 (1.50)
AoA: Scandinavian	N/A	N/A	18.95 (2.01)	19.23 (1.45)
Dialang: Scandinavian	N/A	N/A	55.86 (7.06)	57.22 (6.93)
Self-report: Scandinavian	N/A	N/A	4.57 (1.11)	4.87 (1.20)

Note: N/A, not applicable; AoA, age of acquisition.

A Kruskal–Wallis *H* test indicated that the four groups did not differ in English with respect to AoA, Dialang, or self-reported proficiency (all *p*s ≥ .100). A Mann–Whitney *U* test showed no significant differences in German AoA and self-reported proficiency for the G and GS groups (*p*s ≥ .120) and no differences in Scandinavian AoA, Dialang, or self-reported proficiency for the S and GS groups (*p*s ≥ .080). Lastly, an additional Kruskal–Wallis *H* test revealed significant differences in chronological age ($p < .001$). This difference arose from the S and GS groups including both students and graduates of Scandinavian Studies, and the G and noGS groups consisting solely of recently enrolled students. Since the study focuses on participants' L1 Polish – in which none of the groups receive explicit language instruction – and the groups are otherwise matched in their knowledge of German and English, this age difference is not expected to influence the results.

6.2 Materials

The Acceptability Judgement Task included 74 sentences, with 6 items for each condition. Therefore, 12 items tested adverb placement in main clauses across two conditions: Adv–V and V–Adv (3), 18 items concerned verb placement with adverbial fronting across three conditions: SVA, ASV, and AVS (4), and 18 items involved verb placement with object fronting across three conditions: SVO, OSV, and OVS (5).

(3) Adverb placement in main clauses

a. Adv–V:	On	rzadko	czyta	grube książki.
	he	rarely	reads	thick books
b. V–Adv:	On	czyta	rzadko	grube książki.
	he	reads	rarely	thick books

(4) Verb placement with adverbial fronting

c. SVA:	Hanna	sadzi	nowe kwiaty	każdej wiosny.
	Hanna	plants	new flowers	every spring
d. ASV:	Każdej wiosny	Hanna	sadzi	nowe kwiaty.
	every spring	Hanna	plants	new flowers
e. AVS:	Każdej wiosny	sadzi	Hanna	nowe kwiaty.
	every summer	plants	Hanna	new flowers

(5) Verb placement with object fronting

f. SVO:	Maja	zbiera	maliny	w ogrodzie.
	Maja	picks	raspberries	in the garden.
g. OSV:	Maliny	Maja	zbiera	w ogrodzie.
	raspberries	Maja	picks	in the garden
h. OVS:	Maliny	zbiera	Maja	w ogrodzie.
	raspberries	picks	Maja	in the garden

As the target items concerned Polish word order, they were all grammatically correct but varied in perceived naturalness, which could be modulated by preceding context. To avoid introducing such pragmatic confounds, all items were presented decontextualised.[3] While the SVA and SVO conditions served as fully grammatical baselines across all tested languages, the ASV/AVS and OSV/OVS conditions tested adverbial fronting and object fronting, with the verb placed in either second or third position – reflective of word order permitted by one of the Germanic languages.

Additionally, there were 12 items related to adverb placement in subordinate clauses, which are not reported here, as well as 2 practice items and 12 unrelated fillers. All sentences

[3] This design made it possible to compare four groups and interpret any differences in ratings as the influence of additional languages rather than contextual facilitation. Importantly, the control noGS group rated the decontextualised sentences as acceptable, supporting the baseline acceptability of the items used.

were constructed along the same patterns for each condition. To minimise repetition effects, half of the sentences included personal pronouns and half used names. In a Latin square design, the items were counter-balanced across presentation lists, ensuring that participants saw each lexicalisation in one condition.

6.3 Procedure

Participants provided written consent and received gift cards for their participation. The study was approved by the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University (Approval number: 10/2023/2024).

This study is part of a larger research project, which involved one testing session with a battery of tasks in English, and another equivalent session in Scandinavian. The reported judgement task in Polish was administered at the end of the second session, following an obligatory break.

Written instructions in Polish preceded the task. Subsequently, each item was presented in the middle of the screen, in white font on a black background. The task was conducted using PsyToolkit (Stoet, 2010, 2017), and all items were displayed in a randomised order for each participant. Judgements were made on a scale from 1 to 5 by pressing one of the keys on a keyboard, with 1 being 'fully unacceptable/very bad' and 5 being 'fully acceptable/very good'. The task was untimed and did not include feedback.

Materials, data and scripts supporting the study are available in OSF at https://osf.io/z9njs.

7. Data analysis and results

The participants' ratings were analysed using linear mixed-effects models with the GAMLj module (Gallucci, 2019) in Jamovi (version 2.3.28). In the analysis, Polish ratings were the dependent variable. Proficiency scores (i.e., self-reported ratings on a 7-point scale) in English, German, and Scandinavian were transformed into *z*-scores.

The first models were run separately for each structure to compare the four groups and assess how they rate different word order patterns in Polish, and whether these ratings are influenced by their knowledge of English, which all participants had. Therefore, the models included Group (noGS, G, S, GS), Condition (i.e., varied word order)[4], and English Proficiency

[4] The first property, i.e., adverb placement in main clauses, included two conditions: Adv–V and V–Adv. The other two properties included three conditions each, i.e., SVO, OSV, OVS for verb placement with object fronting,

as fixed effects, along with two interactions: Condition × English Proficiency and Condition × Group. For the random components, random intercepts were specified for Participant and Item, while random slopes were excluded due to convergence issues.

In the subsequent models, the participant pool was limited to those speaking both German and Scandinavian (GS group) to consider how their ratings in Polish change with developing L3/L4 proficiency. Here, the fixed effects included Condition, English Proficiency, German Proficiency, and Scandinavian Proficiency as well as three two-way interactions between Condition and proficiency score in each language. In parallel to the first models, Participant and Item were entered as random intercepts, with no random slopes, again due to convergence issues. In all models, post hoc tests with Bonferroni correction were used for pairwise comparisons.

7.1 Group comparison

The Omnibus test results for the initial models involving group comparisons are reported in Table 4, while the detailed parameter estimates are available in the OSF repository.

Table 4. Effects in linear mixed-effects models for all participants by structure.

	Adverb placement in main clauses			**Verb placement with adverbial fronting**			**Verb placement with object fronting**		
	F	*Den df*	*p*	*F*	*Den df*	*p*	*F*	*Den df*	*p*
Condition	1049.87	2502	**<.001**	1140.22	3881	**<.001**	2775.67	3865	**<.001**
English Proficiency	2.32	223	.129	0.08	224	.776	0.01	223	.905
Group	5.15	223	**.002**	2.80	224	**.041**	3.77	223	**.011**
Condition × English Proficiency	15.37	2492	**<.001**	1.79	3881	.167	0.50	3829	.609
Condition × Group	11.14	2496	**<.001**	9.04	3877	**<.001**	11.22	3859	**<.001**
Marginal R^2 / Conditional R^2	0.28 / 0.46			0.37 / 0.46			0.54 / 0.69		

Note: Significant effects are bolded.

Considering adverb placement in main clauses, the main effect of Condition showed higher ratings for the Adverb–Verb ($M = 4.91$) as compared to the Verb–Adverb ($M = 3.94$, $SE = 0.07$) condition. Regarding Group, the German–Scandinavian group ($M = 4.58$, $SE = 0.08$) overall

and SVA, ASV, AVS for verb placement with adverbial fronting. Examples for all conditions within each structure are provided in the Materials section.

exhibited higher ratings than the German (M = 4.37, SE = 0.09, p = .025) and Scandinavian (M = 4.38, SE = 0.08, p = .006) groups, but not the noGerman–Scandinavian group (M = 4.38, SE = 0.10, p = .104). The Condition × Group interaction showed that the German–Scandinavian group rated the Verb–Adverb condition (M = 4.20, SE = 0.08) higher than the Scandinavian (M = 3.83, SE = 0.08, p < .001), German (M = 3.86, SE = 0.09, p =.001), and noGerman–Scandinavian (M = 3.87, SE = 0.10, p = .014) groups, with no differences observed for the Adverb–Verb condition (see Figure 1).

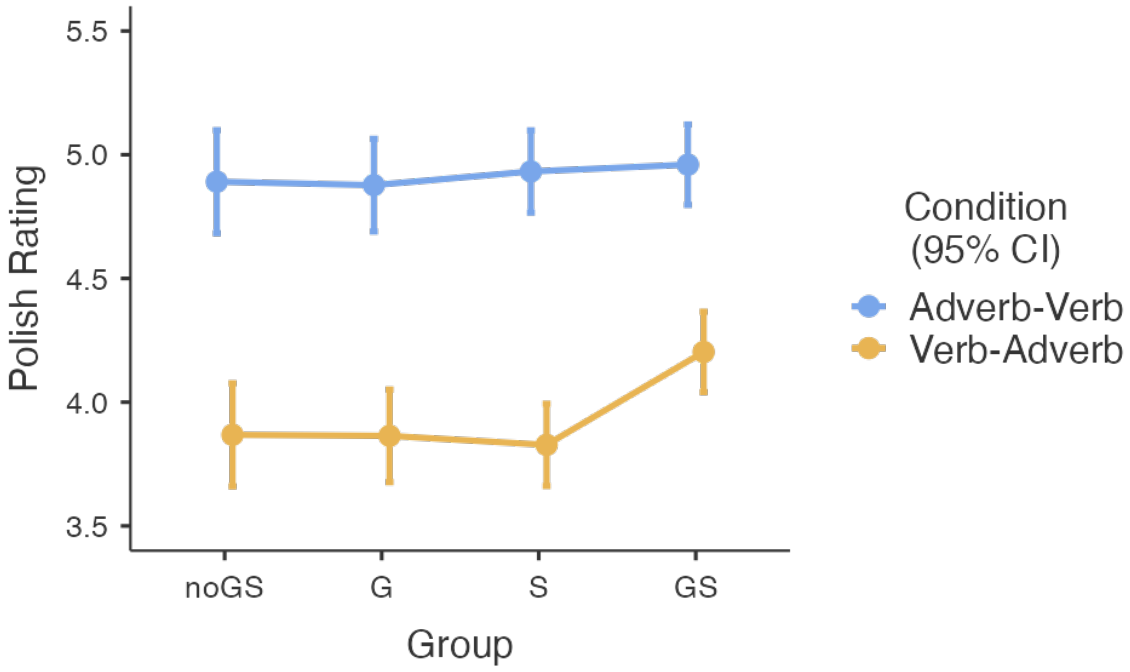


Figure 1. Group × Condition interaction for adverb placement.

A simple effects analysis of the Condition × English Proficiency interaction revealed no significant effects for the Adverb–Verb condition. However, for the Verb–Adverb condition, higher English proficiency was associated with lower ratings, F(1, 358) = 0.21, *estimate* = –0.09, SE = 0.03, t = –3.16, p = .002 (see Figure 2).

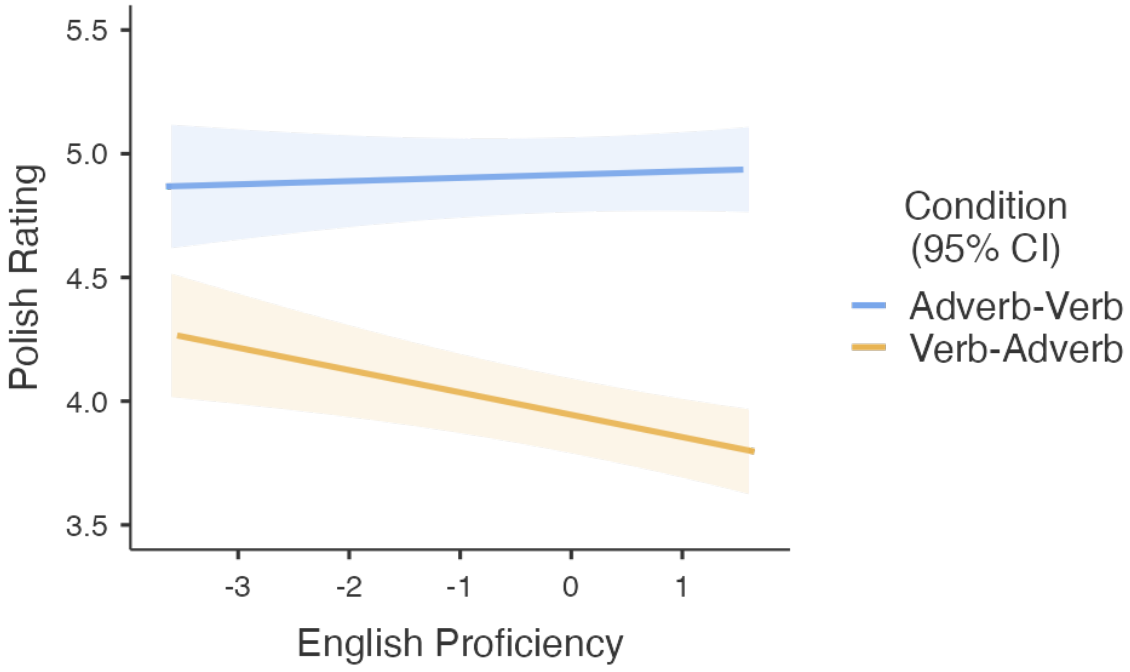


Figure 2. English Proficiency × Condition interaction for adverb placement across groups.

For verb placement with adverbial fronting, the main effect of Condition showed significant differences between all three conditions ($M_{\text{Subject–Verb–Adverbial}}$ = 4.77, $M_{\text{Adverbial–Subject–Verb}}$ = 4.45, $M_{\text{Adverbial–Verb–Subject}}$ = 3.15, SE = 0.04, ps < .001). For the main effect of Group, pairwise comparisons did not reveal any significant differences. The Condition × Group interaction showed higher ratings for the Adverbial–Verb–Subject condition in the German–Scandinavian group (M = 3.48, SE = 0.06) compared with the noGerman–Scandinavian (M = 3.01, SE = 0.10), German (M = 3.03, SE = 0.08) and Scandinavian (M = 3.10, SE = 0.06) groups (all ps ≤ .001; see Figure 3).

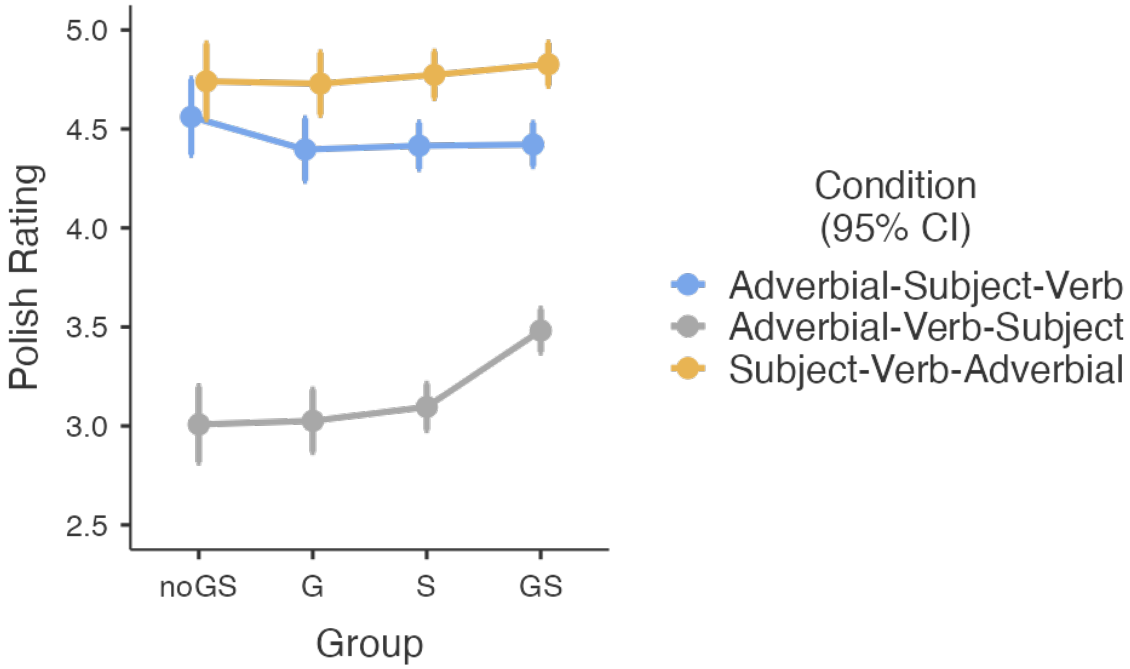


Figure 3. Group × Condition interaction for verb placement with adverbial fronting.

Regarding verb placement with object fronting, the main effect of Condition showed that the Subject–Verb–Object was rated higher (M = 4.92) than the Object–Verb–Subject (M = 2.84) and the Object–Subject–Verb (M = 2.79, SE = 0.05, ps < .001), with no differences between the latter two. The main effect of Group showed an overall difference in ratings between the Scandinavian (M = 3.49, SE = 0.11) and the German–Scandinavian (M = 3.66, SE = 0.06, p = .006) groups. In the Condition × Group interaction, differences were found between the Scandinavian and the German–Scandinavian groups for two conditions: Object–Subject–Verb (M_S = 2.54, M_{GS} = 2.94, SE = 0.07, p = .005) and Object–Verb–Subject (M_S = 2.57, M_{GS} = 3.08, SE = 0.07, p < .001; see Figure 4).

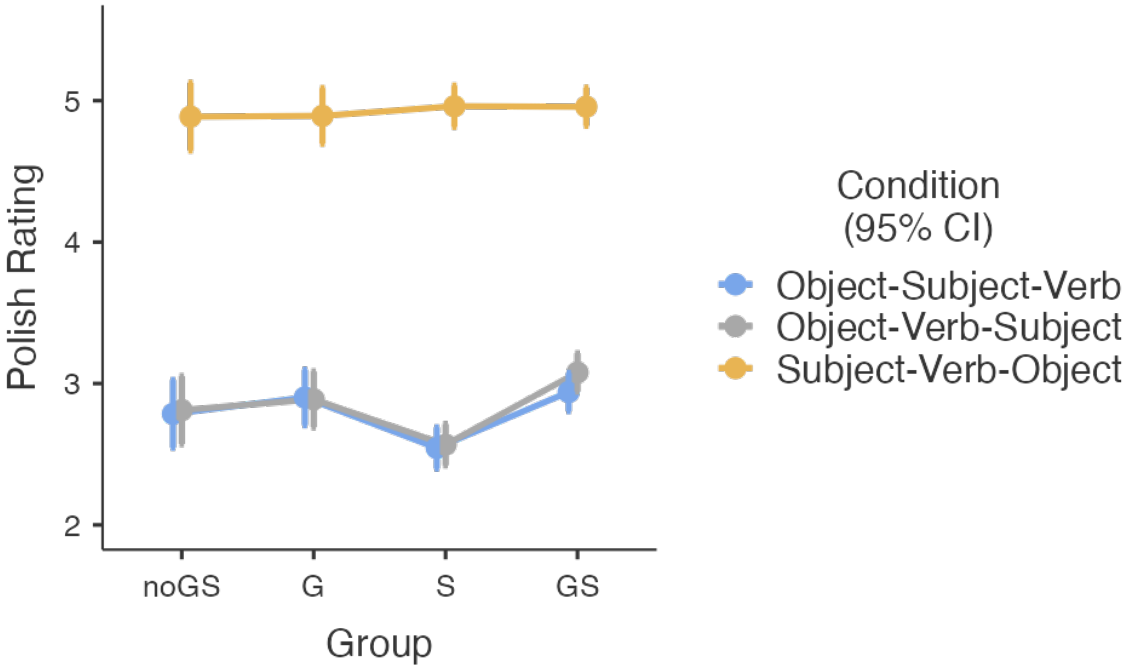


Figure 4. Group × Condition interaction for verb placement with object fronting.

To summarise, while participants generally preferred the Adverb–Verb word order, their ratings of the items with the opposing Verb–Adverb pattern were subject to rCLI from their Lns. Across all participants, increasing proficiency in L2 English was associated with lower ratings for this condition. In contrast, participants in the GS group rated it more favourably, reflecting influence from their L3/L4 backgrounds. Regarding verb placement, no clear effects of L2 English were observed. However, the GS group again showed increased acceptability of the L3/L4-like V2 word order, but only when the verb followed a fronted adverbial; in the condition involving the less frequent object fronting, no rCLI followed.

7.2 The German–Scandinavian group

To further investigate the effect of increasing Scandinavian and German proficiency on the two structures showing notable group differences, i.e., adverb placement in main clauses and verb placement with adverbial fronting, separate models were run for the German–Scandinavian group in isolation. The Omnibus test results for these models are summarised in Table 5.

Table 5. Effects in linear mixed-effects models for the GS group by structure.

	Adverb placement in main clauses			**Verb placement with adverbial fronting**		
	F	*Den df*	*p*	*F*	*Den df*	*p*
Condition	293.52	895.80	**<.001**	378.64	1407.80	**<.001**
English Proficiency	1.89	83	.173	0.00	83	.963
German Proficiency	0.45	83	.505	2.79	83	.099
Scandinavian Proficiency	4.05	83	**.047**	.304	83	.304
Condition × English Proficiency	6.70	942.10	**.010**	3.90	1470.60	**.020**
Condition × German Proficiency	1.66	942.30	.198	1.37	1459.20	.254
Condition × Scandinavian Proficiency	14.43	942.10	**<.001**	7.64	1469.90	**<.001**
Marginal R^2 / Conditional R^2	0.25 / 0.43			0.31 / 0.43		

Note: Significant effects are bolded.

Concerning adverb placement in main clauses, the main effect of Condition showed that the Adverb–Verb was rated higher (M = 4.95) than the Verb–Adverb (M = 4.21, SE = 0.07). In simple effects analyses for the Condition × English Proficiency and Condition × Scandinavian Proficiency interactions, no significant effects were observed for the Adverb–Verb condition. Conversely, for the Verb–Adverb condition, there was a significant positive effect of Scandinavian proficiency, $F(1, 135) = 12.60$, *estimate* = 0.15, SE = 0.04, t = 3.6, $p < .001$, indicating that higher proficiency was associated with higher ratings (see Figure 5), and a significant negative effect of English proficiency, $F(1, 135) = 5.87$, *estimate* = –0.10, SE = 0.04, t = –2.42, p =.017, showing an opposite pattern of higher English proficiency associated with lower ratings (see Figure 6).

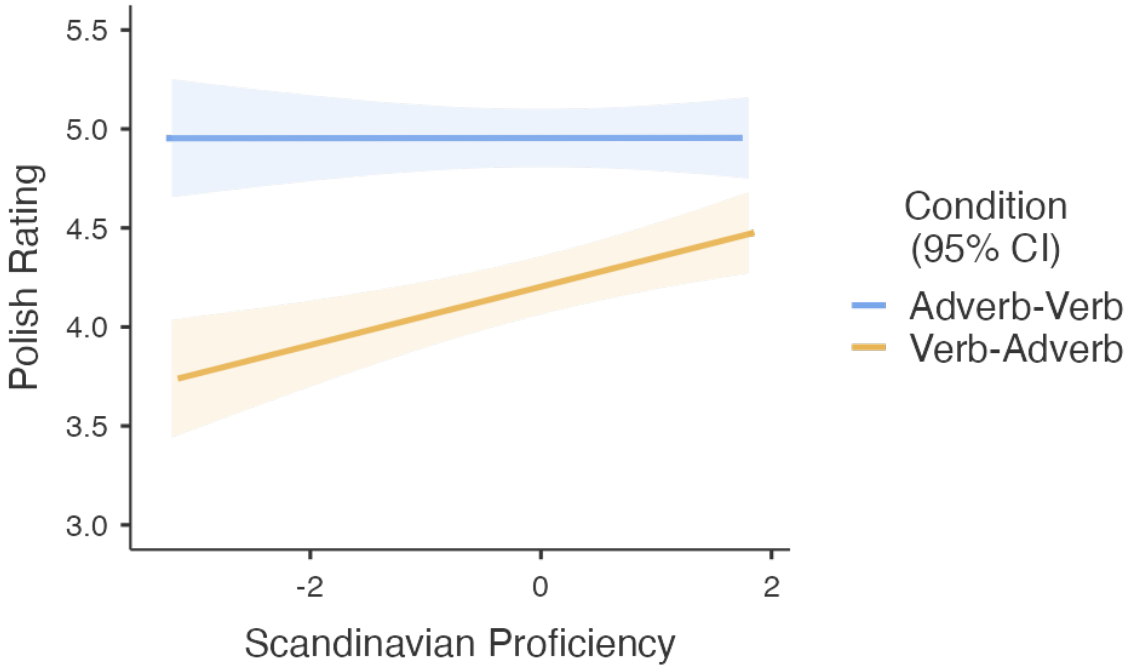


Figure 5. Scandinavian Proficiency × Condition interaction for adverb placement in the German–Scandinavian group.

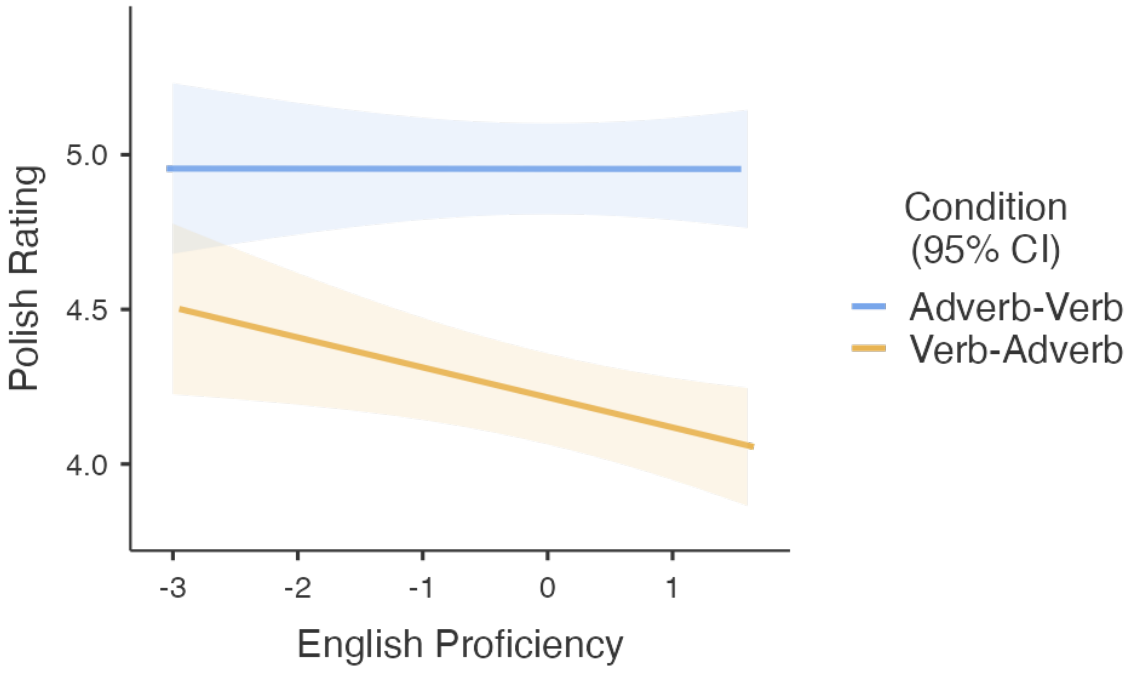


Figure 6. English Proficiency × Condition interaction for adverb placement in the German–Scandinavian group.

Regarding verb placement with adverbial fronting, the main effect of Condition revealed significant differences between all three conditions ($M_{\text{Subject–Verb–Adverbial}}$ = 4.84, $M_{\text{Adverbial–Subject–Verb}}$ = 4.42, $M_{\text{Adverbial–Verb–Subject}}$ = 3.48, SE = 0.06, all ps <.001). A simple effects analysis for the English Proficiency × Condition interaction showed no significant effects. For the Scandinavian Proficiency × Condition interaction, however, a significant negative effect was identified for the Adverbial–Verb–Subject, $F(1, 175) = 9.29$, *estimate* = –0.16, SE = 0.05, t = –3.05, p = .003, indicating that increasing Scandinavian proficiency was linked with lower ratings (see Figure 7).

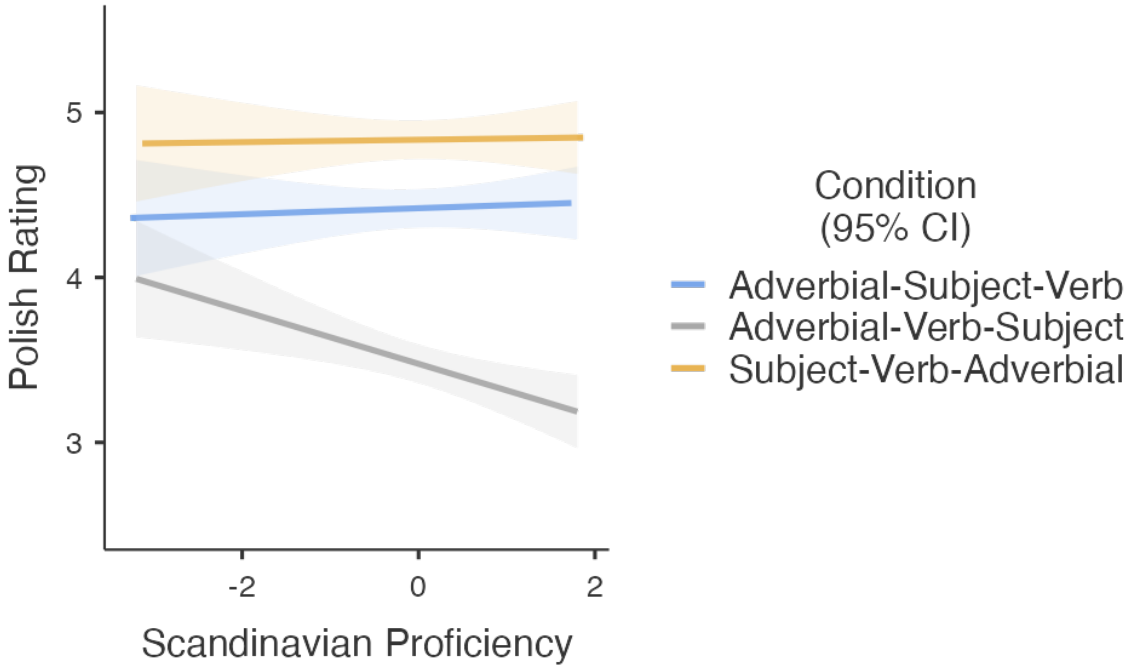


Figure 7. Scandinavian Proficiency × Condition interaction for verb placement with adverbial fronting in German–Scandinavian group.

In summary, a closer examination of developing Ln proficiency within the GS group revealed two contrasting patterns. For the Verb–Adverb word order, ratings decreased with higher proficiency in L2 English and increased with higher proficiency in L3 Scandinavian, which was the expected pattern. In contrast, although the Adverbial–Verb–Subject word order was generally more favoured by the GS group, higher proficiency in L3 Scandinavian was associated with lower ratings. These findings are discussed in the following section.

8. Discussion

The present study investigated how formal acquisition of Ln impacts word order in L1 (RQ1), and whether these effects are stronger among learners with knowledge of more than one Ln (RQ2) or with higher Ln proficiency levels (RQ3). In addition, this study explored whether rCLI is modulated by factors such as frequency of the structure in Ln or optionality allowed by the L1 (RQ4).

According to the results, rCLI patterned differently within each structure. In the first property, i.e., adverb placement in main clauses, all participants showed consistent ratings in the Adverb–Verb condition, while their intuitions regarding the Verb–Adverb were differently impacted by rCLI from non-native languages. With increasing proficiency in L2 English, all participants showed a growing dislike for this word order. Conversely, at higher levels of proficiency in L4 Scandinavian, the same word order was progressively more favoured. The latter effect was, however, only present among learners with knowledge of both L3 German and L4 Scandinavian, indicating that co-activation of both languages was necessary for rCLI to occur. In the second property, i.e., verb placement with adverbial fronting, there were no observable effects of L2 English, yet the German–Scandinavian learners again exhibited enhanced acceptability of the L3/L4-like Adverbial–Verb–Subject condition. Although these items were rated significantly higher than in the other groups, an unexpected pattern emerged, as the favourable ratings decreased with growing proficiency in L4 Scandinavian. The third property, i.e., verb placement with object fronting, did not reveal notable differences between the four groups, indicating that V2 coupled with a fronted object did not trigger rCLI.

The differential impact on the two structures involving verb placement highlights the importance of input frequency at a fine level of distinction. Recall that adverbials are easily fronted in both German (42% of instances) and Scandinavian (23%), while objects in the clause-initial position are very infrequent (3–7%). Although both properties centred on the same syntactic condition of V2, frequencies related to information structure and the element preceding the verb played a decisive role. This aligns with predictions made by both LPM and SM (Westergaard et al., 2017; Slabakova, 2017), which stress the importance of CLI occurring property-by-property and list frequency as particularly relevant. Unsurprisingly, it seems that while in the progressive CLI minimal Ln input leads to an extended period of underspecification, in the regressive direction it is simply insufficient to trigger any changes.[5]

[5] As suggested by an anonymous reviewer, the frequency of the structure in the L1 may also influence its stability. Since OSV and OVS structures are less frequent in Polish than the canonical SVO, they may be more resistant to change. This observation also ties with the subsequent discussion on the degree of optionality permitted by the L1.

A second aspect is the role of optionality allowed by the language undergoing change, which appears to promote rCLI. Similar evidence comes from online processing studies, where learners experienced facilitation at points of L1–L2 overlap when their L1 allowed two options (Oliveira et al., 2017; Requena & Berry, 2021), as well as from offline judgements, where L1 permitted both overt and null pronouns, while the L2 only advanced the former (Długosz, 2021). Here, the contrast concerns adverbs, which in L1 can be placed both pre- and post-verbally, and verbs immediately following a fronted adverbial (V2), which in L1 is allowed, but rather disfavoured. These varying degrees of optionality lead to two distinct patterns. For Verb–Adverb, both L2 English and L3/L4 German–Scandinavian exert rCLI, which reflects word order patterns respectively found in each language. Here, this influence is more pronounced at higher levels of proficiency in Ln: in English, higher proficiency is associated with lower acceptance of this word order, while in German and Scandinavian, it is associated with higher acceptance. In contrast, for Adverbial–Verb–Subject, progressing L3/L4 proficiency leads to an opposing effect, i.e., greater rejection of the L3/L4-like pattern rather than acceptance. Heightened attentiveness to non-standard forms was previously observed among L1 Polish learners (Ewert, 2008), and sharper metalinguistic awareness was reported for different L1s (Cook et al., 2003). It seems that when L1 allows two options, as in variable placement of adverbs, the learners' intuitions shift as a result of Ln exposure and slightly adapt to patterns found therein. However, when L1 allows or favours only one option, while Ln advances a diverging pattern, the learners that are highly proficient in Ln may exhibit greater sensitivity, leading to rejection.

Although Ln influence manifests differently across structures, the results converge on a key observation: all languages remain co-active and can exert influence even when the L1 is well established. As proposed by both LPM and SM, this influence is dynamic yet predictable and subject to factors such as abstract similarity and structural frequency. In their seminal study on LPM, Westergaard et al. (2017) introduce the concept of a *double filter effect*. They observe that 2L1 Russian–Norwegian learners of L3 English simultaneously experience facilitative and non-facilitative influences from their two distinct L1s and argue that "each sentence presented to an L3 learner must pass the filter of both previously acquired grammars in order to be judged as grammatical" (p. 677). Their findings stem from a different context than the one examined here; their study involves two L1s with conflicting patterns, which cause the learners to reject both ungrammatical and grammatical items in the acquisition of L3 permitting one option. Here, regressive influence is the primary focus, alongside the previously discussed role of L1 optionality. Despite these contextual differences, the core observation applies: the differential

impact of L2 English and L3/L4 German–Scandinavian suggests that all languages remain co-active, and L1 sentences are consequently parsed through the filters of L2, L3, and L4.

Concerning the combined nature of rCLI, there is an important point to be addressed. If L3/L4 German–Scandinavian only work in parallel, and singular exposure to one of them is not enough to trigger rCLI, why would L2 English alone suffice? A possible explanation lies in varying levels of proficiency and experience with these languages. While the L2 English of these learners is advanced and the acquisition process started during early school years ($M_{\text{self-report}}$ = 6.01/7, M_{AoA} = 6.40/7), their German ($M_{\text{self-report}}$ = 3.40/7, M_{AoA} = 12.14) and Scandinavian ($M_{\text{self-report}}$ = 4.87/7, M_{AoA} = 19.23) are both at a much earlier stage of development. In tentative terms, it is likely that upon gaining greater proficiency and experience in L3 or L4, these languages could also begin to act as independent driving forces for regressive CLI, while at the intermediate stages, they only work in tandem.

Summarising the implications for the research questions, the results show that L1 Polish of non-immersed, instructed learners is impacted by significant exposure to Ln Germanic languages. This influence is either combined, when L3/L4 are considered, or acts alone in the case of L2, likely due to higher proficiency and greater experience with the latter. Developing proficiency in Ln affects different structures in distinct ways, leading to either increased acceptance or rejection. This highlights the role of an additional factor, i.e., L1 optionality. Moreover, the effect is driven by structural frequency, with rCLI observed in conditions with rich Ln input but absent when input is limited.

Notably, although the observed shifts in learners' intuitions are statistically significant, they are not numerically large (approximately 0.5 points on a 1–5 scale). This, combined with the permissibility of ordering in L1 Polish, raises the question about the longevity of these effects. On the one hand, the offline mode of the task and the learners' non-immersed environment point to a certain permanency of the L1 changes. On the other hand, these intuition shifts could equally emerge as a result of Ln input and frequent co-activation during daily use. The inability to resolve this issue remains a limitation of this study. Employing both online and offline experimental methods, along with longitudinal testing of the same learners in contexts with varying exposure, would be necessary to gain insight into the longevity of Ln-induced regressive influence.

Lastly, it is worth highlighting that the marginal R^2 values of the reported models ranged from 0.25 to 0.54. This suggests that the fixed effects – i.e., Group, Condition and English Proficiency in the models across all groups, as well as Condition, English Proficiency, German

Proficiency, and Scandinavian Proficiency in the models run separately for the GS group – explain a substantial proportion of variance observed in the data. This supports the relevance of the learners' language background in accounting for the differences observed in their ratings.

In terms of methodological limitations, it needs to be noted that the relatively small number of filler items, combined with the focus on word order manipulations, may have heightened the participants' awareness of the study's aim. The disproportion between ungrammatical and grammatical items may have also reduced the usefulness of the lower end of the scale, and, consequently, introduced bias in response patterns. In addition, alternating between nouns and pronouns reduced repetition effects but introduced a potential confound, as the explicit use of pronoun in a pro-drop language such as Polish may have independently lowered acceptability. Finally, the use of decontextualised sentences – intended to reduce contextual facilitation – unavoidably left room for variability in participants' interpretation. It is therefore plausible that additional factors may have influenced the judgements. These methodological limitations were, however, present in the items applied equally across groups, which preserves the validity of the findings regarding rCLI.

In summary, the study provides evidence for regressive cross-linguistic influence from Ln on L1 Polish word order, thereby contributing to the limited understanding of the multi-directionality of CLI and demonstrating that changes at the level of L1 syntax are no exception. The combined nature of CLI and diverging patterns stemming from L2 and L3/L4 indicate that all languages are co-activated in the multilingual mind. With that, the study provides a unique testing ground for the premises of third language acquisition models. Finally, the complex interplay of considered factors highlights the importance of a more nuanced treatment of CLI, which accounts for structure frequency, L1 optionality, and Ln proficiency on a property-by-property basis.

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Appendix L: Article 2 (Olszewska & Długosz, 2025)

Olszewska, A., & Długosz, K. (2025). The acquisition of L3 Scandinavian impacts word order in advanced L2 English: Regressive cross-linguistic influence in verb-particle constructions. *Linguistic Approaches to Bilingualism*. Advance online publication. https://doi.org/10.1075/lab.24095.ols

The acquisition of L3 Scandinavian impacts word order in advanced L2 English

Regressive cross-linguistic influence in verb-particle constructions

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This study explores how learning a Scandinavian language as an L3 affects word order in advanced L2 English, depending on the learner's knowledge of the relevant structure in L3. We target verb-particle constructions, which cross-linguistically employ dissimilar word order patterns. In English and Norwegian, the particle can both precede and follow the object, and the preference is modulated by length of the NP. Conversely, the particle is obligatorily pre-posed in Swedish and always post-posed in Danish. We report acceptability judgement and self-paced reading data from instructed, non-immersed L1 Polish L2 English learners acquiring either L3 Norwegian ($n = 65$), Swedish ($n = 52$), or Danish ($n = 46$) from beginning to advanced levels, with the Norwegian group serving as a control. All learners are matched for L2 English proficiency. An analysis using linear mixed-effects models reveals regressive cross-linguistic influence in participants' judgements and reading times in L2 English, reflected mainly in the post-posed particle being preferred by L3 Danish learners and dispreferred by L3 Swedish learners, particularly when target-like knowledge of the structure is in place. Our study is the first to show that L3 impacts word order in L2, thereby extending the observation of regressive cross-linguistic influence to syntax.

Keywords: regressive cross-linguistic influence, regressive transfer, L3 acquisition, word order, verb-particle constructions

1. Introduction

A steadily growing body of research in third language acquisition indicates that both the first and the second language can exert an influence on the newly devel-

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oping system (e.g., Rothman et al., 2019; Mitrofanova et al., 2023). While much of this work has focused on understanding the mechanisms underlying the initial stages of the L3 acquisition process, few attempts have been made to model the further developmental trajectory (e.g., Puig-Mayenco, 2024). Consequently, the extent to which the L3 can reversely impact the languages known prior remains largely unexplored (see Cabrelli, 2023). A few studies have highlighted the possible facilitation offered by the L3, which enables the learners to converge on the L2 target (e.g., Tsang, 2016a; Xiao, 2018), while the parallel, detrimental effect has barely been considered (e.g., Cabrelli Amaro, 2017b; Puig-Mayenco, 2023). This oversight runs counter to intuition, as extensive evidence demonstrates that L1 experiences attrition following significant, immersive exposure to L2 (e.g., Schmid & Köpke, 2019), while emerging findings showcase that it can also change in instructed, non-immersed environments (e.g., Martín-Villena, 2023).

Drawing on the Linguistic Proximity Model (Westergaard et al., 2017), cross-linguistic influence is expected to be multidirectional and property-by-property, as it results from the co-activation of all languages in the learner's repertoire, regardless of the order in which they were acquired. The primary factor driving cross-linguistic influence is structural similarity, particularly in later stages of language acquisition. Language co-activation — and thus cross-linguistic influence — at the level of grammar is modulated by variables such as proficiency, dominance, and complexity (Slabakova, 2017; Westergaard et al., 2023; Castle et al., 2025). Building on the assumption that cross-linguistic influence is not unidirectional and that all languages always remain activated to some extent, we investigate how learning an L3 impacts a previously acquired L2 system, focusing on verb-particle constructions. We consider instructed, non-immersed L3 learners of three Scandinavian languages — Swedish, Norwegian, and Danish — who are highly proficient in L2 English. Despite these seemingly unfavourable conditions, we observe that the word order in the proficient L2 undergoes change triggered by the subsequent acquisition of the L3, most notably at high levels of L3 accuracy.

1.1 Previous studies on regressive cross-linguistic influence

Thus far, three factors possibly modulating L3-induced regressive cross-linguistic influence (rCLI)[1] have been formally proposed. The Phonological Permeability

1. In line with Westergaard et al. (2023), we do not draw a distinction between representational transfer and processing-related phenomena, and instead adopt *regressive cross-linguistic influence* as an overarching term. The term has previously been used in Brown-Bousfield & Chang (2023), while other studies refer to the effect as *regressive transfer* (e.g., Llinàs-Grau & Puig-Mayenco, 2016; Cabrelli Amaro, 2017b; Puig-Mayenco, 2023), *backward transfer* (e.g., Hui, 2010; Cheung et al., 2011; Park & García Mayo, 2023) or *reverse transfer* (e.g., Aysan, 2012; Tsang, 2016a; Xiao, 2018).

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Hypothesis (PPH; Cabrelli Amaro & Rothman, 2010; Cabrelli Amaro, 2013, 2017a) posits that age of acquisition is a crucial modulator, as systems that are acquired early (L1) and late (L2) vary in stability, which makes them differently vulnerable to influence from an additional L3. The later reintroduced Differential Stability Hypothesis (DSH; Cabrelli Amaro, 2017b) extended this observation to additionally account for morphosyntactic phenomena, as the employed mirror-image design showcased that L3 Brazilian Portuguese always exerted influence over Spanish, yet this influence was stronger when it was an L2 rather than L1. The DSH has only been explicitly tested by Puig-Mayenco (2023), who explored whether an early acquired L2 (operationalised as AoA = 3–6 years) would be equally vulnerable to rCLI from L3, just as the late acquired L2 is assumed to be. A mirror-image comparison of four groups: Catalan–Spanish bilinguals and Catalan–Spanish–English trilinguals with inverted L1s and L2s has shown signs of rCLI, but only on the L2, leaving L1 unaffected. However, the author regarded the absence of an effect of L1 as unsurprising, as participants had only been immersed in the L3-speaking environment for a minimum of 12 months, which is significantly shorter than the durations typically reported in the L1 attrition literature. These results were taken as a partial confirmation of the DSH, as L1 and L2 were indeed affected differently, yet with a complementary observation, i.e., the Sandwich effect (SE). This effect suggests that rCLI on the L2 may be more likely to occur when the structure in question aligns in both L1 and L3. Recently, Brown-Bousfield & Chang (2023) introduced the Similarity Convergence Hypothesis (SCH). While it currently only refers to phonology, the relative recency of the proposal makes its inclusion important. Here, the authors considered two groups of English–German bilinguals (with inverted L1s and L2s), as well as two trilingual groups with an added L3 Spanish. Conversely to the two previous studies, the rCLI from L3 was only found in the L1 English, suggesting that it may be the typological similarity that brings the languages closer to one another.

Moving away from formalised proposals, the second most apparent division that can be applied to group the few existing studies on rCLI in morphosyntax is whether the L3 offers facilitation or hindrance to the L2. In this line of enquiry, L1 Chinese L2 English learners have been found to benefit from the acquisition of L3 French (Hui, 2010; Tsang, 2016a, 2016b), L3 Portuguese (Xiao, 2018), L3 Korean (Ahn & Jang, 2019; Ahn & Mao, 2019) and L3 Spanish (Park & García Mayo, 2023) in phenomena such as number agreement and verbal agreement, as well as in the use of relative clauses and articles. In contrast, Chuang (2002) did not find any effect of L3 German among speakers with the same language background. Apart from these triads, Llinàs-Grau & Puig-Mayenco (2016) found that L4 German exerted an influence on L3 English among L1/L2 Catalan–Spanish speakers, as

they exhibited a higher tendency to omit complementisers compared to the control group without an L4.

Against this backdrop, there are only five studies that examined whether the addition of an L3 could impact previously acquired languages in a non-facilitative manner. Aside from Cabrelli Amaro (2017b) and Puig-Mayenco (2023) mentioned above, both Cheung et al. (2011) and Fung & Murphy (2016) investigated tense–aspect phenomena. While the former has found L3 German-like usage of the past tense in the L2 English among L1 Chinese learners, the latter did not capture any significant effect of L3 French on L2 English among learners with different L1s. Lastly, Aysan (2012) investigated L1 Turkish L2 English learners with either L3 French or L3 Italian. Speakers of the pro-drop L3 Italian were found to be more permissive of pro-drop structures in their L2 English, while a similar trend among the non-pro-drop L3 French was not attested.

This overview of the findings on morphosyntactic rCLI makes it apparent that the effect requires further exploration. We contribute to this largely underdeveloped line of inquiry by considering the crucial role of developing L3 proficiency. The studies listed above either operationalised proficiency in terms of hours of instruction or years of exposure (e.g., Chuang, 2002; Hui, 2010), limiting the extension of their findings to other contexts, or restricted the participant pool to only those with advanced L3 proficiency (e.g., Cabrelli Amaro, 2017; Park & García Mayo, 2023). Tsang (2016a, 2016b) and Xiao (2018), who both consider L1 Chinese L2 English learners, stand out in their attempts to move beyond this snapshot approach, as the former considers three levels of L3 French proficiency (beginner, intermediate, advanced), and the latter includes both 1st and 4th year university students of the same language major in Portuguese. Interestingly, they point to two seemingly diverging trajectories, as one study only finds rCLI at advanced levels (Tsang, 2016a, 2016b), and the other detects the effect shortly after the onset of L3 acquisition with no further facilitation after long-term exposure, possibly due to ceiling effects. To account for not only the existence of rCLI, but to also consider its developmental trajectory, we cross-sectionally test learners at all stages of L3 proficiency (A2–C1). In addition, as we equally test them in both L2 and L3, we are able to evaluate their knowledge on the specific structure under consideration as opposed to referring to their overall L3 proficiency.

Importantly, we advance the current investigation by considering syntactic phenomena. Thus far, Tsang (2016b) tested adverb placement in L2 English main clauses but did not observe any non-facilitation from L3 French for this structure. Whether word order can be subject to rCLI in general, and particularly to one of the non-facilitative kind, remains an open question. Finally, we consider a language triad that is novel to this subfield of enquiry, i.e., L1 Polish L2 English speakers acquiring either Norwegian, Swedish, or Danish as an L3. We test them by

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means of a self-paced reading task (SPRT) and an untimed acceptability judgement task (AJT), which will allow us to consider if online and offline performance is affected differently.

1.2 Particle placement in the languages under study

This study focuses on transitive verb-particle constructions (also known as phrasal verbs), which are characteristic for Germanic languages (e.g., Dehé, 2015). Despite their common origin, they present different syntactic patterns (e.g., Svenonius, 1996, among others). In both English and Norwegian, the particle may either precede or follow the noun phrase, giving rise to two possible word orders (see (1)–(2)).

(1) a. Læreren deler UT lange oppgaver.
'The teacher hands out long assignments.'
b. Læreren deler lange oppgaver UT.
'The teacher hands long assignments out.'

(2) a. The teacher hands OUT long assignments.
b. The teacher hands long assignments OUT.

In these cases, the variable placement of the particle is often referred to as particle shift (e.g., Svenonius, 1996). Importantly, this variation can be modulated by several factors that constrain the choice to one of the available positions (e.g., Dehé, 2015). One important modulator is the type of object, as pronominal objects are obligatorily followed by the particle. In this case, the particle can only precede the pronoun when it is stressed (e.g., Dehé, 2015). It has also been suggested that elements that are inferable from context tend to fall between the verb and the particle, while those that are new to the discourse are placed after the particle (e.g., Chen, 1986). Another crucial factor is the length or heaviness of the NP, as it has been consistently observed that the longer the element is, the more likely it is to follow the particle (e.g., Lohse et al., 2004). In terms of semantics, verb-particle constructions form a continuum from fully transparent to fully idiomatic. High semantic opacity increases the dependency between the verb and the particle, leading to a tendency for them to stay together (e.g., Gonnerman & Hayes, 2005). Alongside these well-established factors, it has also been suggested that there is a slight preference for the adjacent placement of the particle. This has been attributed to the employment of lower processing demands when all constituents are recognised early and in a continuous manner (e.g., Hawkins, 1994). Lastly, it is worth adding that some Norwegian dialects display a preference for one of the given orders (e.g., Lundquist, 2014). However, such dialectal variation is rather limited in the input of non-immersed, instructed Polish learners.

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This kind of flexibility in particle placement is absent from other Scandinavian languages. In Swedish, the particle is always fixed in the position adjacent to the verb (3), while in Danish it is obligatorily shifted (4).

(3) a. Läraren delar UT långa uppgifter.
'The teacher hands out long assignments.'
b. *Läraren delar långa uppgifter UT.
'The teacher hands long assignments out.'

(4) a. *Læreren deler UD lange opgaver.
'The teacher hands out long assignments.'
b. Læreren deler lange opgaver UD.
'The teacher hands long assignments out.'

The possible particle placement in the four languages is summarised in Table 1.

Table 1. Summary of particle placement

	V – Particle – NP	**V – NP – Particle**
English	YES	YES
Norwegian	YES	YES
Swedish	YES	NO
Danish	NO	YES

In Polish, i.e., the participants' L1, these types of relationships are expressed through a prefix added to modify the verb root. As there is no structural equivalent, the L1 does not serve as a potential source of cross-linguistic influence.

Lastly, looking beyond the target languages of our study, we mention the ordering of verb-particle constructions in German, as some participants have reported knowledge of this language. Here, the particle follows the object in V2 sentences with lexical verbs (5a) but becomes preverbally attached when auxiliaries or other finite verbs are involved (5b; Dehé 2015, p. 613).

(5) a. Der Lehrer teilt lange Aufgaben AUS.
'The teacher hands long assignments out.'
b. Der Lehrer wird lange Aufgaben AUSteilen.
'The teacher will hand out long assignments.'

Rather than explicitly testing their knowledge of the construction in German, we account for it in the study design, as explained in the following sections.

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1.3 Acquisition and processing of verb-particle constructions by language learners

Studies on L2 acquisition of particles mainly involve corpus-based investigations of English, showcasing that these multi-word structures are notably difficult to acquire. Due to their syntactic complexity, semantic opaqueness, and polysemy, learners resort to avoidance strategies and instead prefer to use one-word verbs (e.g., Sung, 2020). The pace of acquisition also depends on the speakers' linguistic background — the absence of an equivalent structure in L1 can hinder the process, while its presence may lead to CLI; importantly, learners were found to prefer the placement in which the particle immediately follows the verb (e.g., Wulff & Gries, 2019).

L2 production studies show similar avoidance patterns (e.g., Liao & Fukuya, 2004), albeit reduced when the structure is also present in the L1 (e.g., Laufer & Eliasson, 1993). In a longitudinal study on L2 Swedish rather than English, Bohnacker (2007) demonstrates initial non-target use among learners, followed by a stage of optionality in which both word orders are produced. Although the Swedish pattern eventually emerges, even advanced learners occasionally diverge. Bohnacker (2007) ascribes this slow development to initial transfer from German followed by a long stage of insufficient input, as the structure is relatively infrequent in Swedish.

Experimental studies have mostly focused on the comparison of native and non-native processing patterns. For example, French–English bilinguals are sensitive to degrees of semantic transparency (Blais & Gonnerman, 2013), while highly proficient Arabic–English bilinguals process idiomatic and non-idiomatic constructions similarly to monolinguals (Paulmann et al., 2015). In a self-paced reading study, Herbay et al. (2018) found that French–English bilinguals with high working memory and good lexical knowledge patterned similarly to monolingual English speakers, as they preferred adjacent particle placement with both opaque verbs and long object NPs, while the group with poor performance showed no sensitivity to manipulations.

In a study combining offline judgements and self-paced reading, Schunack (2017) compared native and non-native speakers of Norwegian, focusing on varying particle placement and NP length. All participants knew English, and some had knowledge of additional languages; in the non-native group, German was the L1. In the AJT, native Norwegian speakers exhibited higher ratings when the particle was adjacent in the short condition, but unexpectedly favoured post-posed particles in the long condition. Non-native Norwegian speakers preferred the adjacent placement irrespective of object length. In the SPRT, the native group read the adjacently placed particle faster regardless of length, while the non-native

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group showed no sensitivity to manipulations. The author suggests that the German–Norwegian speakers' experience with non-local dependencies in L1 German could have facilitated their processing in non-native Norwegian, nullifying the observation of any effects.

2. The study

2.1 Research questions

Expanding upon the current discussion, our study will address the following research questions:

RQ1. Can the L3 regressively influence the word order of the previously acquired L2, notably in the case of advanced L2 proficiency and a lack of L3 immersion context? Is the occurrence of the effect in L2 modulated by increasing knowledge of the relevant structure in L3?

RQ2. To what extent does L3-induced regressive cross-linguistic influence impact offline and online performance, as measured by acceptability judgements and reading times in a self-paced reading paradigm?

RQ3. Are language learners sensitive to subtle cues associated with particle placement? Do they show an overall preference for the preNP position of the particle? Is it modulated by the length of the NP?

Drawing on the Linguistic Proximity Model (e.g., Westergaard et al., 2017; Westergaard et al., 2023), we predict that learners' word order patterns in L2 will shift following significant exposure to an additional language, as a result of cross-linguistic co-activation. Consequently, we expect this effect to emerge once target-like knowledge of the structure in L3 is in place. With that, we build on recent work examining the influence of L2 on L1 among instructed learners (e.g., Martín-Villena, 2023), thereby assuming that an immersion context is not necessary for such effects to occur. Given the variability of particle placement in English, we anticipate rCLI in both offline judgements and online sentence processing. Since both pre- and post-particle positions are grammatically acceptable in English, participants are not exposed to any syntactic violations that would typically be detectable by instructed language learners, potentially masking evidence of rCLI. The use of both tasks is intended to provide a more comprehensive picture of rCLI in verb-particle constructions. Turning away from rCLI, and in line with existing evidence (e.g., Wulff & Gries, 2019), we assume that learners will generally prefer the adjacent placement of the particle. In addition, we expect this preference to strengthen as the NP object increases in length (e.g., Lohse et al., 2004).

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All research materials, data, and analysis code are available at https://osf.io /hy39s/.

2.2 Participants

The original sample consisted of 171 participants. Eight were excluded, as they reported either native knowledge of two languages or having lived abroad for longer than 12 months. This resulted in the final sample of 163 participants, divided between the following groups:

a. L1 Polish L2 English L3 Norwegian speakers ($n = 65$)
b. L1 Polish L2 English L3 Swedish speakers ($n = 52$)
c. L1 Polish L2 English L3 Danish speakers ($n = 46$).

As Norwegian patterns similarly to English and allows for the particle to be placed in both positions, we considered it as a control group. Swedish and Danish, which have fixed particle placements, were included in the study as the two experimental groups. This allowed us to isolate the effect of L3, while simultaneously maintaining a cohesive background across the groups in terms of language experience, as all participants were trilingual speakers.

All participants were either students or graduates of Scandinavian Studies at Polish universities. Students of all years were recruited to consider their developing L3 proficiency in a cross-sectional manner. Regardless of the chosen language, they received approximately 300 hours of language instruction each year during their BA and 150 hours during their MA. In addition, all other lectures on literature, history, and culture were delivered in their Scandinavian language of choice from the second year of study, making their daily L3 exposure very high. The instruction was largely based on similar materials and conducted by the same teachers, creating a highly coherent group of instructed adult L3 learners.

Global proficiency in both L2 and L3 was measured with a subjective self-reported assessment and a more objective Dialang placement test (Alderson, 2005). In the former, the participants rated their listening, speaking, reading, and writing abilities on a scale of 1 to 7, and the average score of their responses was calculated. The latter normally consists of 50 real words and 25 non-words, which are randomised and presented as a list. The participants' task is to identify which words exist in the tested language. In this study, we utilised an adapted version of the task (e.g., Lloyd-Smith et al., 2018), in which the 75 words are presented in the centre of the screen, one at a time. The participants assess the words by pressing one of the keys on the keyboard, i.e., Y or N for *yes* or *no* (or J/N for the Scandinavian versions of the test). An accurate judgement of each word earns one point,

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with 75 being the maximum score. To control for the potential additional knowledge of German, we asked for a respective self-report, when relevant.

All participants also filled out the Language History Questionnaire (LHQ3; Li et al., 2020). Table 2 summarises their background information. Prior to testing, participants provided informed written consent and received a gift card for their participation. The study was approved by the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University (Decision Number 10/2023/2024).

Table 2. The participants' characteristics

	L1 Polish L2 English L3 Norwegian (N group)	**L1 Polish L2 English L3 Swedish (S group)**	**L1 Polish L2 English L3 Danish (D group)**
n	65	52	46
Age	21.71 (2.81)	23.35 (3.91)	22.11 (3.03)
Gender	51 female, 10 male, 4 non-binary	39 female, 11 male, 2 non-binary	38 female, 8 male
AoA: L2	6.23 (2.19)	6.75 (2.09)	6.24 (1.75)
Dialang: L2	67.63 (4.90)	67.10 (4.76)	67.57 (4.54)
Self-assessed proficiency: L2	5.98 (0.79)	5.98 (0.63)	6.09 (0.65)
Self-assessed daily exposure in hours: L2	4.48 (2.71)	3.63 (2.62)	4.18 (2.81)
AoA: L3	19.14 (1.49)	18.85 (1.97)	19.33 (1.74)
Dialang: L3	55.00 (7.17)	59.73 (6.85)	54.76 (6.04)
Self-assessed proficiency: L3	4.66 (1.06)	5.03 (1.05)	4.45 (1.38)
Self-assessed daily exposure in hours: L3	3.23 (2.72)	2.78 (2.03)	3.13 (2.22)

The Kruskal-Wallis *H* test indicated that the three groups did not differ with respect to L2 English proficiency (Dialang), $\chi^2(2) = 0.61$, $p = .737$, L2 exposure, $\chi^2(2) = 3.78$, $p = .151$, and L3 exposure, $\chi^2(2) = 0.35$, $p = .841$. However, a significant difference was found in L3 proficiency (Dialang) across the groups, $\chi^2(2) = 16.0$, $p < .001$, with the S group being slightly more proficient in their L3 compared to both the N group ($p = .001$) and the D group ($p = .002$). In terms of additional knowledge of German, 66 out of 163 participants declared no prior exposure in

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the questionnaire. Further 67 reported beginner proficiency (A1–A2 on the CEFR scale, $M_{\text{self-report}} = 2.44$, $SD = 0.85$). Finally, 30 described their proficiency as intermediate or higher (B1–C1 on the CEFR scale, $M_{\text{self-report}} = 5.13$, $SD = 0.60$).

2.3 Materials

Both the SPRT and the AJT each included 32 items related to particle placement. As they were a part of a larger study, the tasks in their entirety involved 132 items. The remaining ones, which are not reported in this paper, were 4 practice items, 16 unrelated fillers, and 80 items testing verb and adverb placement.

For this study, we chose only semantically transparent transitive verbs, as semantic transparency has been found to be one of factors modulating the adjacency of the particle.[2] In a 2×2 design, we focused on varying the length of the object (shortNP vs. longNP) and the relative particle placement (preNP vs. postNP), with 8 items for each condition. The short object NP always included 2 words, i.e., an adjective and a noun, while the long object NP consisted of 5 words, i.e., a determiner, two adjectives conjoined by an 'and', and a noun. The particle either preceded or followed the object NP. To minimise the potential influence of German, we created all sentences in the future tense, as in this context the particle is preverbally attached to the verb. All items followed the same structure: an animate subject noun phrase + an auxiliary verb + a main verb + (particle) + an inanimate object noun phrase + (particle) + a prepositional phrase (see Examples (6)–(9)).

(6) My uncle will hang up new pictures in the living room. (shortNP, preNP)

(7) My uncle will hang new pictures up in the living room. (shortNP, postNP)

(8) My uncle will hang up the new and pretty pictures in the living room. (longNP, preNP)

(9) My uncle will hang the new and pretty pictures up in the living room. (longNP, postNP)

Importantly, only those verb-particle constructions that exist in all four languages were chosen for the study. The sentences were written in English and subse-

2. An anonymous reviewer pointed out that while some of the verbs used in the items can naturally occur without a particle, others would be semantically anomalous without one. Since this could represent a potential confound — particularly in a self-paced reading paradigm — we conducted an additional analysis in which verb type was included as a two-level predictor in the models presented in Section 3. The model results remained unchanged, indicating that the inclusion of this confounding factor did not affect our findings.

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quently translated into Norwegian, Swedish, and Danish. They were also proofread by respective native speakers and altered based on their feedback. This guaranteed that participants were exposed to translation equivalents of the same sentences in both their L2 and L3, allowing for a close lexical match across the tested languages. As outlined in the following section, participants were tested in English and one of the Scandinavian languages during two separate sessions to minimise potential cross-language activation.

In the SPRT, half of the items were followed by a binary *yes* or *no* question to ensure that participants read the sentences for comprehension. The ratio of the two answers was equal, and the questions targeted one of the adjectives within the noun phrase.

Using a Latin square design, the items were counter-balanced across four presentation lists, meaning that each participant only saw the same lexical material in one of the conditions. All experimental items are available in the OSF repository.

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2.4 Procedure

Participation in the study consisted of two separate sessions. The first one was always conducted in L2 English, while the second session, which took place after a minimum of 7 days, always tested the L3 Scandinavian language of choice.

During each of the two testing sessions, participants first completed the self-paced reading task, which was divided into two blocks to minimise fatigue. The task was interspersed by the Dialang placement test. In the task, participants gradually read the sentences word-by-word in a linear, non-cumulative mode of presentation. Each new element appeared with a press of the spacebar, meaning that the reading pace was fully in control of the participants. After completing the online part of the study, the offline acceptability judgement task followed. In this task, the same items were presented in the centre of the screen and participants provided their judgements on a scale from 1 to 5 by pressing one of the keys on the keyboard. The task did not have any time constraint, and participants did not receive any feedback throughout.

All tasks were conducted using PsyToolkit (Stoet, 2010, 2017), a web-based software designed for running online experiments. In both the SPRT and the AJT, items were presented in a single line with white font on a black background. Each item was preceded by a fixation point. In the SPRT, the fixation point drew attention to the left, where the first element of the sentence was to appear. In the AJT, the fixation point remained visible in the centre of the screen for 500 ms. All items were randomised on a by-participant basis. Written instructions were provided prior to each task.

3. Results

3.1 Data analysis procedures

We analysed the data using linear mixed-effects models (LMEMs) in R, version 4.4.0 (R Core Team, 2024), with the lme4 package (Bates et al., 2015) and the lmertest package (Kuznetsova et al., 2017). In the AJT analysis, the dependent variable was participants' ratings in L2 English on a 5-point scale. Although the optimal approach for analysing ordinal data, such as Likert scale ratings, is still a topic of ongoing debate, LMEMs have been shown to yield fewer false positives (Type I errors) compared to traditional ordinal data analysis methods (Kizach, 2014). In the SPRT analysis, the dependent variable consisted of log-transformed reading times in L2 English. Having collected equivalent data in both L2 and L3 from the same participants, we used their L3 ratings as a continuous predictor of successful acquisition of the examined structure. We considered this a more fine-grained measure compared to their global proficiency score offered by Dialang. For the Swedish and Danish groups, responses to ungrammatical items were inverted, meaning that a rightful rejection of the ungrammaticality, rated as '1', resulted in a high accuracy score of '5'. The ratings for grammatically correct items were left intact. The final L3 Accuracy score was then calculated for each participant as a mean score from all 32 items. As Norwegian allows for both word orders, there were no inversions involved, and a mean from original ratings was computed instead. Consequently, L3 Accuracy scores were as follows: $M_{\text{Norwegian}} = 4.54$, $SD = 0.34$, $M_{\text{Danish}} = 3.20$, $SD = 0.43$, $M_{\text{Swedish}} = 3.46$, $SD = 0.42$. It should be noted that L3 Accuracy in Norwegian was very high, and few participants scored below 4. Therefore, the results of the N group at lower proficiency levels should be interpreted accordingly.

The fixed effects in all models included Group, Position, Length, L2 Proficiency, and L3 Accuracy, as well as the interactions: Position × Length, Group × Position, Position × L3 Accuracy, Group × L3 Accuracy, and Group × Position × L3 Accuracy. For coding categorical variables, we applied contrast coding as follows: Position (pre = −0.5, post = +0.5), Length (short = −0.5, long = +0.5), and Group (S = −1, N = 0, D = +1). German Proficiency was included as a covariate, and all continuous variables were centred and transformed into z-scores.

We initially specified models with a maximal random-effects structure justified by the design. This included by-participant random slopes for Position and Length, and by-item random slopes for Position, Length, Group, L2 Proficiency, and L3 Accuracy (e.g., Linck & Cunnings, 2015). We retained only the maximal models that converged without warnings (Barr et al., 2013; Bates et al., 2015) and

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selected the best-fitting model using the AICc (corrected Akaike Information Criterion) in the MuMIn package (Bartoń, 2024).

To determine main effects and interactions from the models, we performed a type III analysis of variance (ANOVA) using Satterthwaite's method, implemented in the car package (Fox & Weisberg, 2019). The emmeans (Lenth, 2024) package was used for post-hoc analyses, with a Tukey adjustment for multiple comparisons. We also examined the multicollinearity of the fixed effects using the vif() function in R. All variance inflation factor (VIF) values were below 3, indicating no significant multicollinearity (Zuur et al., 2010).

The results of the type III Anova for significant effects and interactions are reported in the text, while the model outputs are available in the OSF repository.

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3.2 Acceptability Judgement Task in L2 English

The mean rating for the grammatical filler items was 4.85 ($SD = 0.24$), while for the ungrammatical filler items it was 2.14 ($SD = 0.85$). One participant who rated the grammatical filler items very low ($M = 3.38$) was excluded from the analysis. The model included random intercepts for Participant and Item, as well as a by-participant random slope for Position. Figure 1 presents the predicted values of Rating, taking into account Group, Position, and Length.

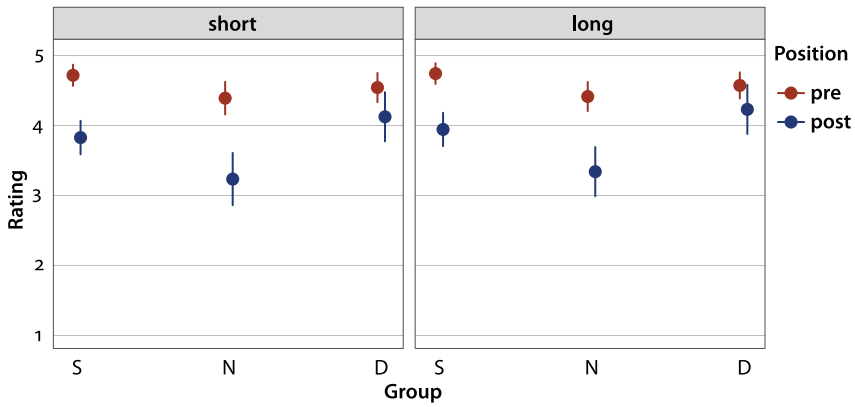


Figure 1. L2 English Rating depending on Group, Position, and Length

The main effect of Group was significant, $F(2, 154) = 6.17$, $p = .003$, with overall higher ratings in the D group ($M = 4.37$, $SE = 0.11$, $p = .005$) and S group ($M = 4.30$, $SE = 0.08$, $p = .004$) compared to the N group ($M = 3.84$, $SE = 0.12$), and no difference between the D and S groups ($p = .889$). The main effect of Position was significant, $F(1, 155) = 65.89$, $p < .001$. Participants preferred the preNP position

($M = 4.56$, $SE = 0.06$) over the postNP position ($M = 3.78$, $SE = 0.10$). The main effect of Length was also significant, $F(1, 4828) = 11.25$, $p < .001$. Participants preferred long NPs ($M = 4.20$, $SE = 0.07$) over short NPs ($M = 4.14$, $SE = 0.07$). Finally, the main effect of L2 Proficiency was significant, $F(1, 154) = 5.03$, $p = .026$, with overall higher ratings at higher L2 Proficiency levels.

As for the interaction components, the model returned a significant interaction between Group and Position, $F(2, 155) = 4.38$, $p = .014$. While the S and N groups rated the preNP position higher than the postNP position ($ps < .001$), the D group did not ($p = .281$). Additionally, the D group rated the postNP position higher than the N group ($p = .007$). The other between-group differences were not significant for either the preNP position or postNP position. The interaction between Position and Length was also significant, $F(1, 4828) = 4.70$, $p = .030$. It confirmed the main effects of Position and Length, i.e., the preference for the preNP position over the postNP position and for long NPs over short NPs. While the preNP position was rated equally high regardless of whether the NP was short ($M = 4.55$, $SE = 0.06$) or long ($M = 4.57$, $SE = 0.06$, $p = .836$), the postNP position was rated higher when the NP was long ($M = 3.83$, $SE = 0.10$) than when it was short ($M = 3.73$, $SE = 0.10$, $p = .001$). L3 Accuracy interacted with Group, $F(2, 154) = 11.93$, $p < .001$, and modulated the interaction between Group and Position, $F(2, 155) = 10.98$, $p < .001$.

To analyse the interactions involving L3 Accuracy, we explored participants' ratings at three levels of L3 Accuracy: low (20th percentile), medium (50th percentile), and high (80th percentile). The S and D groups showed overall higher ratings than the N group at the low and medium level ($ps \leq .001$), but not at the high level ($ps > .200$). As for the triple interaction, the preference for the preNP position over the postNP position was significant in the N and S groups at all three levels ($ps \leq .010$). In the D group, however, this preference was significant at the low ($p < .001$) and medium level ($p = .018$), but not at the high level ($p = .286$). For the preNP position, the only significant difference was between the S and N groups at the medium level ($p = .035$), with higher ratings in the S group. For the postNP position, the D and S groups did not differ at either level ($ps > .230$), but they showed lower ratings compared to the N group at the low and medium levels ($ps \leq .003$). At the high level, the S group rated the postNP position lower compared to the N group ($p = .015$), while the other between-group differences were not significant ($ps > .230$). Figure 2 presents the interaction between Group, Position, and L3 Accuracy.

To summarise, participants showed a preference for the preNP position over the postNP position and for long NPs over short NPs. The preNP position was preferred regardless of the length of the NP. For the postNP position, however, we found that participants preferred the post-posed particle in the long rather

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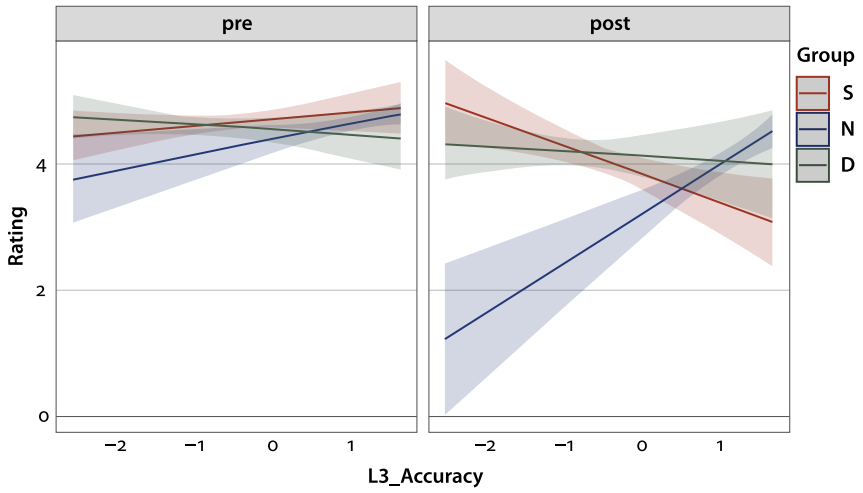


Figure 2. The interaction between Group, Position, and L3 Accuracy for L2 English Rating

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than short NPs, although this difference was very small. With increasing proficiency in L2, participants' ratings were higher, indicating a development towards the acceptance of both the pre- and postNP position. Considering cross-linguistic influence, we found that the D group did not distinguish between the pre- and postNP position, and, more importantly, rated the postNP position higher compared to the N group. Although an increased preference for the preNP position in the S group compared to the other groups was descriptively present (see Figure 1), it only reached significance at the medium level of L3 Accuracy relative to the N group, arguably due to the preNP position being the default position of the particle for all groups and the N group also developing towards the L3 target. Finally, the S group rated the postNP position lower compared to the N group at the high level of L3 Accuracy. Additionally, as evident from the confidence intervals in Figure 2, at the high level of L3 Accuracy, participants in the S and D groups showed a larger variability in their ratings compared to the N group.

3.3 Self-paced Reading Task in L2 English

Mean accuracy on comprehension questions was 96% ($SD = 5.05$). Three participants with an accuracy lower than 75% were excluded from the analysis. We collected reading times on the Verb (pre-critical region), Particle (critical region), and the two words following the particle (spill-over regions 1 and 2: SO1 and SO2). The spill-over regions refer to the words that follow the particle when it is located in the postNP position, i.e., after the direct object. This choice was guided

by two methodological considerations. First, the preNP position is the default position for the particle, where we do not expect significant processing difficulty or cognitive load to affect the following regions. Second, the lexical material in short and long NPs was different, meaning that the words following the pre-posed particle (i.e., the direct objects) could not be directly compared between these two types of NPs. Therefore, we analysed how the three participant groups processed the post-posed particle and the words following it. For clarity, we provide an example item in which the spill-over regions are marked (10)–(13).

(10) My uncle will **hang** [pre-critical region] **up** [critical region] new pictures **in** [SO1] **the** [SO2] living room. (shortNP, preNP)

(11) My uncle will **hang** [pre-critical region] new pictures **up** [critical region] **in** [SO1] **the** [SO2] living room. (shortNP, postNP)

(12) My uncle will **hang** [pre-critical region] **up** [critical region] the new and pretty pictures **in** [SO1] **the** [SO2] living room. (longNP, preNP)

(13) My uncle will **hang** [pre-critical region] the new and pretty pictures **up** [critical region] **in** [SO1] **the** [SO2] living room. (longNP, postNP)

All segments with RTs below 100 ms and above 3,000 ms were excluded from the analysis (Verb: 0.31%, Particle: 0.08%, SO1: 0.10%, SO2: 0.10%). For the remaining data, we removed RTs that exceeded 3.0 *SD*s of each participant's mean (Verb: 1.68%, Particle: 2.07%, SO1: 1.80%, SO2: 2.09%). A table presenting the descriptive RTs is available in the OSF repository.

Starting with the Verb, as the pre-critical region, the model included random intercepts for Participant and Item, with no random slopes. The model did not return any significant main effects or interactions. The main effect of L3 Accuracy was marginally significant, $F(1,152) = 3.90$, $p = .050$, with longer RTs with increasing L3 Accuracy.

The model for the Particle, the critical region, included by-participant random slopes for Position and Length and a by-item random slope for Position. Within this model, the main effect of Position was significant, $F(1,147) = 32.41$, $p < .001$, with shorter RTs for the preNP position compared to the postNP position. The main effect of Length was also significant, $F(1,158) = 7.79$, $p = .006$, with shorter RTs for short NPs than for long NPs. Finally, the interaction between Position and Length was significant, $F(1,4481) = 6.17$, $p = .013$. Participants read the pre-posed Particle equally fast regardless of whether the NP was short or long ($p = .969$). The post-posed Particle was read faster when the NP was short than when it was long. The main effect of Group and the interactions involving Group were not significant.

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For the SO1, the model included random intercepts for Participant and Item and a by-item random slope for Position. The model returned a significant main effect of Length, $F(1, 4795) = 12.74$, $p < .001$, with shorter RTs for the short NPs than for the long NPs. The main effect of Group and the interactions involving Group were not significant. The main effect of Position was significant, $F(1, 189) = 12.81$, $p < .001$, with shorter RTs for the postNP position (*My uncle will hang new pictures up* ***in*** *the living room*) than for the preNP position (*My uncle will hang up new pictures* ***in*** *the living room*). This paradoxical speed-up effect could be attributed to differences in syntactic integration. When the particle immediately follows the direct object, the parser can efficiently complete the *verb + object + particle* structure before encountering additional material. By the time the reader reaches *in*, the verb phrase (*hang new pictures up*) is already fully integrated, facilitating faster processing of the subsequent prepositional phrase. This is also in line with anti-locality effects in sentence processing, which show than increasing the distance between an argument and its head can produce a speed-up at the site of dependency completion (Nicenboim et al., 2015). In contrast, when the particle precedes the direct object, the parser encounters the particle before identifying the direct object, delaying the closure of this structure. This delay may increase the overall processing load and result in slower reading times at the subsequent region. As the AJT results and the reading times for the Particle provide evidence for the preNP position being preferred over the postNP position, we link this paradoxical effect to differences in syntactic integration rather than to difficulties in processing the pre-posed Particle.

Finally, the model for SO2 included random intercepts for Participant and Item and a by-item random slope for Position. Within this model, the interaction between Group and Position was significant, $F(2, 4780) = 4.05$, $p = .017$. Pairwise contrasts revealed that the S group read the SO2 faster when the Particle was pre-posed than when it was post-posed ($p = .007$). The other differences were not significant ($ps \geq .840$). The interaction between Group, Position, and L3 Accuracy was also significant, $F(2, 4781) = 3.30$, $p = .037$. A post-hoc analysis with L3 Accuracy at the low, medium, and high levels revealed no differences between the preNP and postNP position at the low level ($ps > .180$). At the medium level, the difference between the preNP and postNP position was significant in the S group ($p = .001$), but not in the D and N group ($p = .674$, $p = .912$, respectively). At the high level, both the S and N groups read the SO2 faster when the Particle was pre-posed than when it was post-posed ($p = .004$, $p = .010$, respectively), while the D group did not ($p = .276$). In addition, the estimated difference between the pre- and postNP position was larger in magnitude in the S group (*estimate* = −0.10) than in the N group (*estimate* = −0.03). Figure 3 visualises the interaction between Group, Position, and L3 Accuracy.

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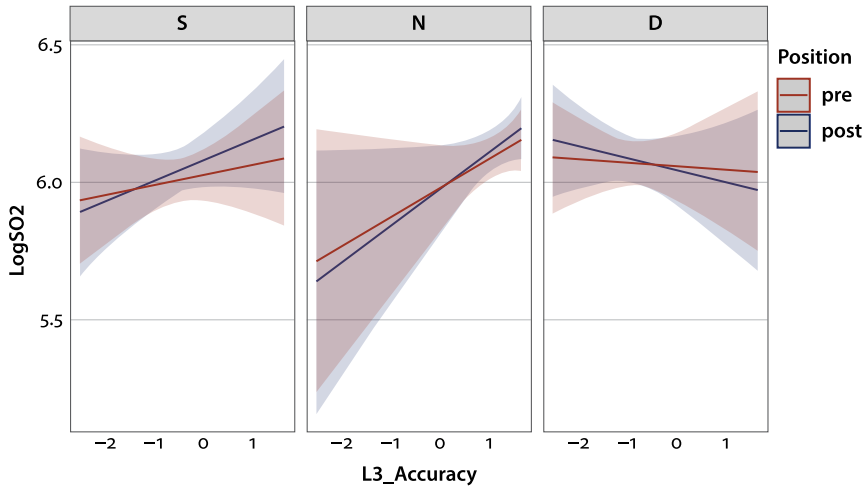


Figure 3. The interaction between Group, Position, and L3 Accuracy for the SO2 region

To summarise, the SPRT results — particularly the reading times for the Particle — confirmed the preference for the preNP position over the postNP position. However, in contrast to the AJT results, the SPRT findings indicated a preference for short NPs over long NPs, and for the postNP position with short NPs rather than with long NPs. Regarding CLI effects, the results for the second spill-over region (SO2) showed that the postNP position was linked to processing difficulty in both the S and N groups, with this effect being stronger for the S group. In contrast, the postNP position did not result in any processing difficulty for the D group at the high level of L3 Accuracy. Additionally, the lack of any relevant effects or interactions for the Verb confirmed that the results observed for the other regions were indeed attributable to our experimental manipulations. Again, the confidence intervals at the high L3 Accuracy in Figure 3 suggest greater variability in reading times for the S and D groups compared to the N group.

4. Discussion

One crucial observation, which will be expanded upon in the following discussion, is that participants overall preferred the preNP position of the particle, thus corroborating previous findings for both monolinguals (e.g., Hawkins, 1994) and bilinguals (e.g., Wulff & Gries, 2019) alike. Turning to the main objective of the study first, the results demonstrate that the addition of an L3 influenced both ratings and reading times in the previously acquired L2 across the different groups. The most notable finding concerns the Danish group, which with increasing accu-

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racy in L3 shows no differentiation between the two positions of the particle. Recall that in Danish, the particle is always located in the postNP position, regardless of the length of the object. This Danish-like preference appears to significantly inflate the group's ratings of the postNP position in English as compared to the Norwegian control group. Correspondingly, it also facilitates the processing of the post-posed particle, as Danish learners who have target-like knowledge in L3 are the only ones across the three groups to not exhibit elevated reading times in the spill-over region following the post-posed particle.

Building on the fact that the sensitivity to the postNP position is heightened for the other two groups in sentence processing, as evidenced by the second spill-over region, it should be noted that this effect is comparatively stronger for the Swedish group than for the Norwegian group. This ties with the fact that in Swedish, the particle consistently follows the opposing, preNP placement. It also translates into faster reading times of the spill-over region following the pre-posed particle, which is observable at intermediate and high levels of accuracy in L3. In terms of offline judgements, the Swedish group also disfavours the postNP placement as compared to the control participants, but this effect is only present in the highly advanced sub-group. Finally, Swedish learners generally rate the pre-posed particle more favourably than the other groups, but the difference only reaches significance at the intermediate level. However, it is possible that the overall high ratings for the pre-posed particle across all conditions and all groups could have curbed the observation of any additional facilitation stemming from the L3, especially since the Norwegian control group also clearly develops towards the L3 target. With growing L3 accuracy, the Norwegian group rates both positions of the particle in L2 English higher, which could be seen as a facilitatory boost from the additional language.

Due to the exploratory character of our investigation, we did not explicitly test the current proposals on rCLI. In tentative terms, we observe that, in line with the predictions of the DSH and the SE, the L2 indeed is affected. Following the SCH, the rCLI is observed between two languages that are typologically close to one another. However, as the structure is absent in the participants' L1 and because we did not test another typologically distant triad, we are unable to directly contribute to the debate on the differential vulnerability of both of the previously acquired languages.

However, our study provides empirical support for the Linguistic Proximity Model (LPM; Westergaard et al., 2017; Westergaard et al., 2023) and extends its applicability to regressive cross-linguistic influence. The LPM refers to constant interaction between multiple languages in the mind of a multilingual speaker, which "provides abundant opportunities for grammars to influence each other, and over time, this interaction may lead to representational changes, mainly

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in the language to be learned, **but also in the previously acquired grammars**" (Westergaard et al., 2023, p. 225, bold added). Adopting the model to rCLI, we propose that the present findings can be accounted for in terms of the co-activation of L3 syntax during L2 syntactic processing. The fact that the influence of L3 Scandinavian on L2 English was particularly pronounced when target-like knowledge of the relevant L3 structure was in place provides further support for the model. According to the LPM, cross-linguistic influence arises from a single mechanism — parsing — which, in our case, allows learners to draw on stable representations in the L3 when processing L2 input (Westergaard et al., 2023). Converging evidence for rCLI from both offline judgments and online sentence processing suggests that some representational changes occur in participants' L2 English due to the prolonged co-activation of L3 Scandinavian syntax.

In addition to the factors already identified as central to the model — namely proficiency, dominance, and structural complexity (Westergaard et al., 2023; Slabakova, 2017) — we propose the inclusion of a new factor: optionality. We hypothesise that rCLI is more likely to occur when previously acquired languages (L1 or L2) exhibit structural similarities to the L3 or permit optionality, that is, when they license two possible realisations of a given feature, while the L3 permits only one. Note that optionality has previously been proposed as a possible explanation for rCLI in the findings presented by Puig-Mayenco (2023).

The rationale behind this proposal is that adult language learners are typically dominant in their L1 and often more proficient in their L2 than in their L3. Therefore, in contrast to a developing L3 — characterized by underspecification in the interlanguage grammar — L2, and particularly L1, exhibit fewer cases of underspecification and, by extension, reduced likelihood of parsing failure. Having developed stable representations in L1 and L2, learners are generally able to suppress the co-activation of incongruent L3 structures or features when parsing L1 or L2 input. However, in the presence of structural similarities and/or optionality in L1/L2, the parser may deem L3-like structures suitable for parsing L1/L2 input, resulting in rCLI. In this sense, both structural similarity and, as we propose, optionality should be considered crucial factors for the occurrence of rCLI.

In addition, we delve into a new area of proficiency-dependent rCLI, operationalising L3 proficiency in terms of knowledge of the relevant structure. In a progressive direction, CLI is most robust at the initial stages, when it is driven by unstable or lacking representation for a given structure in the interlanguage. As the learner accumulates more substantial input and their representations become more stable, fewer instances of CLI are expected (e.g., Rothman et al., 2019; Westergaard et al., 2023). The few studies conducted on rCLI seem to have extended this line or reasoning by predominantly testing advanced L3 groups (e.g., Aysan, 2012; Puig-Mayenco, 2023), implying that target-like L3 knowledge

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is necessary for regressive influence to occur. The results of our cross-sectional study also align with this direction, though there is a slight difference in how early rCLI is manifested between the two groups. Danish learners, faced with a much more difficult task of acquiring the postNP order i.e., the marked, less frequent structure, only experience rCLI when target-like knowledge in L3 is in place. Notably, although these learners follow the generally preferred preNP placement when they are not yet target-like in L3 Danish, the acquisition of this structure clearly makes them indifferent to this distinction. The Swedish word order pattern, which overlaps with the overall preference for preNP, makes the effect harder to pin down. Although these learners give precedence to the preNP over the postNP position across the board, they only rate the preNP higher than the other groups at the intermediate level, possibly due to the fact that knowledge of the Norwegian controls is developing in parallel. These ceiling effects make it difficult to observe any additional facilitation for the pre-position in the Swedish group. For the post-position, however, it is clear that once the group acquires target-like knowledge in their L3, they strongly disprefer the ungrammatical Swedish pattern in their L2 English. Interestingly, the increasingly favourable ratings for both positions in L2 English observed in the control group may have resulted from a facilitatory boost from L3 Norwegian, as both languages allow for variable particle placement.

Crucially, our study demonstrates that L3 can also impact syntactic phenomena, suggesting that rCLI is not limited to phonological (e.g., Cabrelli Amaro, 2017a) or morphosyntactic (e.g., Cheung et al., 2011) features. Previously, Tsang (2016b) probed a potential non-facilitative effect of L3 French on the acquisition of adverb placement in L2 English, but found no supporting evidence. The fact that verb-particle constructions were found to be susceptible to differential influence from three languages highlights the need for further research on rCLI, targeting not only different areas of language, but also phenomena of varying complexity.

Notably, our study also provides additional evidence on environmental conditions in which rCLI can occur. According to the most common understanding of L1 attrition, change in an earlier acquired language is predominantly expected among learners immersed in the non-native environment for an extensive period of time, while their exposure to L1 remains limited (e.g., Schmid & Köpke, 2019). Recently emerging work highlights that such context may not be necessary for L1 changes to occur, as they are evidenced among both immersed and instructed bilinguals, albeit to a lesser degree among the latter group (e.g., Martín-Villena, 2023). Although our study focuses on changes introduced between non-native languages, it points to a similar direction, as the L2 adapts (a) in the absence of

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immersion in the L3 environment, (b) and despite continuous contact with the L2, as these learners report ongoing use of their L2 English.

Lastly, it is also important to note that the performance of the Danish and Swedish groups reveal much more variability compared to the Norwegian group, particularly among participants who have mastered the particle position in their L3. We interpret this finding as further evidence for the influence of L3 Danish and Swedish on L2 English. The Norwegian group is quite consistent in their ratings and reading times in L2 English for both the preNP and postNP positions, as both are correct in Norwegian and English. The other groups, however, exhibit a more diverse performance in L2 English, arguably because one particle position is more favourable in their L3 than the other.

Although rCLI is central to the present investigation, there are other considerable insights into the learners' performance regarding verb-particle constructions in general. The general preference for the adjacent placement of the particle in both ratings and reading times is aligned with both higher frequencies of this order reported in learner corpora (e.g., Wulff & Gries, 2019), as well as in experimental studies (e.g., Herbay et al., 2018). In this regard, it seems that the learners pattern similarly to monolingual speakers and recognise the pre-posed particle as the less marked position, making it easier to process. The role of NP length as a modulator presents a more complex picture. Previously, L2 learners were found to either disprefer the post-posed particle alongside long NPs (Herbay et al., 2018) or to show no sensitivity to the length manipulation (Schunack, 2017). The results of our study present a mixed picture: while the judgement data indicate a preference for the post-position with long NPs, the self-paced reading data suggest the opposite — a preference for the post-position with short NPs. As proposed by an anonymous reviewer, the judgement results may be attributable to an unintended confound. As previously noted, elements that are inferable from previous context tend to appear between the verb and the particle (e.g., Chen, 1986). In our study, the items in the short condition contained bare nouns, while the ones in the long condition included a definite article. Therefore, the learners may have interpreted the definite NPs as referring to known discourse, even in the absence of explicit contextual cues. This discrepancy in the stimuli may have contributed to the unexpectedly inflated ratings for the post-posed particle alongside long NP objects. These paradoxical ratings were also previously observed by Schunack (2017), who used definite NPs in all length conditions, but among native Norwegian speakers rather than Norwegian learners. The author suggested that they might be either item-specific, as particle placement can be affected by numerous factors beyond object length, or participant-specific, suggesting the role of individual variation.

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The discrepancy between the offline and online measures in our study — namely, the preference for long NPs in the judgement task but for short NPs in the self-paced reading task, along with the post-position being preferred with long NPs in the former and with short NPs in the latter — underlines the need for further studies on the acquisition of verb-particle constructions by L2 learners. Note that the difference between the ratings for long NPs ($M = 4.20$, $SE = 0.07$) and short NPs ($M = 4.14$, $SE = 0.07$), although statistically significant, was very small. This preference may not necessarily reflect particle placement, but could instead indicate participants' inclination toward more syntactically sophisticated sentences. Importantly, the results of the two tasks provide converging evidence for rCLI.

The final, more general observation is that the more proficient the learners are in their L2, the higher they rate all items across all conditions. This suggests that beyond experiencing rCLI, they become more aware of the variable particle placement in English.

In terms of limitations, our study would possibly have benefitted from testing the same participants in a longitudinal manner. We believe that recruiting large numbers of learners at successive stages of L3 development is an equally valid, yet much more feasible, solution. However, a truly longitudinal design, in which participants' competence at the onset of L3 acquisition would serve as a control state relative to their subsequent L3 development, would provide further corroboration of our results. Second, our study included a number of participants with knowledge of German. Although we alleviated the risk of CLI by using sentences that structurally do not overlap with German, controlled for self-reported proficiency in the analyses, and found that the vast majority reported beginner proficiency, one could argue that it should be excluded altogether. However, due to the Polish schooling system, the presence of German in the learners' repertoire cannot be easily avoided, and their exclusion would greatly limit the sample size.

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5. Conclusion

In summary, the study demonstrates that the addition of an L3 can influence word order in the previously acquired L2. Despite being equally highly proficient in L2 English, the three groups exhibit different behaviours in L2 following the addition of L3s with dissimilar word order patterns. Importantly, we extend the application of the Linguistic Proximity Model to rCLI and propose that structural similarity between the languages, along with the optionality permitted by the systems undergoing change, are the crucial modulators of rCLI. We believe that our study

makes an important contribution by shedding new light on the understudied, bidirectional character of third language acquisition.

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Data availability statement

Materials, data and R code that support the findings of this study are available in Open Science Framework at https://osf.io/hy39s/.

CRediT author statement

Anna Olszewska: funding acquisition; conceptualisation; methodology; investigation; data curation; writing — original draft; writing — review & editing; Kamil Długosz: supervision; formal analysis; visualisation; writing — original draft; writing — review & editing.

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Appendix M: Article 3 (Olszewska & Długosz, 2026)

Olszewska, A., & Długosz, K. (2026). Regressive cross-linguistic influence as co-activation: Can L3 Scandinavian trigger V2 in L2 English? *Second Language Research*. In press.

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Regressive cross-linguistic influence as co-activation: Can L3 Scandinavian trigger V2 in L2 English?

Abstract: This study investigates regressive cross-linguistic influence (rCLI) from developing L3 Norwegian, Swedish, or Danish to advanced L2 English among L1 Polish speakers. We focus on three phenomena related to second position finite verb placement (V2), differing in frequency and input ambiguity: V2 with adverbial fronting, V2 with object fronting, and adverb placement in main clauses. Using three tasks targeting comprehension and production – an acceptability judgement task, a self-paced reading task, and an oral production task – we compare two groups of L3 (n = 163) and L2 learners (n = 71) matched in L2 English proficiency. We found modest but consistent evidence for rCLI: compared to the L2 group, L3 learners were more likely to accept V2 items, were less sensitive to V3 violations, and produced occasional instances of V2. Structure-specific rCLI emerged only in the judgment task, with the strongest effects in V2 with adverbial fronting, weaker effects in adverb placement, and no effects in V2 with object fronting. Extending the Linguistic Proximity Model to rCLI, we argue that the underlying mechanism is the same as in progressive CLI: co-activation. However, because L2 grammars are more stable and less underspecified than a developing Ln, co-activation does not lead to L2 grammar restructuring.

Keywords: regressive cross-linguistic influence; regressive transfer; Scandinavian languages; English; word order; V2; adverb placement

1. Introduction

The source and extent of cross-linguistic influence (CLI) is a central focus in research on third and additional language acquisition, as L3 learners draw on two potential source languages rather than one. Current models make different predictions about the factors shaping CLI, giving precedence to typological similarity, structural similarity, or L1/L2 status (e.g., Rothman et al., 2019). While some accounts are limited in scope to the initial stages of L3 acquisition, other seek to theorise its development beyond the point of Ln onset.

The latter perspective is exemplified by the Linguistic Proximity Model (LPM; Mykhaylyk et al., 2015; Westergaard et al., 2017), which holds that all languages in the learner's repertoire remain co-activated and hence interact at the level of individual linguistic properties. Under this view, CLI can be observed at any stage of Ln development. While it is primarily driven by abstract structural similarity, it can be modulated by additional factors such

as frequency or ambiguity in the input – a point also emphasised by the Scalpel Model (Slabakova, 2017). These accounts provide a framework for investigating not only the progressive direction of CLI, but also its multidirectional nature – specifically, the effects that acquiring a novel language may have on already existing grammars.

This study contributes to this emerging line of research on regressive cross-linguistic influence (rCLI)[1] by investigating the effect of developing L3 Norwegian, Swedish, or Danish on advanced L2 English among L1 Polish speakers. We examine three structures related to second position finite verb placement (V2) – V2 with adverbial fronting, V2 with object fronting, and adverb placement in main clauses – each differing in L3 frequency and input ambiguity in the L2. To test how these property-specific variables modulate rCLI, we employ an acceptability judgement task (AJT), a self-paced reading task (SPRT), and an oral production task (OPT) to provide comprehensive insights into the fine-grained mechanisms driving L3-induced change in previously acquired grammars.

2. Regressive cross-linguistic influence in a multilingual context

When treated as a distinct phenomenon, rCLI has been addressed within four theoretical frameworks to date.

The Differential Stability Hypothesis (DSH; Cabrelli Amaro, 2017), originally formulated for phonology (Cabrelli Amaro & Rothman, 2010; Cabrelli Amaro, 2013) and later extended to morphosyntax, links susceptibility to rCLI to age of acquisition. L2, as a later-acquired language, is assumed to be less stable and therefore more prone to L3 influence than L1. This was supported by a mirror-image study involving English–Spanish learners of L3 Brazilian Portuguese, in which both experimental groups showed effects on acceptability judgements regarding raising across a dative experiencer, but the influence was stronger on L2 Spanish rather than on L1 Spanish.

In the first empirical test of the DSH, Puig-Mayenco (2023) employed a self-paced reading paradigm with Catalan–Spanish–English trilinguals, who had an early-acquired L2 and were recently immersed in the L3 environment. Using a similar mirror-image design (inverting L1s and L2s while keeping L3 constant), the study found an effect only on L2, yielding partial support for the DSH. The absence of effects on L1 was deemed unsurprising, given the

[1] We adopt *regressive cross-linguistic influence* as an umbrella term encompassing phenomena related to both representation and processing (see Westergaard et al., 2023). Other studies have also used *regressive transfer* (e.g., Puig-Mayenco, 2023), *backward transfer* (e.g., Park & García-Mayo, 2024) and *reverse transfer* (e.g., Tsang, 2016a).

participants' recent L3 immersion – a condition often considered essential in L1 attrition research. Initially, optionality was considered as a possible explanatory factor, as the L2 structures that were affected by rCLI allowed for both the presence and absence of sentential negation, while the unaffected ones did not. However, based on comparison with earlier findings, the author ultimately proposed the Sandwich effect (SE), suggesting that L2 is particularly vulnerable to influence when a property follows the same pattern in L1 and L3.

Subsequently, Brown-Bousfield and Chang (2023) proposed the Similarity Convergence Hypothesis (SCH), according to which rCLI is driven by typological similarity between the interacting languages, though the account has so far been limited to phonology. This proposal was motivated by a parallel, mirror-image study involving English–German learners of L3 Spanish, in which L3 influence on speech rhythm was observed only in L1 English, the typologically more similar language.

Recently, Olszewska and Długosz (2025) investigated Polish–English learners of L3 Norwegian, Swedish, or Danish. The study focused on particle placement – which is variable in English and Norwegian but restricted to a single position in Danish and Swedish – and reported shifts in word order patterns in both judgement and self-paced reading data in the latter two L3 groups. The findings were framed within the Linguistic Proximity Model, which attributes CLI to the co-activation of structurally similar grammars – in this case, the L3 grammar during L2 processing. Extending the model, the authors proposed that optionality in the language undergoing change is the key factor in rCLI, which they link to different degrees of underspecification in learners' L1/L2 versus L3 grammars. CLI in general is driven by underspecification – in the progressive direction, the more unstable the incrementally built L3 grammar, the more cases of CLI are expected. When the regressive direction of influence is considered, it should be noted that learners are typically dominant in their L1 and more proficient in their L2 than in their L3. Consequently, these two previously acquired languages typically exhibit fewer cases of underspecification than the developing L3 system and are therefore less prone to error, allowing learners to suppress the co-activation of incongruent L3 structures or features when parsing L1 or L2 input. However, the presence of structural similarities and optionality in L1/L2 complicates the picture, as the parser may accept L3-like structures as suitable for parsing L1/L2 input, resulting in rCLI. Structural optionality is therefore argued to promote rCLI.

Although theoretical accounts are still emerging, some exploratory studies building on the comparison of a trilingual and a bilingual group have yielded mixed findings. For example, Cheung et al. (2011) reported L3-induced non-facilitation in tense–aspect among

Chinese–English learners of L3 German, whereas Fung and Murphy (2016) found no such effect for L3 French. Aysan (2012) observed effects in pronoun omission among Turkish learners with non-pro-drop L2 English and pro-drop L3 Italian, while Kim (2023) showed that L3 Spanish influenced Korean–English learners' generic interpretation of bare plurals. Importantly for our study, Tsang (2016a, 2016b) tested several structures within the same population and reported facilitative effects of L3 French on L2 English number agreement and past tense marking, but no rCLI for adverb placement. Overall, however, most studies point to facilitative rCLI, particularly from L3 Romance or Germanic to L2 English (e.g., Llinàs-Grau & Puig-Mayenco, 2016; Park & García-Mayo, 2024; Velnić et al., 2026; Xiao, 2018).

Together, these findings highlight the complex nature of rCLI and underscore the need for further research that systematically varies: (i) linguistic properties – in the syntactic domain, only two have been investigated so far, with adverb placement yielding null results (Tsang, 2016b), and particle placement proving susceptible to influence (Olszewska & Długosz, 2025); (ii) experimental tasks – current research relies heavily on acceptability judgements (e.g., Cabrelli Amaro, 2017) and written production (e.g., Hui, 2010), with fewer studies employing real-time processing measures (e.g., Puig-Mayenco, 2023) and none using oral production; (iii) L3 proficiency levels – most work focuses solely on advanced learners (e.g., Park & García-Mayo, 2024), although the few available cross-sectional studies suggest that effects may already be observed at intermediate levels (Olszewska & Długosz, 2025; Xiao, 2018) and/or develop later (Tsang, 2016a; 2016b); and (iv) learner backgrounds – there is a dominance of studies on Chinese–English speakers (e.g., Cheung et al., 2011), which leaves other language constellations underrepresented.

3. Verb and adverb placement in the examined languages

Norwegian, Swedish, and Danish exhibit second-position finite verb placement (V2) in main declarative clauses (e.g., Holmberg, 2015).[2] Consequently, subject–verb inversion is obligatory if the first position is occupied by any constituent other than the subject (1a, in Norwegian), while adverbs are placed post-verbally (2a).

[2] Except for a few contexts in which non-V2 word order occurs, mostly driven by dialectal variation or pragmatic reasons; see e.g., Lohndal et al. (2020) for Norwegian or Westendorp (2021) for Danish and Swedish. In material preparation, we avoided ambiguous contexts.

(1) a. *I går **reiste de** til Sverige.*
yesterday travelled they to Sweden
b. 'Yesterday, **they travelled** to Sweden.'

(2) a. *Han **leser ofte** bøker.*
he reads often books
b. 'He **often reads** books.'

In contrast, English lacks obligatory V2,[3] and constituent fronting results in V3 rather than subject–verb inversion (1b). Adverb placement depends on the verb type; when lexical verbs are involved, adverbs are typically placed in the pre-verbal position (2b).

The languages also differ in terms of information structure. In the Scandinavian branch, subject-initial SVX clauses are the most common, accounting for approximately 60–70% of declarative sentences in written and spoken corpora (e.g., Bohnacker & Rosen, 2007, for Swedish; Eide & Sollid, 2011, for Norwegian; Kristensen, 2012, for Danish). XVS clauses, however, are also frequent – in particular, adverbials are routinely fronted (ca. 22–23% of corpora occurrences), while object fronting is rare (ca. 3–9%). In English, by contrast, SVX is also the predominant word order and XSV occurs in only 6.8% of declaratives (Jensen et al., 2019, p. 7), making element fronting far less commonly attested than in Scandinavian. Although exact proportions of fronted constituents in English are not documented, non-obligatory adverbials are known to appear clause-initially, while objects in this position are strikingly rare (e.g., Chamonikolasová, 2009).

Polish word order is more flexible compared to the rigid Germanic patterns, and constituent ordering is largely guided by pragmatic factors. Based on two corpora, Castle et al. (2026) report that SVO is most prevalent (58.9–65.4% of all instances), followed by SOV (8.9–12.4%), OVS (9.1%–9.7%), and OSV (4.5–5.9%). To our knowledge, no corpus data are currently available on adverb placement or the relative frequency of fronted elements. We therefore collected acceptability judgements from 27 Polish–English bilinguals (see the OSF repository). This provides a reference point, confirming that these different constituent orderings are available in L1 Polish, allowing the study to primarily focus on L3→L2 influence.

[3] Although it exhibits residual V2 in limited contexts, such as wh-questions, as a remnant of a more systematic V2 system (e.g., Holmberg, 2015).

4. Transferability of V2 into Ln English

While V2 has been examined in multiple contexts and learning situations (Bohnacker & Westergaard, 2024, for an overview), one particularly relevant perspective to this study concerns instances in which it spills over into non-V2 systems in a non-target-like manner.

Among simultaneous bilinguals, Dutch–English children were found to be more likely to accept XVS word order in English than their monolingual peers, but showed no CLI in oral production (Bosch & Unsworth, 2021).

In sequential L2 acquisition, non-target-like verb placement resembling V2 typically emerges at early stages and gradually declines over L2 development (e.g., Stadt et al., 2020; Westergaard, 2003), though traces can remain even at higher levels of attainment (e.g., Rankin, 2012; Robertson & Sorace, 1999). In this domain, Westergaard (2003) showed that Norwegian beginner learners of L2 English acquired target-like finite verb placement (i.e., V3) earlier with fronted adverbials than with fronted objects. Subject-initial clauses with adverbs – which in English can occupy different positions depending on verb type – were acquired last. The study highlighted the crucial role of frequency and ambiguity in learner input: because objects in the clause-initial position are infrequent, learners take longer to inhibit non-facilitative V2 from the L1. Likewise, since adverbs can appear in multiple positions in subject-initial clauses, their salience in the input is reduced, and the development is slower.[4] Concerning the type of fronted constituent, Rankin (2023) examined a written production corpus of German–English learners and found a contrasting trend. While XVS in the material was overall rare, making the conclusions tentative, non-target-like verb placement resembling V2 in English occurred more often with fronted adverbials than with topic NPs.

In an L3 context, simultaneous Russian–Norwegian learners of subsequent English were found to experience CLI from both previously acquired languages. In studies on adverb placement, these trilinguals were more target-like than Norwegian–English learners, yet scored lower than Russian–English learners, suggesting persistent non-facilitation from Norwegian V2 (Mykhaylyk et al., 2015; Westergaard et al., 2017). A follow-up study by Jensen et al. (2023) examined a broader set of properties and identified property-specific developmental trajectories. For V2 with adverbial fronting, no group differences were found, indicating that this structure was acquired early on due to its high salience in the input. In contrast, for subject-initial clauses with adverbs, the trilingual group patterned with Russian–English

[4] This discrepancy is assumed to arise from the asymmetric nature of V2, which consists of a set of smaller, non-monolithic rules (Westergaard et al., 2019). Under this view, subject-initial and non-subject-initial clauses are derived via different syntactic operations.

learners. Given the availability of both Russian and Norwegian in the learners' repertoires, the authors interpreted this finding as indicative of later stages of L3 development, characterised by successful suppression of non-facilitative influence from Norwegian and continued facilitation from Russian.

Considering instructed V2 acquisition, Angelovska (2017) examined Russian learners with advanced L2 German and L3 English, whose L3 proficiency ranged from beginner to intermediate. Across written and oral elicitation tasks, CLI in the L3 was limited overall (4% instances of *XVS, compared with 12% XSV and 84% SVX), but dependent on task modality and L3 proficiency – learners exhibited more CLI in speaking than in writing, and at beginner rather than intermediate stages. Sanchez (2020) investigated written production of simultaneous Catalan–Spanish learners of L3 German and L4 English, focusing on the relationship between L3 accuracy and CLI robustness in L4. The results revealed a counter-intuitive pattern – CLI into L4 English was stronger among learners with lower, rather than higher, L3 accuracy. The author argued that at lower levels of L3, learners have more difficulties with inhibiting co-activation from the underdeveloped source language, leading to a higher incidence of CLI in L4.

5. The study

5.1 Research questions

Building on findings from previous studies on V2 transferability and rCLI in multilingual learners, this study addresses the following research questions:

RQ1. To what extent does rCLI from L3 to L2 manifest in different V2-related structures – namely, V2 with adverbial fronting, V2 with object fronting, and adverb placement in main clauses – and do structure-specific factors such as L3 frequency and ambiguity in the L2 input condition the observed patterns?

RQ2. Is the effect in L2 modulated by learners' developing knowledge of the relevant structure in L3?

RQ3. Do task modality differences – online comprehension (SPRT), offline acceptability judgement (AJT), and oral production (OPT) – modulate rCLI effects?

Regarding RQ1, L1 sensitivity to micro-variation in verb placement has been shown to result in different CLI patterns in L2, reflected in earlier vs. later acquisition of specific properties (e.g., Westergaard, 2003). This developmental variability maps directly onto the frequency of these properties in learners' input, with more frequent properties giving rise to stronger CLI and to earlier acquisition. Although the learning situation is vastly different – inhibiting V2 from L1 to L2, versus from L3 to L2 – we assume that these factors will also matter in the regressive direction of CLI. In line with findings on progressive CLI, we expect rCLI to manifest for V2 with adverbial fronting, which is frequent in the L3, but not for V2 with object fronting, which is comparatively rare. We further assume that ambiguity in the L2 will modulate these effects: because English adverbs can occur in clause-initial, -medial, or -final position, with placement additionally conditioned by verb type, this variability is likely to constrain rCLI more than in cases involving unambiguous verb placement, which in English typically occurs in the V3 position.

With respect to RQ2, we predict that rCLI in L2 will strengthen with increasing accuracy in L3. This expectation aligns with earlier findings, where rCLI first appeared at intermediate stages and subsequently became more robust (Olszewska & Długosz, 2025), or was found only at advanced levels (Tsang, 2016a, 2016b). It is worth noting, however, that Xiao (2018) detected rCLI shortly after the onset of L3 acquisition with no further facilitation, and other studies only considered advanced L3 learners.

Turning to RQ3, we examine whether potential rCLI effects differ as a function of task modality. The three tasks tap into distinct levels of linguistic processing: SPRT targets online comprehension and is sensitive to short-term co-activation of grammatical representations; AJT reflects offline comprehension and may capture more stable representational properties; and OPT requires the retrieval and deployment of grammatical knowledge in production. Given these differences, rCLI effects may vary in their robustness across tasks rather than manifest uniformly. We therefore do not advance strong directional predictions for production in the regressive domain. While increased cognitive demands may facilitate cross-linguistic influence in production, extended planning time may equally allow speakers to suppress non-target representations. By comparing patterns across the SPRT, AJT, and OPT, RQ3 aims to determine whether task-related processing demands modulate the visibility of rCLI effects.

All materials, data, and analysis code supporting the findings of this study are available in the OSF repository at https://osf.io/7vdn4.

5.2 Participants

Two groups of learners participated in the study: 171 Polish–English–Scandinavian trilinguals (L3 group) and 74 Polish–English bilinguals (L2 group). All had acquired L2 English in instructed settings and reported advanced proficiency prior to testing. Eleven participants were excluded, as they reported native knowledge of an additional language or having resided abroad for over a year.

The trilingual experimental group included 163 students or graduates of bachelor and master programmes in Scandinavian Studies. All began learning Norwegian, Swedish or Danish at university. Recruiting students from different years enabled a cross-sectional view of developing L3 proficiency. In total, the group included 65 Polish–English learners of Norwegian, 52 learners of Swedish, and 46 learners of Danish. Given the close structural similarity and the shared requirement for finite verb placement in second position among the Scandinavian languages, the learners were considered together for a more robust statistical analysis.

The bilingual control group comprised 71 first-year university students majoring in either Scandinavian Studies or German and English Studies. Both programmes were designed for absolute beginners in German and the Scandinavian languages, and testing for the study took place at the very start of the academic year. Therefore, none had yet received any university-level language instruction. This ensured that the background profiles of both groups were comparable to the highest possible degree, with the presence or absence of L3 Scandinavian knowledge being the sole distinguishing factor.

Proficiency in L2 English and L3 Scandinavian was assessed using a modified Dialang placement test (Alderson, 2005), in which 75 real and nonce words were randomised and presented on-screen one at a time. Participants responded by pressing Y or N on the keyboard (for ‘yes’/’no’; J/N in the Scandinavian versions), and scored one point for each correct judgement, with a maximum score of 75 (e.g., Lloyd-Smith et al., 2021). In addition, participants provided self-reported ratings of listening, speaking, reading and writing skills on a 7-point scale, from which an average score was computed.

Participants also completed the Language History Questionnaire (LHQ3; Li et al., 2020), and their background information is summarised in Table 1.

Table 1. Participants' characteristics.

	L1 Polish L2 English (L2 group)	**L1 Polish L2 English L3 Swedish, Norwegian or Danish (L3 group)**
n	71	163
Chronological age	19.80 (1.75)	22.40 (3.32)
Gender	49 female, 15 male, 7 other	128 female, 29 male, 6 other
AoA: L2	6.20 (1.78)	6.41 (2.04)
Dialang: L2	68.20 (5.16)	67.40 (4.73)
Self-reported proficiency: L2	6.05 (0.52)	6.01 (0.70)
AoA: L3	N/A	19.10 (1.73)
Dialang: L3	N/A	56.40 (7.09)
Self-reported proficiency: L3	N/A	4.72 (1.17)

Note: N/A, not applicable; AoA, age of acquisition.

Mann–Whitney *U* tests showed no significant group differences in L2 English regarding the Dialang score, AoA, or self-reported proficiency (all *p*s ≥ .142). However, a significant difference in chronological age emerged ($p < .001$), reflecting the fact that the control group consisted of newly enrolled students, while the experimental group included both students and recent graduates. Given the groups' otherwise comparable backgrounds, this age difference is not expected to affect the study's outcomes.

Both groups included participants with additional knowledge of German. In the L3 group, 76 participants reported no such knowledge, 57 had beginner-level proficiency (A1–A2 according to CEFR; $M_{\text{self-report}} = 2.48$, $SD = 0.90$), and 30 indicated intermediate or higher proficiency (B1–C1; $M_{\text{self-report}} = 5.13$, $SD = 0.60$). In the L2 group, 29 participants reported no knowledge, 36 were at A1–A2 level ($M_{\text{self-report}} = 2.48$, $SD = 0.78$), and 6 at B1–C1 ($M_{\text{self-report}} = 5.17$, $SD = 0.83$). A Mann-Whitney *U* test showed no significant difference in self-reported German proficiency between the groups ($p = .989$). Importantly, participants did not report any current use or active exposure to German; rather, their knowledge typically reflected earlier school-based instruction. This contrasts with the L3 Scandinavian languages in the L3 group, which participants were studying on a daily basis at the time of testing. Nevertheless, as German main clause word order resembles that of the Scandinavian languages, German proficiency was included as a covariate in the analyses.

5.3 Materials

5.3.1 Acceptability judgement task and self-paced reading task

The same stimuli were used in both AJT and SPRT. For each of the three tested structures, we had 8 items per word order pattern: SVA, ASV, AVS (3a–c) for V2 with adverbial fronting, SVO, OSV, OVS for V2 with object fronting (4a–c), and Adverb–Verb, Verb–Adverb for adverb placement in main clauses (5a–b). All target items were constructed according to the same structure. In addition to these 64 target items, each task included 4 practice items, 16 unrelated fillers, 16 items testing subordinate clauses, and 32 items testing particle placement (not reported here).

(3) V2 with adverbial fronting

a. SVA – baseline, grammatical in L2 and L3

Han tvättar smutsiga kläder på lördag. (Swedish)

He washes dirty clothes on Saturday. (English)

b. ASV – grammatical in L2

**På lördag han tvättar smutsiga kläder.*

On Saturday he washes dirty clothes.

c. AVS – grammatical in L3

På lördag tvättar han smutsiga kläder.

*On Saturday washes he dirty clothes.

(4) V2 with object fronting

a. SVO – baseline, grammatical in L2 and L3

Nina legger nøklene på bordet. (Norwegian)

Nina lays the keys on the table. (English)

b. OSV – grammatical in L2

**Nøklene Nina legger på bordet.*

The keys Nina lays on the table.

c. OVS – grammatical in L3

Nøklene legger Nina på bordet.

*The keys lays Nina on the table.

(5) Adverb placement in main clauses

a. Adverb–Verb – grammatical in L2

**Han altid køber billige produkter.* (Danish)

He always buys cheap products. (English)

b. Verb–Adverb – grammatical in L3

Han køber altid billige produkter.

*He buys always cheap products.

To ensure attentive reading during the SPRT, half of the items were followed by equally balanced yes/no comprehension questions, targeting either the object or prepositional phrase.

All items were written in the present simple tense. We avoided identical cognates and words belonging to more than one category (e.g., 'tests' is ambiguous, as it functions as both a noun and a verb). To ensure comprehensibility, lexical material was selected from textbooks for beginner learners of Scandinavian (A1–A2). Items were written in Norwegian and translated into Danish, Swedish and English to ensure close lexical equivalence. As outlined in *Procedure*, English and Scandinavian stimuli were presented during two separate sessions to minimise cross-language activation. All stimuli were proofread by respective native speakers and revised accordingly.

A Latin square design was used to create four counterbalanced presentation lists, ensuring that each participant encountered the same lexical material in only one condition. All materials are available in the OSF repository.

5.3.2 Oral production task

The oral production task used the same lexical material and structural patterns as the AJT and SPRT but employed a different method, detailed in *Procedure*. Instead of full stimuli, participants received background sentences and were prompted to produce syntactic transformations. The task included 8 items per structure, resulting in 24 target items, along with 4 practice items, 8 items testing subordinate clauses, and 16 testing particle placement

(not reported here). No additional fillers were included, as this task was cognitively more demanding than the receptive tasks.

For object and adverbial fronting, participants were given a background sentence with canonical word order (SVA or SVO; 6a). An object or an adverbial was then extracted and given as a cue (6b, in bold), prompting production with either target-like or non-target-like word order.

(6) a. Kari lager svart kaffe om morgenen. (Norwegian)
Kate brews black coffee every morning. (English)
b. **Every morning…** *[brews] Kate [brews] black coffee.
Hver morgen… [lager] Kari *[lager] svart kaffe.

To elicit adverb placement in main clauses, a relative clause with a clause-final adverb was presented (7a). The subject followed as a production cue (7b, in bold).

(7) a. Komplicerade diskussioner är något som hon ofta inleder. (Swedish)
Complex discussions is something that she begins often. (English)
b. **Hon...** *[ofta] inleder [ofta] komplicerade diskussioner.
He… [often] begins *[often] complex discussions.

The overarching criterion across all transformations was that the target word order was never given in the background sentence, ensuring it had to be produced by the participant.

5.4 Procedure

The study was approved by the Ethics Committee for Research Involving Human Participants at Adam Mickiewicz University (Decision number 10/2023/2024). All participants provided written consent and received gift cards.

The first testing session was always conducted in L2 English. It included (i) the first block of the self-paced reading task, (ii) the Dialang placement test, (iii) the second block of the SPRT, (iv) the acceptability judgement task, (v) the oral production task, and (vi) the Language History Questionnaire, in this order. After a minimum of 7 days, trilingual participants returned for a second session, during which they completed the same battery of tasks in their L3 Scandinavian language of choice.

In the SPRT, participants read sentences word-by-word in a linear, non-cumulative manner, with full control over the pace. A fixation point first appeared on the left side on the screen to draw their attention, and each word was displayed upon pressing the spacebar.

In the AJT, a fixation point appeared in the centre of the screen for 500 ms before each item. Participants rated items on a 5-point scale by pressing a corresponding key on the keyboard. There was no time constraint, and no feedback was provided.

In the OPT, participants first saw a background sentence on-screen. They read it silently and pressed the spacebar to continue. They then completed a colour-word Stroop task (Stroop, 1935) within a 4,000 ms time window, in which they had to indicate the colour of the word they saw by pressing the corresponding key on a keyboard (R, B, Y, and O were used for red, blue, yellow and orange). Afterward, they received a cue (a subject, an object or an adverbial) accompanied by a beep sound, prompting them to reproduce the sentence by speaking out loud. While not strictly timed, the auditory cue encouraged an immediate response. A fixation point was displayed in the centre for 500 ms between segments, and participants advanced to the next item at their own pace (see Figure 1).

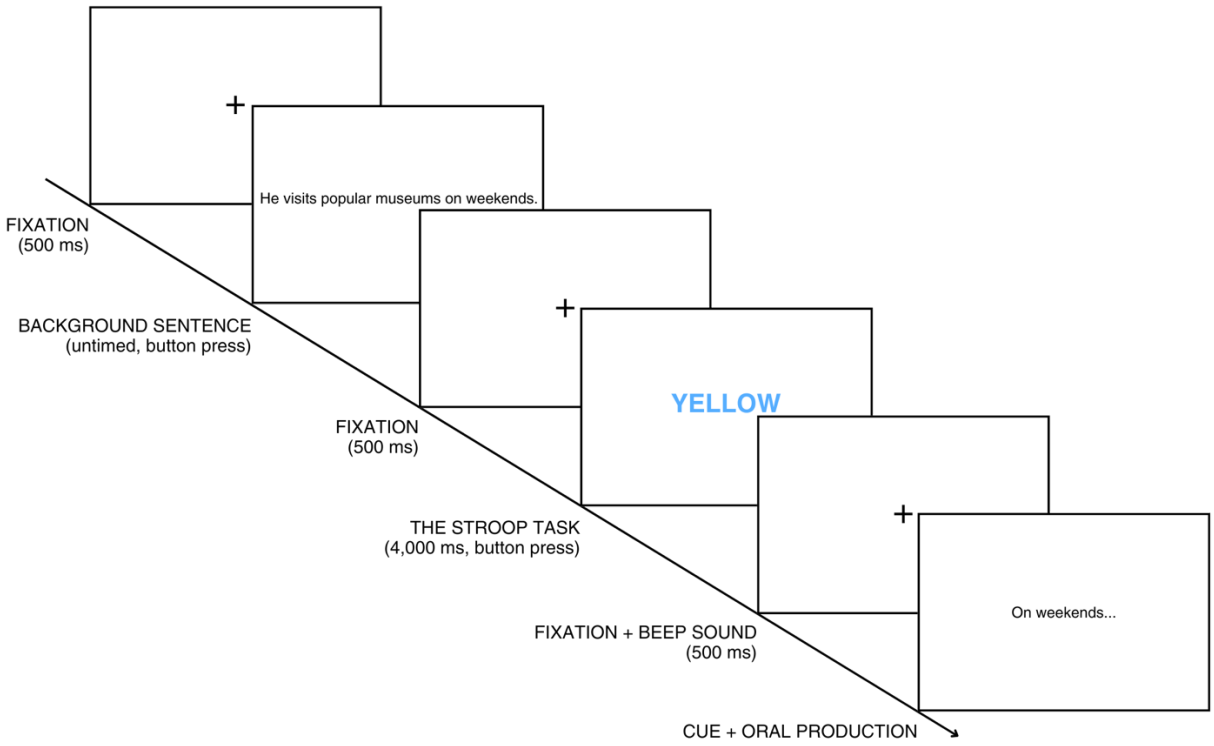


Figure 1. Oral production task procedure.

The OPT was adapted from the NWD project (Lundquist et al., 2019), retaining the core mechanism behind syntactic transformations, but introducing changes to emphasise the reconstructive side of the task.

The SPRT and AJT were run on PsyToolkit (Stoet, 2010, 2017), a web-based platform for online experiments, with the items randomised for each participant. The OPT was conducted via PowerPoint Online using two presentation lists. All items appeared as single-line white text on a black background. Oral instructions in Polish preceded each testing session, and written instructions in the target language were provided at the start of each task.

6. Data analysis

The dependent variable was rating on a 1–5 scale in the AJT, reading times on critical and spill-over regions in the SPRT, and accuracy (binary outcome) in the OPT. The AJT and SPRT data were analysed using linear mixed-effects models (LMEMs) in R, version 4.4.0 (R Core Team, 2024), with the lme4 package (Bates et al., 2015) and the lmerTest package (Kuznetsova et al., 2017). The OPT data were analysed using Bayesian logistic mixed-effects models with weakly informative priors in the brms package (Bürkner, 2017).

In the AJT and SPRT, the SVA and SVO items were excluded to enable direct comparisons across conditions (V2 with adverbial fronting, V2 with object fronting, adverb placement) and groups within a single model. Accordingly, AVS, OVS, and Verb–Adverb were classified as V2, whereas ASV, OSV, and Adverb–Verb were classified as V3.

For the AJT and SPRT analyses, the fixed-effects structure included Group, Condition, Verb placement, L2 proficiency, and the three-way interaction between Group, Condition, and Verb placement, along with the corresponding lower-order interactions. For the OPT analysis, the predictors were Group, Condition, L2 proficiency, and the Group × Condition interaction.

In all models, we included German proficiency as a covariate to control for between-participant differences in German knowledge. As a further control, we also included interactions between Verb placement, on the one hand, and L2 proficiency and German proficiency, on the other, to account for potential differential effects of these two proficiency measures across verb placement patterns.

Additional analyses explored the role of L3 accuracy, based on AJT ratings for each structure in the L3. Mean scores were derived from original ratings in the grammatical condition

and recoded ratings in the ungrammatical condition, where a correct rejection (rated '1') was converted into a high accuracy score ('5').[5]

We began with a maximal random effects structure justified by the experimental design (Linck & Cunnings, 2015). Random slopes that were not supported by the data, as indicated by non-convergence or singular fits, were removed stepwise until a parsimonious model that converged without warnings was obtained.

Categorical predictors were coded using sum contrasts so that the model intercept represented the grand mean. Binary predictors were effect coded (–0.5, 0.5), and predictors with three levels were coded using standard sum contrasts. Continuous predictors were standardised (z-scored) prior to analysis. Multicollinearity was assessed using variance inflation factors (VIFs).

P-values were obtained from Type III *F*-tests with Satterthwaite-approximated degrees of freedom for linear mixed-effects models (lmerTest; Kuznetsova et al., 2017), and from Type III likelihood-ratio χ^2 tests for generalised mixed-effects models (car; Fox & Weisberg, 2019). Post hoc analyses were conducted using estimated marginal means (EMMs) via the emmeans package (Lenth, 2024). Pairwise comparisons were adjusted using the Tukey method for factors with more than two levels and Bonferroni correction for two-level contrasts.

7. Results

7.1 Acceptability judgment task

7.1.1 Group comparisons: L2 vs. L3

The mean rating for the grammatical filler items was 4.85 ($SD = 0.24$), while for the ungrammatical filler items, it was 2.14 ($SD = 0.85$). One participant who rated the grammatical filler items very low ($M = 3.38$) was excluded from the analysis. Table 2 presents the results of Type III *F*-tests, and the results of the post hoc tests are reported below.

[5] For V2 with a fronted element, ratings for the baseline SVA and SVO conditions were excluded to obtain subject-verb inversion accuracy.

Table 2. The results of Type III *F*-tests for the AJT models (with a two-level group factor).

Effect	***F*(df1, df2)**	***p***
Group	$F(1, 230.4) = 0.51$	.474
Condition	$F(2, 192.4) = 214.35$	< .001
Verb placement	$F(1, 56.1) = 2976.58$	< .001
L2 proficiency (z)	$F(1, 229.0) = 0.01$	.943
German proficiency (z)	$F(1, 229.0) = 0.03$	.873
Group × Condition	$F(2, 230.3) = 4.07$	.018
Group × Verb placement	$F(1, 10438.7) = 46.02$	< .001
Condition × Verb placement	$F(2, 56.6) = 112.59$	< .001
Verb placement × L2 proficiency	$F(1, 10367.7) = 160.68$	< .001
Verb placement × German proficiency	$F(1, 10415.3) = 2.23$	.136
Group × Condition × Verb placement	$F(2, 10438.5) = 15.73$	< .001

First of all, all conditions differed significantly, with ratings following the pattern adverb placement > adverbial fronting > object fronting (all *p*s < .001). Overall, V3 items received higher ratings than V2 items, an effect that was further qualified by the Condition × Verb placement interaction.

The Group × Condition interaction was also significant. The L3 group gave higher ratings than the L2 group for adverb placement ($p = .037$), but the groups did not differ significantly for adverbial fronting ($p = .080$) or object fronting ($p = .312$).

Regarding the Group × Verb placement interaction, the L2 and L3 groups did not differ in their ratings of V3 items ($p = .412$), but the L3 group rated V2 items significantly higher than the L2 group ($p = .026$). In addition, although both groups rated V3 higher than V2 (*p*s < .001), this effect was significantly larger in the L2 group than in the L3 group (interaction contrast estimate = 0.25, $z = 6.78$, $p < .001$).

The Group × Condition × Verb placement interaction further showed that the L3 group rated V2 with adverbial fronting higher than the L2 group ($p = .001$), but the groups did not differ for V2 with object fronting ($p = .495$) or V2 with adverb placement ($p = .084$). For V3, the groups did not differ in adverbial fronting ($p = .913$). However, V3 with object fronting was rated lower by the L3 group than by the L2 group ($p = .008$), whereas V3 with adverb placement was rated higher by the L3 group ($p = .034$).

Finally, the Verb placement × L2 proficiency interaction reflected opposite proficiency slopes across verb-placement contexts. Higher L2 proficiency was associated with lower ratings for V2 ($\beta = -0.108$, $SE = 0.033$, 95% *CI* [−0.173, −0.042]) but higher ratings for V3 ($\beta = 0.112$, $SE = 0.033$, 95% *CI* [0.047, 0.178]).

Figure 2 shows model-predicted ratings in L2 English by Group, Condition, and Verb placement.

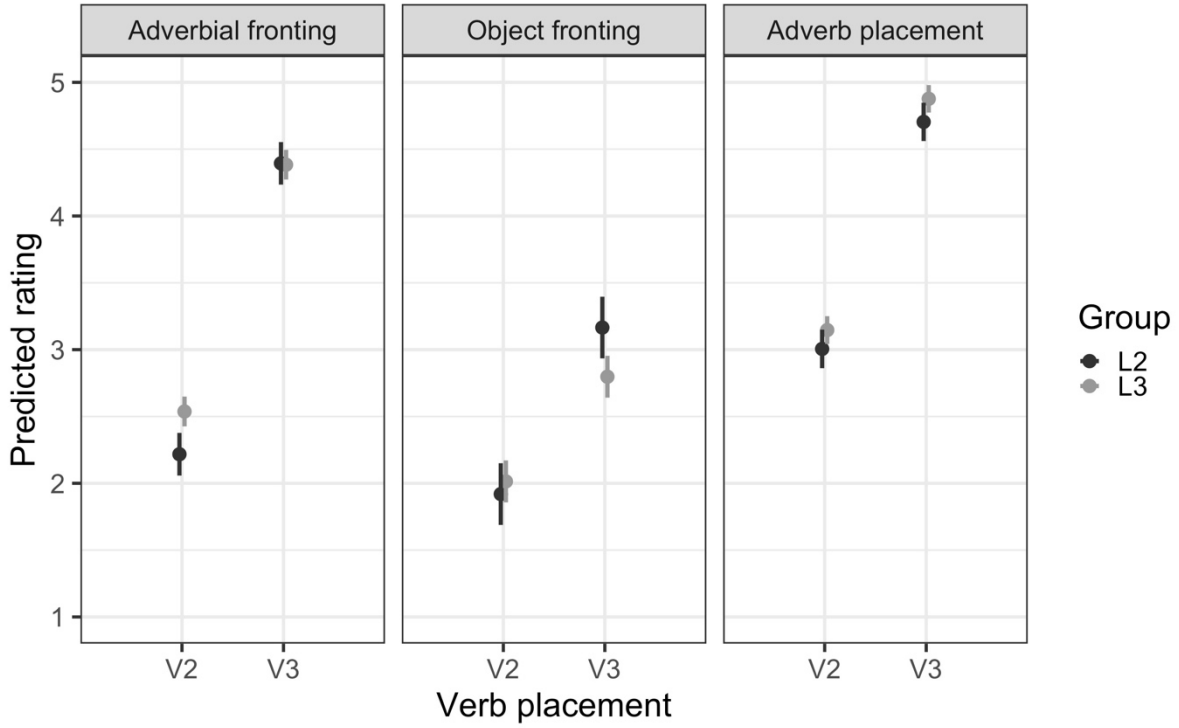


Figure 2. Predicted ratings in L2 English as a function of Group (two-level), Condition, and Verb placement.

Overall, the L3 group rated V2 items significantly higher than the L2 group, suggesting greater acceptance of non-target V2 word order in English among participants with knowledge of L3 Scandinavian. Although both groups rated V3 items higher than V2 items, this difference was significantly larger in the L2 group, again indicating greater acceptance of V2 in the L3 group. The three-way interaction further showed that the higher acceptance of V2 in the L3 group was primarily driven by adverbial fronting, marginally by adverb placement, and not observed for object fronting, suggesting structure-specific acceptance patterns. In addition, the L3 group rated V3 sentences with object fronting lower and V3 sentences with adverb placement higher than the L2 group.

7.1.2 Group comparisons: L2 vs. L3 intermediate vs. L3 advanced

To examine how L3 accuracy affected participants' L2 ratings, we conducted additional analyses including this factor. Visual inspection suggested a non-linear relationship between L3 accuracy and L2 ratings for V2 (AVS, OVS, and Verb–Adverb; see Figure 3), but closer examination showed that the lower L2 ratings in these conditions at low L3 accuracy were driven by very few participants (in one case, a single individual). After accounting for this, the

relationship appeared more linear: predicted cross-linguistic influence was reflected in higher L2 ratings for participants with L3 accuracy 3–4 and lower L2 ratings for those above 4; this was consistent across all three syntactic structures. We therefore divided the L3 group into two subgroups for further analysis – intermediate (L3 accuracy: 3–4) and advanced (L3 accuracy: >4) – and compared them to the L2 control group. Thus, the factor Group comprised three levels: L2, L3 intermediate, and L3 advanced. Importantly, the three groups did not differ in German proficiency (L2: 2.9/7, L3 intermediate: 3.5/7, L3 advanced: 3.3/7), as indicated by a Kruskal–Wallis test ($\chi^2(2) = 3.44$, $p = .179$). Table 3 shows the Type III *F*-test results.

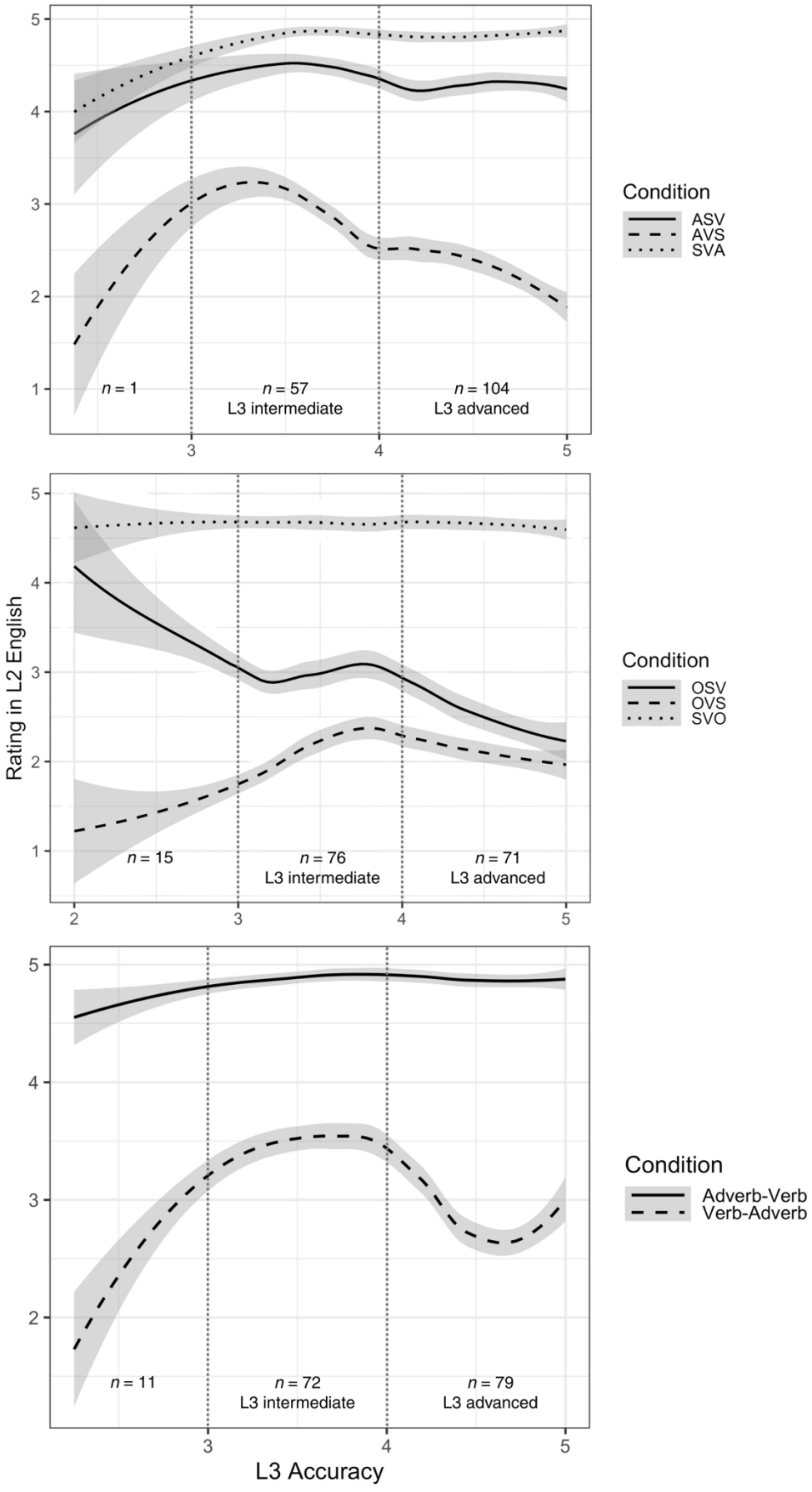


Figure 3. Raw ratings in L2 English for the three structures as a function of L3 accuracy.

Table 3. The results of Type III *F*-tests for the AJT models (with a three-level group factor).

Effect	***F*(df1, df2)**	***p***
Group	$F(2, 414.9) = 5.78$	.003
Condition	$F(2, 205.0) = 256.91$	< .001
Verb placement	$F(1, 247.0) = 654.01$	< .001
L2 proficiency (z)	$F(1, 218.4) = 0.08$	.780
German proficiency (z)	$F(1, 223.1) = 0.01$	.941
Group × Condition	$F(4, 273.5) = 3.23$	.013
Group × Verb placement	$F(2, 495.8) = 3.86$	.022
Condition × Verb placement	$F(2, 56.3) = 153.61$	< .001
Verb placement × L2 proficiency	$F(1, 228.0) = 15.48$	< .001
Verb placement × German proficiency	$F(1, 226.8) = 0.12$	.734
Group × Condition × Verb placement	$F(4, 9894.7) = 30.36$	< .001

As the main effects and the interactions Condition × Verb placement and Verb placement × L2 proficiency replicate those reported in the previous analysis, we focus here on effects involving Group (three levels). Figure 4 visualises participants' model-predicted ratings in L2 English as a function of Group, Condition, and Verb placement.

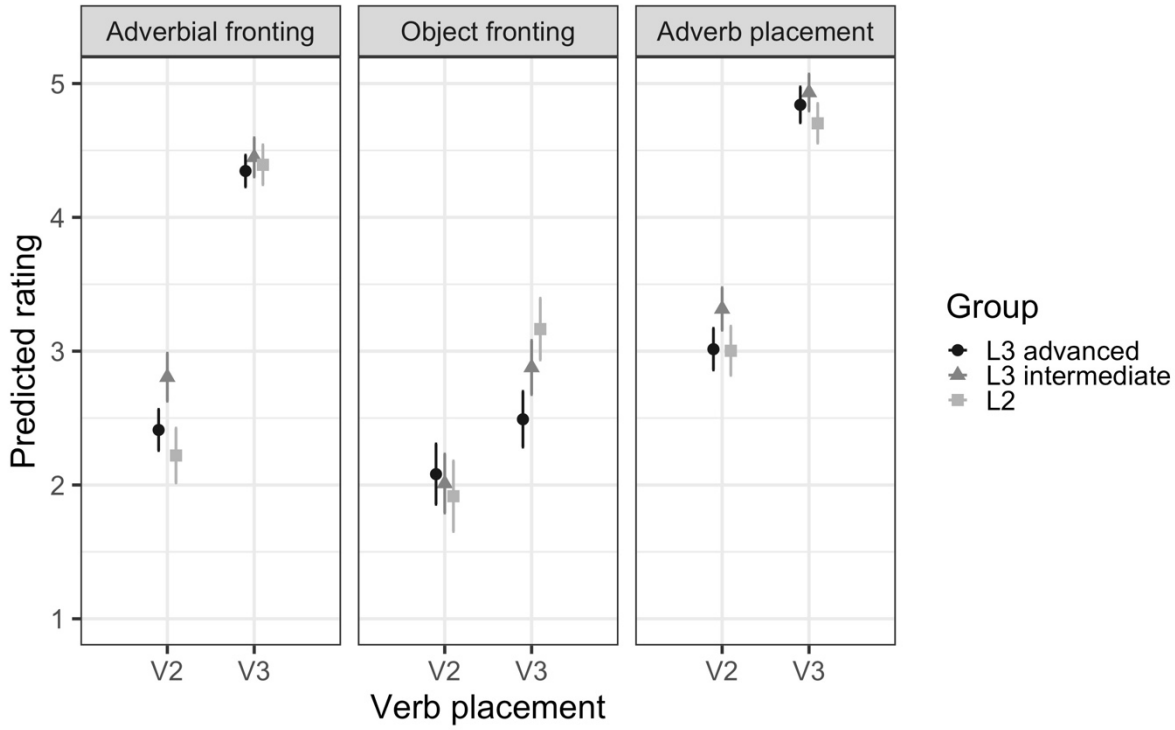


Figure 4. Predicted ratings in L2 English as a function of Group (three-level), Condition, and Verb placement.

Starting with the Group × Condition interaction, the L3 intermediate group rated items with adverbial fronting and adverb placement higher than both the L3 advanced group ($p = .002$

and p = .024, respectively) and the L2 group (both ps = .003). The L3 advanced and L2 groups did not differ for these conditions (p = .697 and p = .627, respectively). For object fronting, no between-group differences were observed (all ps > .20).

Regarding the Group × Verb placement interaction, V2 items were rated higher by the L3 intermediate group than by both the L3 advanced (p = .008) and L2 groups (p = .014), while the L3 advanced and L2 groups did not differ (p = .545). For V3 items, the L3 intermediate group gave higher ratings than the L3 advanced group (p = .009), whereas the L2 group did not differ significantly from either group (both ps > .07).

The Group × Condition × Verb placement interaction further showed that the L3 intermediate group rated V2 with adverbial fronting and V2 with adverb placement higher than both the L3 advanced group (p < .001 and p = .002, respectively) and the L2 group (p < .001 and p = .019, respectively), whereas the L3 advanced and L2 groups did not differ (all ps > .28). For V2 with object fronting, no between-group differences were found (all ps > .60).

For V3 with object fronting, the L3 advanced group gave lower ratings than both the L3 intermediate (p = .008) and L2 groups (p < .001), whereas the L3 intermediate and L2 groups did not differ. For V3 with adverb placement, the L3 intermediate group showed higher ratings than the L2 group (p = .043) but did not differ from the L3 advanced group (p = .520). The L3 advanced and L2 groups also did not differ (p = .309). Finally, for V3 with adverbial fronting, no between-group differences were observed (p > .40).

To sum up, the additional analysis focusing on the role of L3 accuracy showed that the higher acceptance of V2 items emerged at intermediate but not advanced L3 accuracy levels and was restricted to adverbial fronting and adverb placement, again suggesting structure-specific acceptance patterns. In addition, the lower ratings for V3 with object fronting were specific to the L3 advanced group. Finally, V3 with adverb placement received higher ratings in the L3 intermediate group than in the L2 group, but the L3 intermediate and L3 advanced groups did not differ.

7.2 Self-paced reading task

Data from one participant with a comprehension accuracy below 50% were removed. For the rest, reading times under 100 ms or over 4,000 ms were excluded per region, eliminating <1% of data. Reading times were collected at the critical region and the spill-over region. The critical region was where a syntactic violation could first be detected (the verb for V2 with adverbial or object fronting, and the adverb for adverb placement). The spill-over region was defined as the first word consistently occurring after the ordering manipulation (the adjective for V2 with

adverbial fronting and adverb placement, and the preposition for V2 with object fronting; see example 8).

(1) a. Every day takes [CR] he long [SO] showers. (V2 with adverbial fronting)
b. The jackets hangs [CR] she in [SO] the closet. (V2 with object fronting)
c. He gives rarely [CR] clear [SO] answers. (adverb placement)

For ease of presentation, we report the results of Type III *F*-tests with Satterthwaite-approximated degrees of freedom for the fixed effects in Table 4 in the main text. The complete model summaries – including parameter estimates, standard errors, and *t*-values – are available in the OSF repository. Figure 5 shows model-predicted reading times, back-transformed from log scale, at the critical and spill-over regions as a function of Group, Condition, and Verb Placement.

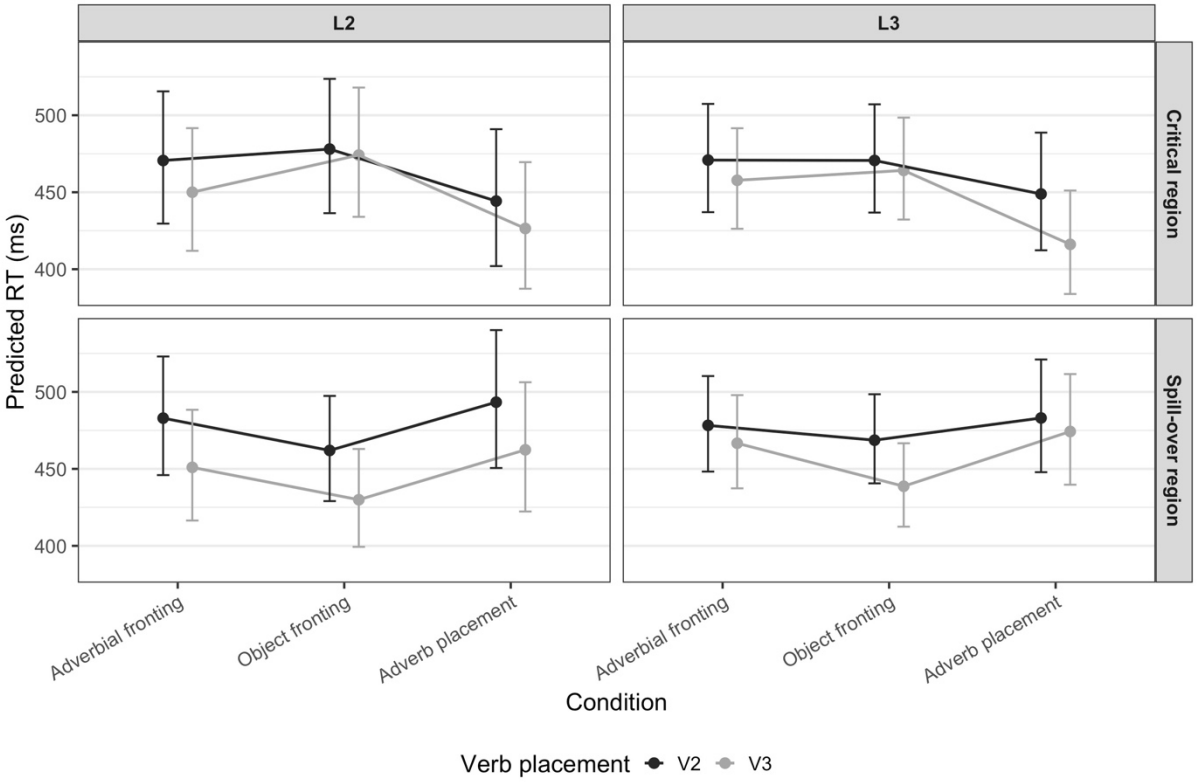


Figure 5. Predicted reading times (ms), back-transformed from log scale, at the critical and spill-over regions as a function of Group, Condition, and Verb Placement.

Table 4. The results of Type III *F*-tests for the SPRT models.

Effect	Critical region		Spill-over region	
	***F*(df1, df2)**	***p***	***F*(df1, df2)**	***p***
Group	$F(1, 229.2) = 0.02$	.890	$F(1, 230.0) = 0.09$	.760
Condition	$F(2, 61.2) = 1.86$	.164	$F(2, 65.0) = 1.27$	.286
Verb placement	$F(1, 63.8) = 8.99$	.004	$F(1, 10625.0) = 66.10$	<.001
L2 proficiency (z)	$F(1, 229.3) = 0.22$	.640	$F(1, 223.5) = 0.44$	.509
German proficiency (z)	$F(1, 229.1) = 0.01$	.916	$F(1, 229.3) = 0.18$	.673
Group × Condition	$F(2, 10836.6) = 1.27$	.281	$F(2, 435.6) = 0.28$	.758
Group × Verb placement	$F(1, 10734.3) = 0.33$	.568	$F(1, 10608.5) = 6.17$	.013
Condition × Verb placement	$F(2, 64.4) = 1.31$	.276	$F(2, 10611.8) = 1.71$	.181
Verb placement × L2 proficiency	$F(1, 10555.8) = 0.10$	.752	$F(1, 10435.4) = 2.30$	.129
Verb placement × German proficiency	$F(1, 10778.5) = 1.15$	.283	$F(1, 10616.1) = 2.10$	.148
Group × Condition × Verb placement	$F(2, 10732.2) = 1.13$	.324	$F(2, 10601.9) = 1.04$	.353

There was a significant main effect of Verb placement, with longer reading times for V2 than for V3 at both the critical and spill-over regions. At the spill-over region, the Group × Verb placement interaction was also significant. V2 was read more slowly than V3 in both groups. However, the size of this difference was significantly larger in the L2 group than in the L3 group (interaction contrast estimate = 0.032, $z = 2.48$, $p = .013$). In contrast, the two groups did not differ in overall reading times for either V2 ($p = .876$) or V3 ($p = .449$). Apart from these effects, no other main effects or interactions were statistically significant (all ps > .13).

Figure 5 shows model-predicted reading times for the spill-over region by Group and Verb placement.

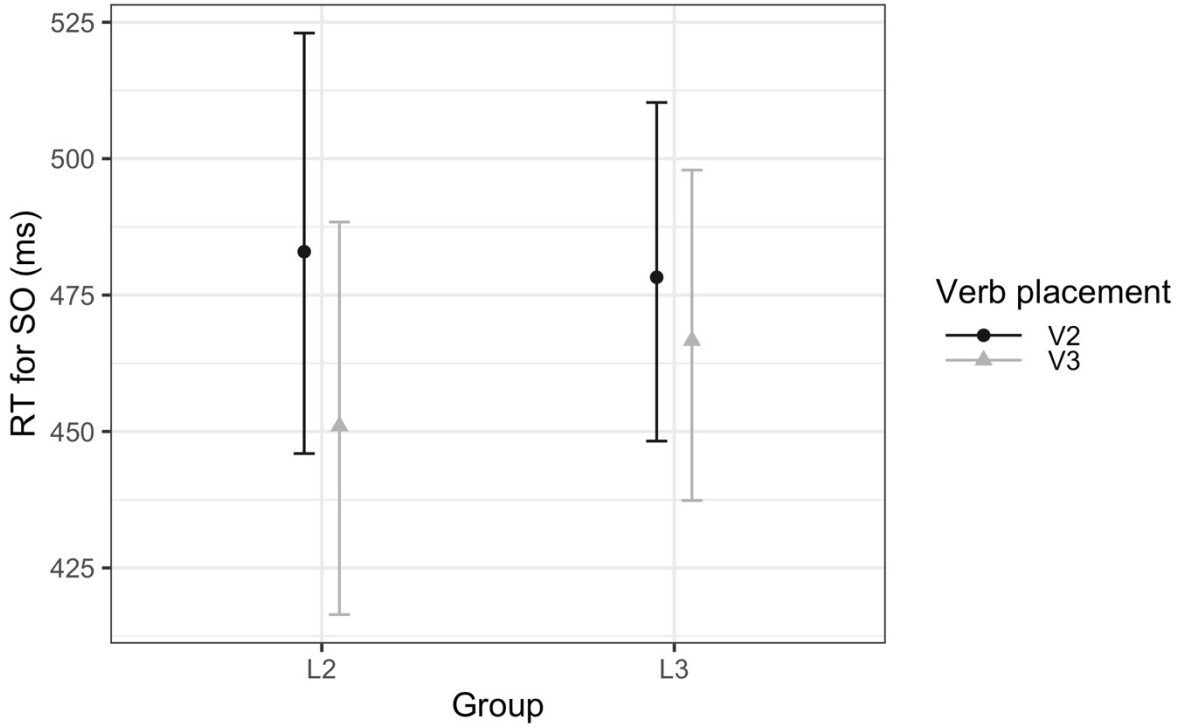


Figure 6. Predicted reading times (ms), back-transformed from log scale, at the spill-over region as a function of Group and Verb placement.

Additional models restricted to the L3 group tested the effects of L3 accuracy and its interactions with Condition and Verb placement, including the three-way interaction. The results indicated that L3 accuracy did not influence L3 participants' performance in any condition, verb placement context, or region. Detailed results of these analyses are available in the OSF repository.

In sum, the self-paced reading results partly corroborated the judgment task. Although both groups were clearly sensitive to syntactic violations, as reflected in elevated reading times at the critical and spill-over regions, they differed in the degree of sensitivity. Specifically, at the spill-over region, the difference between V2 and V3 items was larger in the L2 group than in the L3 group, suggesting reduced sensitivity to non-target V2 word order among participants with knowledge of L3 Scandinavian. However, this effect was neither structure-specific nor modulated by L3 accuracy.

7.3 Oral production task

One participant in each group did not complete the OPT. Recordings from the remaining participants (162 and 70, respectively) were manually transcribed and coded for word order

accuracy (0/1). Swapping lexical material was not penalised, provided the targeted structure was produced. Sentences that were incomplete or lacked the targeted structures were excluded, reducing the dataset by 6.71%. For V2 with object fronting, where the object served as a prompt, most background sentences were transformed into passive voice (e.g., *The books are read in the library*) and were therefore not coded for V2 accuracy. Results for this structure should thus be interpreted with caution. A summary of OPT is provided in table 5.

Table 5. Summary of responses produced in the OPT.

Structure	**V2 with adverbial fronting**		**V2 with object fronting**			**Adverb placement**	
Production	V3	V2	V3	V2	passive	V3	V2
L2 group	100% (526/526)	0% (0/526)	6.26% (33/527)	0% (0/527)	93.74% (494/527)	97.73% (473/484)	2.27% (11/484)
L3 group	94.47% (1162/1230)	5.53% (68/1230)	16.62% (199/1197)	3.34% (40/1197)	80.03% (958/1197)	91.81% (1110/1209)	8.19% (99/1209)

Figure 7 presents the summarised raw accuracy (0/1) to participant-level proportions per structure; points show each participant. Within each group and structure, the larger marker denotes the mean of participant proportions, and the error bars indicate 95% confidence intervals across participants.

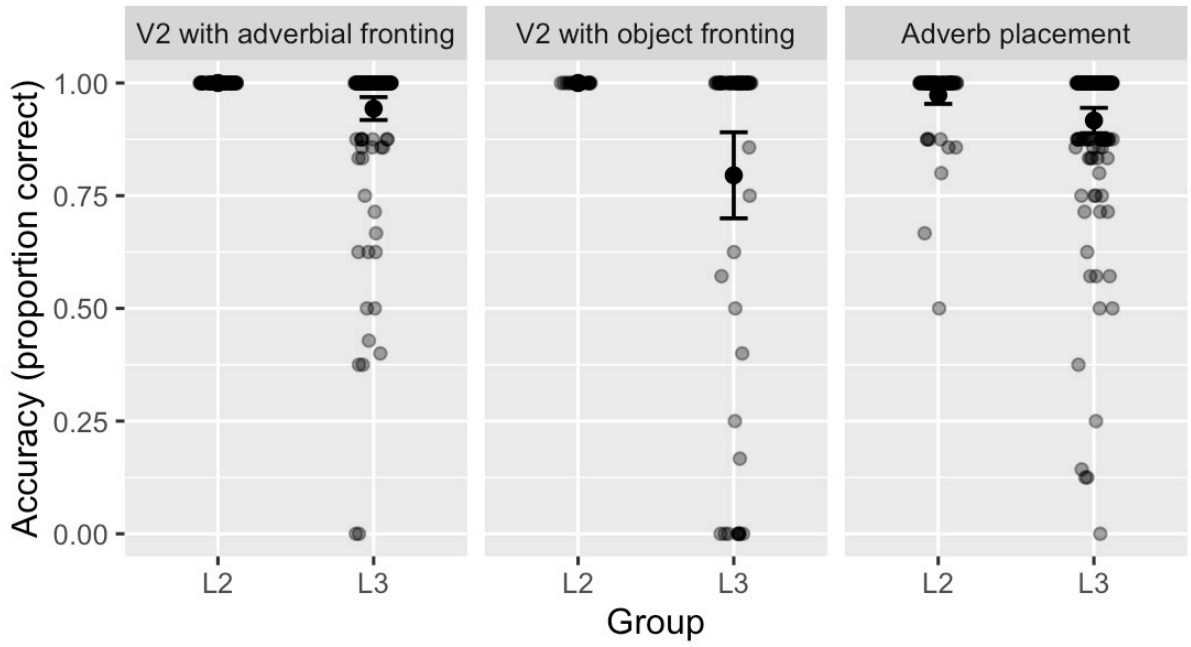


Figure 7. Raw production accuracy for the three structures as a function of Group (two-level).

For V2 with both adverbial and object fronting, the L2 group performed at ceiling (100% accuracy), resulting in complete separation for the Group factor. We therefore used Bayesian logistic mixed-effects models with a Bernoulli likelihood, a logit link, and weakly informative priors to obtain regularised, finite estimates while retaining the full crossed random-effects structure.

Accuracy was near ceiling overall (baseline posterior probability ≈ .9998), but a strong Group effect was observed. The L3 group was substantially less accurate than the L2 group (posterior log-odds difference = −5.38, 95% credible interval [−9.30, −2.36]), corresponding to an odds ratio of 0.07 [0.01, 0.31]. Thus, the posterior probability that the L3 group was less accurate than the L2 group exceeded .99. There was no credible evidence that the size of the group difference differed across conditions (Condition × Group interactions: 95% *CrI*s included zero), indicating that the L3 disadvantage was comparable for V2 with adverbial fronting, V2 with object fronting, and adverb placement. Neither L2 proficiency nor German proficiency showed a reliable association with production accuracy once Group and Condition were taken into account (all 95% *CrI*s included zero).

A separate Bayesian logistic mixed-effects model was fit to the L3 group only to examine whether L3 accuracy predicted production accuracy. Accuracy was again near ceiling (baseline posterior probability ≈ .997). Nevertheless, L3 accuracy showed a reliable negative association with L2 production accuracy (log-odds = −0.81, 95% *CrI* [−1.61, −0.10]), corresponding to an odds ratio of 0.44 [0.20, 0.90]. Thus, higher L3 accuracy was associated with lower accuracy in production. In contrast, L2 proficiency was positively associated with accuracy (log-odds = 0.80, 95% *CrI* [0.05, 1.58]). German proficiency did not show a reliable effect once L2 proficiency and L3 accuracy were included (log-odds = −0.64, 95% *CrI* [−1.42, 0.09]). There was no credible evidence that the effect of L3 accuracy differed across structures (L3 accuracy × Condition interactions: 95% *CrI*s included zero).

8. Discussion

This study investigated the effect of acquiring three V2-related structures in L3 Norwegian, Swedish, and Danish on advanced L2 English. We considered (i) the influence of structure-specific factors such as L3 frequency and L2 input ambiguity, (ii) the role of developing L3 accuracy, and (iii) differences across task modalities.

Our results reveal modest but consistent evidence for the influence of L3 Scandinavian on verb placement across the three tasks, indicating that L3 Scandinavian can indeed trigger V2 in L2 English to some extent. Compared to the L2 group, the L3 group was more likely to accept

V2 items, was less sensitive to V2 violations, and produced more instances of V2. While the judgment results reveal structure-specific acceptance patterns, the other two tasks point to a more general influence in the verb placement domain, regardless of structural context. The following discussion first focuses on the judgment data.

In our view, the property-specific influence observed in the judgment task aligns with the premises of the Linguistic Proximity Model (Mykhaylyk et al., 2015; Westergaard et al., 2017). According to the model, all languages in the learner's repertoire remain co-activated throughout L3 development. In the learning process, learners consult both previously acquired grammars, use them to parse incoming input and construct a new grammar incrementally – the more corroborating input is parsed, the more stable the representations become. Crucially, the model is not tied to a fixed direction of CLI, as "the learning context itself is not the central part of the LPM; instead, the linguistic properties of the three languages take central stage, as these will be responsible for the co-activation of structures in the learner's mind" (Westergaard, 2021b, p. 507). As a consequence, L1 and L2 structures can be co-activated during L3 processing, and conversely – learners can parse L2 input through both L1 and L3 grammars. Extending the LPM to rCLI, Olszewska and Długosz (2025) argue that the mechanism behind rCLI is essentially the same as in progressive CLI: co-activation. They propose that an already advanced L2 exhibits fewer cases of underspecification or parsing failure than a newly developing grammar, resulting in fewer opportunities for influence from other languages – in this case, the L3 (and L1) on the L2 grammar. Therefore, more favourable conditions are required for rCLI to occur. These are provided by factors outlined in the LPM – such as structural similarity and structure frequency – to which Olszewska and Długosz (2025) add optionality in the target language as a key factor.

Moreover, the model assumes that learners are sensitive to fine-grained distinctions in the input, with the strength of co-activation modulated by frequency of specific structures (Slabakova, 2017; Westergaard, 2021a). This accounts for the differential patterns observed in our judgement data: V2 with a frequently fronted adverbial yields the most robust effects, converging across online and offline comprehension, while a fronted object, rarely occurring in this position, does not elicit an equivalent response.[6]

[6] This is particularly relevant considering the teaching materials these instructed learners are exposed to. In textbooks for beginner learners of Scandinavian languages, V2 is very salient and most often occurs with a fronted time adverbial (e.g., when they learn to describe their day or recall subsequent past events). This emphasis may lead to a particularly prompt co-activation of this structure.

A further modulatory factor is input ambiguity, which gives rise to less stable effects in adverb placement. This pattern is consistent with previous findings showing that input ambiguity renders adverb placement in L2 English challenging to acquire (e.g., Jensen et al., 2023; Westergaard, 2003). While preverbal placement is most typical (e.g., *She often reads books*), English also allows adverbs in clause-initial (e.g., *Often, she reads books*) and clause-final positions (e.g., *She reads books often*). Although Scandinavian-like word order is ungrammatical in English (e.g., **She reads often books*), sentences with intransitive verbs may appear similar on the surface (e.g., *She sleeps often*), making the two orders indistinguishable in the absence of an object. This ambiguity helps explain why the effect fluctuates – while present among L3 intermediate participants, it becomes less robust and only marginally significant in L2–L3 group comparisons.

In the study by Olszewska and Długosz (2025), optionality – broadly understood as the ability to place an element in more than one position[7] – was proposed as a key condition enabling rCLI. By contrast, we examine V2, which is not characterised by optionality. For these structures, adopting L3-like processing in L2 would result in a grammar violation. While rCLI for V2 with object fronting is ruled out due to low frequency in the L3, the other two structures – V2 with adverbial fronting and adverb placement – do show evidence of rCLI. However, non-target English items receive higher scores only at the intermediate level of L3 accuracy. These learners with accuracy scores between 3 and 4 are in the process of acquiring V2 word order in their L3 Scandinavian. Ratings of 3 and 4 correspond to 60% and 80% accuracy, respectively, suggesting a decent mastery of the structure. Our findings indicate that these L3 representations in the incrementally built grammar may temporarily destabilise the previously acquired L2. Despite this temporary misanalysis, the effects fade, and advanced L3 learners' judgements return to baseline by drawing on stable representations in both L2 and L3. Similar effects of robust CLI in L4 at lower levels of accuracy in L3 were also observed by Sanchez

[7] We recognise that optionality is a broad term, used in different ways across the literature. For instance, it may refer to residual optionality in advanced grammars, where L2 learners occasionally produce non-target structures (Sorace, 2000), or to variation within a single linguistic property, as in wh-questions in the Tromsø dialect, which can be formed with V2 or V3 (Westergaard, 2003). One might also note that V2 in English is marginally optional, as it appears in stylistic or locative inversion (*Here comes the bus*; Rankin, 2012); or that adverb placement is optional, given its multiple positions (*She often eats waffles for breakfast / Often, she eats waffles for breakfast / She eats waffles for breakfast often*). In the present study, however, we use optionality to refer to cases where the language undergoing change licenses multiple options, while the language exerting influence licenses an overlapping one. Examples include particle placement – in English the particle may precede or follow the object NP, whereas in Danish, it must follow (Olszewska & Długosz, 2025); clitic placement – in Spanish, the direct object clitics can be both pre- and postverbal, while in English they are always postverbal (Requena & Berry, 2021); or pronoun omission – in Polish, both overt and null pronouns are allowed, while in German pronouns in ton-topic position must be overt (Długosz, 2021).

(2020), who argued that an underdeveloped source language is more difficult to inhibit. An anonymous reviewer suggested that the effects observed at the intermediate level of L3 accuracy may reflect differences in language learning aptitude, such that learners who perform poorly in the L3 also perform poorly in the L2. Although we acknowledge this possibility, we believe that our results are better explained in terms of rCLI for two reasons. First, the acceptance patterns among intermediate L3 participants are structure-specific and align with our predictions regarding the role of L3 frequency and L2 input ambiguity. Second, the L3 intermediate group rated V2 with adverbial fronting and adverb placement higher than the L2 group, suggesting that the effect is conditioned by knowledge of L3 Scandinavian rather than by general language learning aptitude.

This reasoning also accounts for the fact that in the study by Olszewska and Długosz (2025) on optional particle placement, the effects were observed at intermediate (for the Swedish group, which had an easier task of acquiring a pre-posed particle) or at higher levels of L3 accuracy (for the Danish group, which had to acquire a post-posed placement). In comparison, the effects observed here appear at intermediate stages of L3 accuracy and subsequently diminish. We suggest that these differences can be traced back to optionality – in particle placement, a more stable L3 representation reinforces one of the options already available in the L2, whereas in V2, greater stability in the L3 representation leads to the detection of a grammar violation in the L2 and is in turn more strongly inhibited.

Notably, the effects observed in online processing are independent of structural context and L3 accuracy levels. It is worth recalling, however, that this transient co-activation does not lead to major changes in the L2. On the contrary, the non-target V2 order elicits sensitivity to violations in both learner groups, but the crucial difference lies in the effect size, which is significantly smaller in the L3 group. This indicates that V2 is present in the L3 grammar and is transiently co-activated when encountered in L2 input. Yet this, in our view, is where rCLI stops. In the absence of optionality in L2 English, the L3 word order is (weakly) co-activated and employed to parse L2 input, but is successfully blocked by the strong L2 representations, preventing any representational changes – as observed in ratings at advanced L3 levels, which pattern with those of the L2 control group.

To explain the differential effects of L3 accuracy on participants' performance across the three tasks, it is necessary to consider the characteristics of the tasks themselves. First, the acceptability judgment task is a metalinguistic task that provides abundant opportunities to consult explicit grammatical knowledge, particularly in its untimed version (Spinner & Gass, 2019, p. 49). Given that our participants were university students, it is conceivable that those at

higher levels of L3 accuracy – i.e., those who achieved a V2 accuracy of 80–100% in their L3 Scandinavian – are more aware of differences in verb placement between English and Scandinavian languages and are therefore more likely to reject the L3-like V2 order in their L2 English. This would explain why the structure-specific effects emerge at intermediate levels of L3 accuracy, which, as a reminder, correspond to a V2 accuracy of 60–80% in the L3.

In turn, the self-paced reading task taps into largely unconscious processing or implicit knowledge that remains outside the learner's control. Crucially, the reduced sensitivity to V3 violations emerged regardless of L3 accuracy, suggesting that greater mastery of V2 in the L3 does not lead to stronger syntactic co-activation in the L2 during online processing. Notably, both groups were sensitive to syntactic violations, but this sensitivity was weaker in the L3 group. Thus, while participants in the L3 group were ultimately able to suppress the L3-like V2 order when processing L2 English, the presence of the L3 still resulted in a reduced violation effect relative to the L2 group. One possible explanation is that cross-linguistic co-activation during online processing does not depend on the degree of mastery of a structure, but rather on whether the structure is represented in the learner's grammar. Once V2 has been acquired in the L3, even at intermediate levels, it may become available for automatic activation during sentence processing. Additional increases in L3 accuracy may therefore strengthen explicit knowledge of the structure without necessarily increasing its influence on online L2 processing.

In oral production, the L3 group exhibited greater variability and committed more errors than the L2 group. As in the self-paced reading task, these effects were not structure-specific, indicating a more general disadvantage in the L2 stemming from L3 Scandinavian acquisition. Descriptively, in V2 contexts with a fronted element, the L3 group produced V2 with adverbial fronting in 5.53% of instances and V2 with object fronting in 3.34% of instances, while the L2 group remained fully target-like. These rates resemble the low proportions of XVS observed in L2→L3 CLI in written and oral production (ca. 4% in Angelovska, 2017). Adverb placement presents a different picture. Here, the L3 group produced 8.19% non-target V2 word order compared to 2.27% in the L2 group. We interpret this as further corroboration of the role of input ambiguity, as even learners without any knowledge of Scandinavian did not consistently produce adverbs in the target position.

Crucially, overall accuracy in the L3 group was very high. We therefore interpret these patterns as evidence for rCLI in the form of short-term V2 co-activation, likely amplified by the heavy cognitive demands of the task. As noted by an anonymous reviewer, the production results may also reflect considerable individual variation. Overall, 62 out of 162 L3 learners produced at least one V2 structure in English, compared to 9 out of 71 L2 learners. Excluding

adverb placement, 32 L3 learners produced V2, whereas no L2 learners did. Because overt speech arises from competitive processes, and individual learners differ in their ability to suppress interference from non-target languages, this individual variation may reflect differences in inhibitory control, particularly under conditions of increased processing load (e.g., Green, 2017).

In addition, when the L3 group is considered separately, higher L2 English proficiency facilitates performance, whereas higher L3 Scandinavian accuracy appears to exert an opposing influence. While the latter pattern may seem to contradict the assumption that intermediate L3 learners' grammars undergo temporary destabilisation, after which advanced L3 learners successfully inhibit L3 interference, the AJT and OPT differ substantially in their processing demands (e.g., Kim & Nam, 2017). Given the high processing load involved in the OPT, it is conceivable that the inhibition of V2 interference depends more on individual control abilities, which may override the employment of metalinguistic knowledge evidenced in the AJT. Since the L3 accuracy proxy was derived from an untimed task, an additional measure of individual control aptitude would be necessary to disentangle the observed patterns.

Returning to the finding that L3 group rated V2 with object fronting word order lower than the L2 group, particularly at advanced L3 accuracy levels, we attribute this effect to rCLI at the level of information structure (e.g., Bohnacker & Rosén, 2007). As OSV sentences are infrequent and thus dispreferred in L3 Scandinavian, the L3 group is arguably less permissive toward them in their L2 English.

Our study is not free from limitations. We suggest that transient changes occur in L2 English when trilinguals are at intermediate stages of L3 accuracy, based on comparisons with advanced L3 speakers and L2 speakers with no knowledge of L3. While the relatively large group sizes support this interpretation, we note that we did not track the same learners throughout L3 development. A longitudinal study could therefore corroborate or challenge our findings. Another limitation concerns language exposure in L2 and L3: our questionnaire captured only self-estimated daily use in hours, and some participants appeared to misinterpret the question.[8] Future studies on rCLI should incorporate a fine-grained assessment of exposure and use across specific contexts to better capture individual variation, as these factors may play a role. Furthermore, future studies could include less proficient L2 learners, which was not feasible in our context. The effects of L3 on L2 syntax could be more pronounced if the L3, rather than the L2, were the dominant language.

[8] While some participants provided estimates exceeding 24 hours per day, others adhered to this limit, rendering cross-participant comparison unreliable.

In conclusion, our findings demonstrate that acquiring a novel L3 can trigger rCLI even in advanced L2 grammars. In line with the Linguistic Proximity Model, these effects in judgement data are property-specific and dependent on frequency and ambiguity in the input, highlighting their role in modulating the strength of co-activation. In a prior study (Olszewska & Długosz, 2025) on particle placement, we found evidence for rCLI under favourable conditions – namely, when the target language permits optionality within the structure and adopting L3-like parsing reinforces an existing option. In the present study, by contrast, we show that in the absence of optionality, rCLI manifests as short-term co-activation of the L3 during L2 comprehension, without evidence of further L2 restructuring. Under these conditions, rCLI is largely restricted to online processing and to occasional deviations in oral production under high processing load. Together, these findings contribute to our understanding of the multidirectional nature of CLI and suggest that, in the absence of optionality, rCLI may operate primarily at the level of processing rather than grammatical representation.

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Appendix N: Article 4 (Olszewska, 2026)

Olszewska, A. (2026). Instructed language learning and its impact on previously acquired languages: A state-of-the-art review of regressive cross-linguistic influence across grammatical domains. *Lingua*, *336*, 104156.

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Instructed language learning and its impact on previously acquired languages: A state-of-the-art review of regressive cross-linguistic influence across grammatical domains

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Abstract

This narrative, state-of-the-art review maps the literature on regressive cross-linguistic influence (rCLI), also referred to as regressive transfer. While research on second and third language acquisition has predominantly focused on how the first (L1) and/or the second (L2) language can influence the acquisition of an additional language, this narrower, emerging subfield investigates the reverse process: how a newly acquired language may affect the languages known prior to its acquisition. The review synthesises findings on grammatical phenomena with a specific focus on adults in instructed learning contexts. A comprehensive literature search identified 30 empirical studies (journal articles, book chapters, monographs, and master's and doctoral dissertations). Each study was examined to extract information on terminology, language pairings, sample size, learner proficiency levels, grammatical phenomena, and research instruments. This analysis revealed several recurring patterns. rCLI research shows substantial variation in terminology and limited theoretical grounding. Findings also point to varying effects of Ln proficiency, underscoring the need for studies with cross-sectional or longitudinal designs. Moreover, systematic variation in typological distance, tested phenomena, larger sample sizes, and the use of complementary tasks have all emerged as key factors for advancing the subfield. Overall, this review brings attention to the multidirectional nature of cross-linguistic influence and highlights factors that warrant further investigation.
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Keywords: State-of-the-art review; Narrative review; Regressive cross-linguistic influence; Regressive transfer; Grammar; Instructed learners

1. INTRODUCTION

Understanding how languages interact in the multilingual mind has become a central focus of research on second and third language acquisition (L2, L3, respectively), in which cross-linguistic influence (CLI) from previously acquired

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systems plays a crucial role (e.g. Jarvis and Pavlenko, 2008; Rothman et al., 2019). CLI is now widely recognised as multidirectional in nature, with lexicon-based evidence showing that bilingual speakers not only access L1 during L2 comprehension (e.g. Hopp, 2017) but also recruit L2 representations during L1 processing (e.g. Długosz, 2023a). Despite this consensus on mutual access between the languages, relatively little research has examined whether CLI at the level of grammar can occur in the regressive direction, with the acquisition of an additional language leading to transient or representational changes in the L1 and/or L2. Compared to the extensive literature on progressive CLI, investigation into regressive cross-linguistic influence (rCLI)[1] remains in its early stages, resulting in an incomplete picture of multilingual development.

This review synthesises existing evidence on changes in previously established native and non-native languages, following the acquisition of a novel linguistic system in a sequential, instructed setting. While the distinction between changes driven by instructed, non-immersed acquisition and those emerging from naturalistic, immersive exposure remains under debate (see Martín-Villena, 2023), this review specifically focuses on the former. This is to offer a more detailed account of learners exposed to comparable types of input in similar learning environments, and to tentatively distinguish rCLI from language attrition. Whether these two contexts introduce changes that are fundamentally the same or different remains an open empirical question. Moreover, although previous work has considered factors guiding bidirectional CLI among other bilingual populations, such as children (e.g. van Dijk et al., 2022), the present review concerns adult acquisition. Crucially, the primary focus lies in grammatical phenomena.

Given the emerging nature of this subfield, a state-of-the-art review methodology with a narrative approach was adopted (e.g. Chong and Plonsky, 2024). The objective is to map existing evidence on rCLI, clarify the currently used terminology, summarise available findings and identify possible research gaps. Unlike the *meta*-analytic approach, designed to probe focused research questions using statistical methods (e.g. Plonsky and Oswald, 2012), this review provides an exhaustive, narrative account – a more appropriate choice given the limited number of available studies, their exploratory nature, and the absence of effect size reporting. Consequently, it serves as a precursor to future systematic reviews, which will become feasible once more substantial evidence is accumulated.

The review begins by clarifying the adopted terminology and proceeds in thematically organised subsections, covering studies (i) with theoretical implications, (ii) on facilitative and non-facilitative L3-to-L2 influence, and (iii) on facilitative and neutral L2-to-L1 influence. The discussion section highlights recurring patterns across language pairings, linguistic phenomena, learners' proficiency levels, and methodological approaches. These thematic groupings were selected inductively, because they represent dimensions consistently reported across the reviewed literature and therefore provide a principled basis for cross-study comparison. They also reflect groupings employed in similar reviews of progressive CLI in L3/Ln acquisition (e.g. Rothman et al., 2019). The review concludes by identifying factors that require further investigation, thereby laying a foundation for advancing future rCLI research.

2. LITERATURE SEARCH AND SELECTION

To retrieve the relevant literature, an initial search was conducted via Google Scholar on September 1, 2025. Following constructive feedback from an anonymous reviewer, the search was subsequently expanded and reconducted across Scopus, ProQuest, Wiley Online Library, Web of Science, and Springer Link on January 20, 2026. In both searches, keywords included the core terms 'transfer' and 'cross-linguistic influence' combined with the attributes 'regressive', 'reverse', or 'backward'. This step identified the majority of studies on L3-to-Ln influence. To ensure coverage of L2-induced effects, which were not retrieved, additional targeted queries included 'L2 effects on L1′ and 'L2 influence on L1′. No date or language restrictions were applied. Studies were considered relevant if they addressed any form of CLI from a later-acquired language onto an earlier-acquired one. After the initial dataset was compiled, reference lists and citations were manually examined to identify further sources, including those using alternative terminology.

Given the predefined scope of the review, which targets rCLI at the level of grammar in instructed learning contexts, studies on phonetics, phonology, and lexical knowledge were excluded. Accordingly, studies investigating syntax, morphosyntax, and phenomena at the syntax–semantics and syntax–pragmatics interfaces were retained. A further screening process concerned acquisition setting, excluding studies on L1/L2 attrition and heritage bilingualism, and retaining

[1] As discussed in Section 3, the field is characterised by terminological inconsistency in how the phenomenon is labelled. The present article adopts *regressive cross-linguistic influence* – although it is currently not the most prevalent term – because it constitutes the most encompassing alternative; it does not impose a distinction between processing-related and representational phenomena and encompasses all forms of interaction between the languages in the learner's repertoire.

only those involving instructed learners.[2] The final reported sample includes 30 studies published between 1998 and 2025, spanning journal articles, book chapters, monographs, and master's and doctoral dissertations. Following data extraction, a narrative summary with tabulation was conducted, integrating findings across studies through descriptive comparison and identification of recurrent patterns across the literature. This inductive approach ensured that the thematic structure of the review was grounded in the included studies, while consistently reported categories were used to enable cross-study comparison. Given the heterogeneity of designs, tasks, and outcome measures in the studies, this review did not apply a standardised critical appraisal tool, which would risk imposing artificial comparability across fundamentally different methodologies. For a summary of all reported studies, see Table 1.

3. DEFINING THE KEY CONCEPTS

Research to date shows considerable terminological inconsistency, reflecting the absence of a shared conceptual framework. Within third language acquisition research, i.e. studies on L3-induced influence, three labels have predominated: BACKWARD TRANSFER (e.g. Cheung et al., 2011; Hui, 2010), REVERSE TRANSFER (e.g. Aysan, 2012; Xiao, 2018), and REGRESSIVE TRANSFER (e.g. Kim, 2023; Puig-Mayenco, 2023). These terms have been used interchangeably, presumably to highlight the opposing direction of influence. REVERSE CROSS-LINGUISTIC INFLUENCE (Velnić et al., 2026) and ATTRITION have appeared sporadically (Cabrelli Amaro, 2017b), while more recently, the label REGRESSIVE CROSS-LINGUISTIC INFLUENCE has been introduced as a broader, more encompassing alternative (e.g. Bousfield and Chang, 2023; Olszewska and Długosz, 2025).

By contrast, in second language research the dominant formulations have been EFFECTS OF L2 ON L1 (e.g. Cook et al., 2003; Długosz, 2021), and INFLUENCE OF L2 ON L1 (e.g. Oliveira et al., 2017; Requena and Berry, 2021). Less frequent alternatives include EFFECTS OF FOREIGN LANGUAGE LEARNING (Kecskés, 1998) and ATTRITION(–LIKE) EFFECTS (Martín-Villena, 2023).

The choice between TRANSFER, CROSS-LINGUISTIC INFLUENCE, and ATTRITION is not accidental, but rather reflects distinct theoretical perspectives on the extent of influence. Traditionally, research on L1 attrition has concentrated on bilinguals living in an L2-dominant, immersed environment for an extended period of time. This line of reasoning assumes that attrition stems from limited L1 use combined with extensive L2 exposure, potentially leading to language erosion or loss (Schmid and Köpke, 2017, p. 640). More recently, Schmid and Köpke (2017, p. 641) have expanded the scope of the term, suggesting that in principle, "*Attrition effects begin as soon as L2 development sets in (. . .) so every bilingual is an L1 attriter*". Under this view, attrition encompasses a wide range of effects occurring as a result of co-activation of languages in the learner's repertoire – from transient manifestations of cross-linguistic influence to permanent changes at the level of language representation. This continuum-like perspective allows attrition to be considered more broadly across different stages of Ln (any language acquired after the L1) development, rather than somewhat artificially restricting it to a specific length of residence or acquisition context. In rCLI research, this broader approach has been explicitly supported by Cabrelli (2023). At the same time, Schmid and Köpke's proposal has been challenged as one that diffuses crucial distinctions between phenomena that share certain similarities, but are conceptually different, consequently rendering the notion unproductive (e.g. Kupisch et al., 2017; Meisel, 2017). In addition, including L3-to-L2 rCLI under the label of L2 attrition risks confusion with yet another, similarly named phenomenon. Namely, L2 ATTRITION or FOREIGN LANGUAGE ATTRITION have more commonly been used to frame forgetting that follows the end of L2 exposure (e.g. Mehotcheva and Köpke, 2019). Thus, although attrition could be driven by rCLI (e.g. Mickan et al., 2020), levelling these distinctions can be rather misleading.

Beyond ATTRITION, the difference between TRANSFER and CROSS-LINGUISTIC INFLUENCE has also been subject to debate. The latter is often regarded as the more inclusive term, encompassing all types of interactions between the languages in the learner's mind – both at the level of grammatical representations and in language processing (Sharwood Smith, 1983). It has even been argued that the notion of transfer should be abandoned altogether, as it implies literal movement of a grammatical property, either by removing it from the source language or by copying it elsewhere (Sharwood Smith, 2021). A less categorical approach prefers CLI but treats the two terms as interchangeable from a practical point of view (e.g. Westergaard et al., 2023). From another perspective, however – one that places copying at the core of initial grammar development – the distinction carries theoretical weight. Here, transfer refers specifically to changes in grammatical representations, while CROSS-LANGUAGE EFFECTS capture transient, processing-related phenomena. Cross-linguistic influence serves as an umbrella term for both (e.g. Rothman et al., 2019).

[2] With the exception of two reported studies: Cabrelli Amaro (2017b), where immersion context was not strictly controlled across the groups and is acknowledged as a potential confound, and Puig-Mayenco (2023), where learners initially acquired the L3 in instructed settings but had spent at least 12 months abroad in immersion at the time of testing. These studies are nevertheless included in the review due to their theoretical importance.

Table 1
An overview of studies examining regressive cross-linguistic influence from non-native languages acquired in instructed settings.

Number	Study	Term adopted in the study	rCLI type	Direction	Constellation[a]	Sample size[b]	Reported proficiency[c]	Proficiency measure	Phenomena	Instruments[d]
1	Kecskés (1998)	effect of foreign language learning	facilitative	L2-to-L1	L1 Hungarian L2 English, French	104 (35 with English, 36 with French)	L2: unspecified	–	subordinate clauses	written production task
2	Chuang (2002)	language interference	facilitative	L3-to-L2	L1 Taiwanese L2 English L3 German	120 (60)	L2: studied for at least 7 years; L3: unspecified	–	relative clauses	AJT, translation task, written sentence-combination task
3	Cook et al. (2003)	effects of the second language on the first	facilitative	L2-to-L1	L1 Japanese, Spanish, Greek L2 English	162 (24 Japanese, 20 Spanish, 51 Greek)	L2: unspecified	–	non-canonical word order (animacy, case, number cues)	subject identification task
4	Dussias and Sagarra (2007)	effect of L2 on L1	neutral	L2-to-L1	L1 Spanish L2 English	92 (20 immersed bilinguals, 28 non-immersed bilinguals)	L2: from intermediate to advanced	self-reports	relative clause attachment	eye-tracking
5	Ewert (2008)	effect of L2 on L1	facilitative	L2-to-L1	L1 Polish L2 French	72 (24 younger bilinguals, 24 older bilinguals)	L2: 1 year or 3 years of intensive instruction	years of study, hours of instruction	syntactic and stylistic preferences	AJT
6	Hui (2010)	backward transfer	facilitative	L3-to-L2	L1 Chinese L2 English L3 French	56 (31)	L2: studied for at least 16 years; L3: 3rd year students of a major in French	L2: Hong Kong Advanced Level Examination; L3: years of study, hours of instruction	relative clauses	written picture elicitation task
7	Cheung et al. (2011)	backward transfer	non-facilitative	L3-to-L2	L1 Chinese L2 English L3 German	27 (12) in written production; 37 (26) in AJT	L2: advanced; L3: intermediate	L2, L3: years of study	tense-aspect	AJT, written production task
8	Aysan (2012)	reverse transfer	non-facilitative	L3-to-L2	L1 Turkish L2 English L3 Italian or French	60 (20 with Italian, 20 with French)	L2: intermediate; L3: advanced	L2: proficiency test; L3: years of study	subject pronoun omission	AJT with correction
9	Tsang (2016a)	reverse cross-linguistic influence, reverse transfer	facilitative	L3-to-L2	L1 Chinese L2 English L3 French	114 (48)	L2: advanced; L3: divided into three groups (beginner, intermediate, advanced)	L2: Oxford Placement Test; L3: Test de Connaissance du Français	number agreement	timed AJT with correction, free written production task
10	Tsang (2016b)	reverse transfer	facilitative and non-facilitative	L3-to-L2	L1 Chinese L2 English L3 French	133 (48)	L2: advanced; L3: divided into three groups (beginner, intermediate, advanced)	L2: Oxford Placement Test; L3: Test de Connaissance du Français	number agreement (facilitation), past simple tense marking (facilitation), adverb placement (non-facilitation)	timed AJT with correction, multiple-choice cloze task, free written production task
11	Llinàs-Grau and Puig-Mayenco (2016)	regressive transfer	facilitative	L4-to-L3	L1-L2 Catalan-Spanish L3 English L4 German	71 (22)	L3: advanced; L4: intermediate	L3: Cambridge Online Placement Test; L4: self-reports	that-deletion	written sentence-combination task
12	Fung and Murphy (2016)	backward transfer, backward cross-linguistic influence	non-facilitative	L2-to-L1 L3-to-L2	L1 English L2 French L1 varied L2 English L3 French	47 (21 in the L2 group, 9 in the L3 group)	L2: advanced; L3: intermediate or higher	L2, L3: years of study	tense-aspect	timed AJT, proofreading task

13	Cabrelli Amaro (2017b)	regressive transfer, attrition	non-facilitative	L3-to-L2, L1	L1 Spanish or English L2 Spanish or English L3 Brazilian Portuguese	75 (13 English–Spanish, 7 Spanish–English)	L2: advanced; L3: advanced	L2 English: not tested; L2 Spanish: proficiency test; L3 Brazilian Portuguese: proficiency test	subject-to-subject raising across a dative experiencer	AJT
14	Oliveira et al. (2017)	L2 influence on L1	facilitative	L2-to-L1	L1 Brazilian Portuguese L2 English	53 (27)	L2: advanced	L2: Vocabulary Levels Test	resultative and depictive constructions	speeded AJT, maze task
15	Xiao (2018)	reverse transfer	facilitative	L3-to-L2	L1 Chinese L2 English L3 Portuguese	105 (41 in 1-year group, 34 in 4-year group)	L2: intermediate; L3: two groups (one after 1 year of study, one after 4 years of study)	L2: Oxford Quick Placement Test; L3: years of study	study 1: verbal agreement study 2: definiteness in the article system	study 1: AJT, free written production task study 2: picture-based cloze task
16	Ahn and Jang (2019)	backward transfer	facilitative and non-facilitative	L3-to-L2	L1 Korean L2 English L3 French L1 Korean L2 English L3 Chinese L1 Chinese L2 English L3 Korean	79 (20) with L3 French 79 (20) with L3 Chinese 79 (20) with L3 Korean	L2: intermediate; L3s: intermediate	L2: Michigan Test; L3s: Mini DELF Test for French, HSK Test for Chinese, TOPIK Test for Korean	genericity	AJT, story-based truth-value judgement task
17	Ahn and Mao (2019)	reverse transfer	facilitative	L3-to-L2	L1 Chinese L2 EnglishL3 Korean	73 (23)	L2: intermediate; L3: 1st or 2nd year of learning	L2: Cambridge Quick Placement Test; L3: years of study	anaphoric reflexive binding	truth-value judgement task
18	Cedden and Aydin (2019)	influence of non-native languages on the L1	facilitative	L2, L3, L4-to-L1	L1 Turkish L2 English L3 German L4 varied	117 (26 L4 speakers)	L2: advanced; L3: unspecified; L4: from intermediate to advanced	L2, L3, L4: self-reports	non-canonical word order	self-paced reading task
19	Liu et al. (2020)	cross-linguistic influence	neutral	L2-to-L1	L1 Chinese L2 English	32 (15)	L2: advanced	L2: IELTS (tested externally)	null and overt subject realisation	video-based oral narration task
20	Długosz (2021)	L2 effects on L1, cross-linguistic influence	neutral	L2, L3-to-L1	L1 Polish L2 English L2 German	41 (25)	L2: advanced; L2: advanced	L2s: years of study, hours of instruction	object pronoun omission, verb placement in wh-questions	AJT
21	Requena and Berry (2021)	cross-linguistic influence	facilitative	L2-to-L1	L1 Spanish L2 English	41 (22)	L2: advanced	L2: MELICET test, self-reports	clitic placement	self-paced reading task
22	Kim (2023)	regressive transfer	non-facilitative	L3-to-L2	L1 Korean L2 English L3 Spanish	31 (7)	L2: advanced; L3: from beginner to intermediate	L2, L3: proficiency tests	genericity	AJT, truth-value judgement task
23	Sun (2023)	reverse transfer	non-facilitative	L3-to-L2	L1 Chinese L2 English L3 French	44 (22)	L2: from intermediate to advanced; L3: from intermediate to advanced	L2: TEM-8, IELTS (tested externally); L3: TEF, TCF, DELF, DALF (tested externally)	tense-aspect	error correction task, AJT with correction, cloze task
24	Puig-Mayenco (2023)	regressive transfer	non-facilitative	L3-to-L2, L1	L1 Catalan or Spanish L2 Catalan or Spanish L3 English	62 (17 Catalan–Spanish, 15 Spanish–Catalan)	L2: advanced; L3: advanced	L2s: not tested; L3: Oxford Quick Placement Test	negative concord	self-paced reading task
25	Martín-Villena (2023)	L2 to L1 influence, attrition effects	neutral	L2-to-L1	L1 Spanish L2 English	207 (80 instructed bilinguals, 94 immersed bilinguals)	L2: advanced	L2: Oxford Quick Placement Test, self-reports	null and overt subject referring expressions	two video-based oral narration tasks, picture selection task, self-paced reading task

(*continued on next page*)

Table 1. (*continued*)

Number	Study	Term adopted in the study	rCLI type	Direction	Constellation[a]	Sample size[b]	Reported proficiency[c]	Proficiency measure	Phenomena	Instruments[d]
26	Park and García Mayo (2024)	backward transfer	facilitative	L3-to-L2	L1 Korean L2 English L3 Spanish	29 (11)	L2: advanced; L3: advanced	L2: proficiency test; L3: language certificate DELE scores (tested externally)	definiteness in the article system	AJT, self-paced reading task
27	Velnić et al. (2026)	reverse cross-linguistic influence	facilitative	L3-to-L2	L1 Polish L2 English L3 Norwegian	113 (24)	L2: unspecified; L3: unspecified	L2, L3: not tested; filler items from the main task used as a proxy	genericity	contextualised AJT
28	Kim et al. (2025)	reverse transfer, backward transfer	facilitative	L3-to-L2	L1 Korean L2 English L3 Chinese	116 (56)	L2: beginner and advanced L3: unspecified	L2: Cambridge Quick Placement Test; L3: Mini HSK Test	anaphoric reflexive binding	truth value judgement task
29	Olszewska and Długosz (2025)	regressive cross-linguistic influence	neutral	L3-to-L2	L1 Polish L2 EnglishL3 Danish, Swedish or Norwegian	163 (52 with Swedish, 46 with Danish)	L2: advanced; L3: from beginner to advanced	L2, L3: Dialang Test, self-reports	verb-particle constructions	AJT, self-paced reading task
30	Olszewska (2025)	regressive cross-linguistic influence	neutral	L4, L3, L2-to-L1	L1 Polish L2 English L3 Danish, Swedish or Norwegian L4 German	228 (87 L4 learners)	L2: advanced; L3/ L4: from beginner to advanced	L2, L3, L4: self-reports	V2, adverb placement in main clauses	AJT

[a] The table presents the linguistic repertoires of the experimental groups, which were expected to show signs of rCLI. Control groups in the studies typically subtracted the L3, and in some cases, L1 and L2 were inverted in a mirror-group design. These control group configurations are not reported in the table.

[b] The table first reports the overall number of participants, followed by the number of participants in the experimental group in parentheses.

[c] Whenever proficiency is marked as unspecified, it indicates that the authors did not report it explicitly. In most cases, however, they commented on the relative proficiency levels of the experimental and control groups (e.g. by stating that the groups were comparable).

[d] AJT refers to either an acceptability judgement task or a grammaticality judgement task, depending on the terminology used by the author.

These issues are equally relevant to research on the regressive direction of influence, though the exact nature of the reported changes is often left unspecified. For example, Cabrelli Amaro (2017b) links acceptability judgement data to representational changes and adopts the label regressive transfer. By contrast, Olszewska and Długosz (2025) report both judgement and self-paced reading data, and employ regressive cross-linguistic influence as an overarching term. Most rCLI studies, however, have been exploratory in nature[3] and have not explicitly justified the terminology adopted or the assumptions underlying it, focusing instead on establishing whether the effect can be detected at all. Consequently, many studies have not clearly articulated their theoretical underpinning. Future studies would therefore benefit from greater explicitness regarding their conceptual grounding and the level at which the underlying changes are assumed to occur.

4. THEORETICAL FRAMEWORKS

Within the theoretical frameworks applied specifically to the regressively occurring influence, four main lines of reasoning can be identified. This section proceeds chronologically and reviews only theoretical frameworks that have been employed in the reported studies, rather than frameworks that could, in principle, be applicable to rCLI.

The earliest proposal is the DIFFERENTIAL STABILITY HYPOTHESIS (DSH; Cabrelli Amaro, 2017b) which holds that languages differ in stability depending on whether they are acquired early (L1) or late (L2).[4] Even if the late-acquired system approaches native-like proficiency, it is, in principle, less stable and, therefore, more susceptible to influence from a subsequently acquired L3. The DSH proposes that "*there is a maturationally conditioned difference in stability between linguistic systems that are acquired before* versus *after the critical period*" (Cabrelli Amaro, 2017b, p. 177–178) and operationalises this distinction by setting the threshold age of acquisition at 12 years. To test the DSH, the author examined the influence of L3 Brazilian Portuguese on two mirror groups of Spanish–English bilinguals and a control group of Spanish monolinguals. Results from an acceptability judgement task targeting subject-to-subject raising across a dative experiencer revealed that Spanish in both experimental groups was influenced by L3 Brazilian Portuguese. Weaker effects observed in L1 Spanish were interpreted as a reflection of either cumulative influence from L2 and L3 or close typological similarity between Romance languages. The significantly more robust effects attested in L2 Spanish, however, gave precedence to age of acquisition as the primary factor driving rCLI and highlighted its status as less stable in general.

In the first empirical test of the DSH, Puig-Mayenco (2023) investigated whether an early-acquired L2 – i.e. one which began to be acquired between the ages of 3 and 6 – is equally susceptible to influence from an L3 as a late-acquired L2. To this end, the author compared four mirror-image groups: two of Catalan–Spanish bilinguals and two of Catalan–Spanish–English trilinguals, with Catalan and Spanish alternating as either L1 or L2. A number of marginally different conditions concerning negative concord were targeted in a self-paced reading task. A comparison between the bilingual control groups and the trilingual experimental groups – who shared the same linguistic background and differed only in the presence of an L3 – revealed effects of L3 English on the L2. The L1, however, remained unaffected, regardless of it being Catalan or Spanish. This was taken as partial support for the DSH, as L2 proved more vulnerable, while the lack of L1 effects was attributed to a relatively short period of immersion in an L3-speaking environment. An additional finding – though not supported by concurrent evidence on rCLI – concerned L2 optionality; specifically, L2 structures in which sentential negation was optional showed signs of influence, whereas those with a single setting did not, suggesting that optionality may facilitate rCLI emergence. However, having considered the two affected conditions against previous findings, the author ultimately proposed an extension to the DSH, i.e. the SANDWICH EFFECT. This proposal posits that rCLI is more likely if a structure is acquired in a target-like manner in the L3, and patterns the same in both L1 and L3. Crucially, this similarity of distribution is not a prerequisite, but rather a factor that increases the likelihood of influence.

Another recent account is the SIMILARITY CONVERGENCE HYPOTHESIS, introduced by Brown-Bousfield and Chang (2023). While the proposal is currently grounded in research on phonology, it is included here as potentially relevant for future work. The study compared mirror groups of sequential bilinguals with English and German (as L1s or L2s), as well as sequential trilinguals with L3 Spanish. Using a picture narration task, the authors analysed speech rhythm to test the roles of age of acquisition and typological similarity. The comparison made between the bilingual and the trilingual groups indicated that L3 Spanish exerted influence only on L1 English, which was deemed typologically closer in this constellation. Crucially, age of acquisition did not act as a predictor, and L2s were not universally more affected, as

[3] As stated explicitly by several authors (e.g. Długosz, 2021; Fung and Murphy, 2016).

[4] The DSH's theoretical predecessor was the Phonological Permeability Hypothesis (Cabrelli Amaro and Rothman, 2010; Cabrelli Amaro, 2013, 2017a). The proposal was initially limited to phonology but was later extended to include morphosyntactic phenomena following the findings of Cabrelli et al. (2015) and Cabrelli Amaro (2017b).

would have been expected under the DSH. On this basis, the hypothesis proposes that in the case of typological similarity, the earlier-acquired system converges towards the later-acquired system.[5]

Recently, Olszewska and Długosz (2025) suggested that rCLI can be accounted for by the LINGUISTIC PROXIMITY MODEL – one of the models originally developed to predict the course of progressive CLI in L3 acquisition (Westergaard et al., 2017; Westergaard et al., 2023). The authors examined Polish–English learners of Norwegian, Swedish, or Danish. In Olszewska and Długosz (2025), the targeted phenomenon was particle placement, which in English and Norwegian optionally precedes or follows an object NP, but is fixed in one position in Swedish and Danish. Cross-sectional data from acceptability judgement and self-paced reading tasks showed influence from L3 Swedish and L3 Danish, modulated by learners' developing accuracy on the structure in the L3. For Swedish learners, in which the target pre-posed option is relatively easy to acquire, rCLI had already emerged at the intermediate level. For Danish learners, who had to acquire the more taxing post-posed option, rCLI appeared only at advanced levels. The L3 Norwegian control group showed no preference for either particle position in L2 English, supporting the notion that the effects observed in the other groups were L3-induced. If anything, these learners judged both particle positions more favourably, suggesting possible facilitation from Norwegian. Overall, the authors argue that the same mechanism – co-activation of structurally similar properties – underlies both progressive and regressive CLI. Because L2 grammars are usually more stable than the subsequently developing L3, L3 co-activation during L2 processing does not generally lead to lasting changes. However, under favourable conditions where adopting L3 parsing strategies in the L2 does not entail a grammar violation, rCLI effects may persist and strengthen with increasing L3 accuracy – as in particle placement, where the L3 reinforces one of the available L2 options. The authors, therefore, propose that optionality, alongside structural similarity, is a key factor enabling rCLI.

In addition, it can be noted that a number of studies on rCLI draw on the notion of MULTICOMPETENCE (Cook, 1991), which views all languages of an individual as an interconnected system. From this perspective, CLI in either direction becomes an expected outcome (e.g. Hui, 2010; Tsang, 2016a). However, while this holistic view highlights the interdependence of an individual's languages, it does not allow for formulating any specific or testable predictions regarding when or how such effects will arise.

Finally, two studies have also referred to the COMPETITION MODEL (e.g. MacWhinney, 2012), which assumes that sentence processing follows the relative weight of linguistic cues. Cue weights arise from their availability and reliability, and are established on the basis of distributional patterns in the input. These cues sometimes converge and at other times conflict, resulting in an interpretation driven by the stronger cue. Considering the differing cue weights across languages, the model has been applied to cross-linguistic settings and used to account for L2-to-L1 influence. In this respect, Requena and Berry (2021) and, more broadly within a multicompetence framework, Cook et al. (2003) examined whether L2 cue weights would carry over to the L1. Accordingly, both studies found that L2 exposure can weaken the strength or reliability of L1-specific processing cues.

Because the main theoretical contributions originate in studies on L3-induced rCLI, these will serve as the point of departure for the subsequent section on further empirical contributions. Empirical work in this domain can be broadly divided into studies investigating facilitative versus non-facilitative effects, and the section will begin with the former. After addressing findings on L3-to-L2 influence, the review will shift to the comparatively fewer studies on L2-to-L1 influence. Throughout the review, findings are reported in line with the interpretations advanced by the original authors. In cases where interpretations depend on a specific task or analytic focus, this is clarified. Given the heterogeneity of the literature, this narrative review does not attempt to re-analyse empirical results or provide an exhaustive study-by-study evaluation of methodological limitations. Rather, it maps the existing early evidence in the field.

5. EMPIRICAL FINDINGS ON THE INFLUENCE OF L3 ON L2

Overall, 15 of the 30 studies examined L3-to-L2 influence, and 1 study focused on L4-to-L3 influence. In addition, 3 studies simultaneously examined differential influence on both L1 and L2. Across these studies, 9 reported clearly facilitative effects, 7 identified non-facilitative effects and 2 documented both; 1 study reported neutral effects.

5.1. Facilitative influence

The first studies exploring facilitative L3-to-L2 influence were conducted by Chuang (2002) and Hui (2010). Both focused on English relative clauses and examined whether experience with an L3 could accelerate the L2 acquisition

[5] This relates to objective typological similarity. While the authors acknowledge that psychotypological similarity may also be relevant in the process, they did not directly collect data on this subjective distance and, therefore, refrain from extending the hypothesis in that direction.

due to typological and structural similarities between the languages. To isolate potential L3 effects, both studies compared a trilingual experimental group with a bilingual control group. Chuang (2002) investigated Taiwanese–English–German learners and hypothesised that knowledge of two, rather than one, Germanic languages would create an advantage for the trilingual speakers. However, despite administering a battery of tasks – acceptability judgement, translation, and sentence-combination tasks – no group differences emerged, leading to the conclusion that L3 German did not facilitate L2 English acquisition. Hui (2010), by contrast, tested Chinese–English–French learners using a written picture elicitation task with prompts designed to elicit 24 occurrences of relative clauses. By targeting structures that are typologically and structurally equivalent between English and French, the author hypothesised that the trilingual group would be more likely to produce them than the bilingual group. A cross-group comparison showed that the trilinguals indeed produced a higher number of different types of relative clauses than the bilinguals, which was interpreted as evidence of L3-induced facilitation. Focusing on the same language constellation and the same design, Tsang (2016a) examined number agreement as both L3 French and L2 English employ inflection to mark plurality on nouns. Participants at beginner, intermediate and advanced levels of L3 proficiency completed a timed acceptability judgement task and a free written production task in L2 English. Contrary to predictions, the trilingual experimental group did not significantly outperform the bilingual controls in the acceptability ratings. However, in written production, advanced trilinguals produced a higher ratio of target-like plural noun phrases than bilinguals, leading the author to conclude that facilitation from the L3 emerges only at higher levels of proficiency. In an extension of this study, Tsang (2016b) also included a multiple-choice cloze task and tested two additional structures: past tense marking and adverb placement. Again, no group differences emerged in receptive measures; in written production, however, L3 facilitation was evident for number agreement and past tense marking, while adverb placement remained unaffected. Consistent with the earlier findings, these effects were largely confined to advanced learners.

In a similar vein, Ahn and Jang (2019) conducted a series of experiments on the generic interpretation among speakers of different language triads. The three experiments targeted the article system in L2 English, and involved Korean–English–French, Korean–English–Chinese, and Chinese–English–Korean trilinguals, juxtaposed with control bi- and monolinguals in a subtractive design. In the study, the authors formulate distinct hypotheses regarding the influence on definite plural NPs across varied language combinations. In an acceptability judgement task, no differences between experimental and control groups were found. By contrast, in a truth-value judgement task – where the participants judged a sentence as true or false relative to a short background story – group differences emerged in accuracy. In experiment 1, English and French differ in their interpretation of definite plural NPs, rendering L3 French potentially non-facilitative; accordingly, the Korean–English–French trilinguals were less accurate than the Korean–English bilingual controls. In experiment 2, consistent with the expectation that L3 Chinese would likewise be non-facilitative, the Korean–English–Chinese group performed less accurately than its bilingual control. Finally, in experiment 3, the Chinese–English-Korean group, for which facilitation from L3 Korean was predicted, outperformed its bilingual counterpart. Since all groups had comparable intermediate proficiency in L2 English, the authors interpreted these accuracy differences in the truth-value task as evidence of influence stemming from different L3s.

Subsequently, Ahn and Mao (2019) used a similar truth-value judgement task to examine the interpretation of reflexive bindings among Chinese–English–Korean learners, comparing them with bilinguals matched in L2 English but with no knowledge of L3 Korean. Although the results did not reach statistical significance, the trilingual experimental group showed a trend towards higher accuracy than the bilingual controls. As the groups were otherwise comparable in their language backgrounds, this was tentatively interpreted as a sign of facilitation from L3 Korean. In a follow-up study, Kim et al. (2025) administered the same task and stimuli, using the same design with Korean–English–Chinese learners at two levels of L2 English proficiency. When tested in L2 English, the trilingual learners with higher L2 proficiency outperformed the L2-matched control group, suggesting facilitation from the additional L3.

Taking a more comprehensive approach, Xiao (2018) combined longitudinal and cross-sectional study methods. A group of Chinese–English–Portuguese learners was tested at both the beginning and end of their first year of studying Portuguese, and their responses were compared with those of a separate group of learners who had been majoring in Portuguese for four years, as well as with Chinese–English controls. The first experiment, which examined verbal agreement through free written production and acceptability judgement tasks with correction, showed L3-to-L2 facilitation after one year of study in both tasks. No further L2 development was detected in the more experienced group with four years of exposure, which was attributed to a ceiling effect – since the L3 had already provided maximal facilitation for the structure after just one year of study, further gains were not possible. In the second experiment, a picture-based cloze task was used to test the article system. Here, facilitation was observed in both the first-year and fourth-year student groups, suggesting that extended L3 exposure mattered for this structure. These differing outcomes were attributed to the relative frequency and salience of the two structures under study, with verbal agreement considered easier to acquire. In both experiments, no comparable effects were detected in the bilingual control groups, supporting the conclusion that the L3 was the source of the influence.

Building on this line of research, Park and García Mayo (2024) considered a different language triad and investigated whether speakers of L1 Korean, an article-less language, would experience L3 Spanish facilitation in their L2 English, since both these languages have an article system. To isolate the effect of additional language knowledge, the trilinguals were compared with Korean–English bilinguals and English monolinguals. Although the two tested conditions yielded mixed results, data from both acceptability judgement and self-paced reading tasks overall revealed that the trilingual group was more sensitive to ungrammaticalities than the bilingual group with subtracted Spanish. Given that both groups had comparable proficiency in L2 English, the greater sensitivity to errors was attributed to rCLI.

Recently, Velnić et al. (2026) investigated Polish–English–Norwegian trilinguals. Using a subtractive design, the authors compared this group with two others: Norwegian monolinguals and Polish–English bilinguals. Although the study aimed to capture direct L3-to-L2 facilitation, a contextualised acceptability judgement task showed that the trilinguals had not yet acquired genericity distinctions in their L3 Norwegian, rendering it unavailable as a source of rCLI. Nevertheless, they performed more accurately than the control bilinguals, which the authors attributed to a broader advantage stemming from exposure to multiple languages with an article system.

Lastly, Llinàs-Grau and Puig-Mayenco (2016) considered a different profile of Catalan–Spanish learners and examined whether an additional non-native system – L4 German – could facilitate L3 English. To this end, they compared quadrilinguals to trilinguals without L4 German and tested both groups in L3 English. They focused on that-deletion – a phenomenon allowing the omission of the complementiser 'that' in English more generally, and in German only in restricted contexts. In a written sentence-combination task, quadrilingual learners omitted the complementiser significantly more often than trilingual learners, demonstrating that L4 German knowledge, though contextually limited, promoted more target-like performance in L3 English.

5.2. Non-facilitative influence

By comparison, fewer studies have addressed possible non-facilitative effects, whereby the acquisition of an additional L3 destabilises previously acquired L2 knowledge. In these studies, the L3s pattern differently than the L2s on the relevant properties, leading to the hypothesis that trilinguals will be less accurate than bilinguals with otherwise comparable L2 proficiency.

Cheung et al. (2011) considered tense-aspect phenomena among Chinese–English–German learners. Because the German past tense has a broader reference than its English counterpart, the trilingual learners were hypothesised to overextend its use in English. This prediction was borne out: in both written production and acceptability judgement tasks, the trilingual group displayed a German-like usage of the past tense that was not observable in the bilingual control group. Similarly, Sun (2023) examined the same property in Chinese–English–French learners using the same subtractive design, but employed error correction, acceptability judgement, and cloze tasks instead. The results indicated L3 influence, but only in the final, production-based task, with no significant differences between groups found for the receptive tasks. In a related study, Fung and Murphy (2016) investigated the same phenomenon among L2 English L3 French learners with varied L1s, who were then compared to bilingual and monolingual control groups. In a proofreading task, participants were asked to read and correct a text passage, but no evidence of overuse of ungrammatical structures was found. In a timed acceptability judgement task, the trilingual group did assign higher ratings than the bilingual controls, though these differences did not reach statistical significance. Accordingly, the authors reached only tentative conclusions about the impact of L3 on L2.

In contrast to these mixed findings, Aysan (2012) investigated subject pronoun omission among Turkish–English learners with either L3 French or L3 Italian. While Turkish and Italian allow for pronouns to be omitted, in English and French, they are always expressed overtly. Using an acceptability judgement task with correction, the author found that the Turkish–English–Italian group significantly over-accepted ungrammatical L2 English sentences with omitted pronouns. Since neither the trilingual Turkish–English–French group nor the bilingual Turkish–English group showed such effects, this difference was attributed to non-facilitative rCLI from L3 Italian.

More recently, Kim (2023) examined genericity among Korean–English–Spanish learners. In the study, the trilingual group was significantly less accurate than bilingual controls without L3 Spanish in their interpretation of bare plurals, while no difference was observed for definite plurals. Importantly, however, this effect emerged in a story-based truth-value judgement task, while ratings in an acceptability judgement task remained unaffected, suggesting possible task effects.

As outlined earlier in the section on theoretical accounts, further evidence of non-facilitative L3 influence has been documented by Cabrelli Amaro (2017b) and Puig-Mayenco (2023). In addition, Olszewska and Długosz (2025) report a differential, L3-specific influence that is best characterised as neutral. Although their findings are not repeated here, it is worth noting that they likewise fall into these categories, with some of them also bearing relevance for understanding L1 changes – the focus of the next section.

6. EMPIRICAL FINDINGS ON THE INFLUENCE OF L2 ON L1

Turning to L2-induced rCLI, it is important to note that despite the more rapid growth of L3-induced rCLI research, this earlier line of work remains equally important for understanding cross-linguistic influence more broadly and accounts for 11 of the 30 reported studies. However, in contrast to the clear distinction between facilitative and non-facilitative influence in research on L3 learners, studies on L2-to-L1 influence tend to focus either on clearly facilitative effects (6 studies) or on what can best be termed as neutral effects (5 studies).

6.1. Facilitative influence

Among the studies pointing specifically to L2-to-L1 facilitation, Kecskés (1998) provides a pioneering example. In a longitudinal study with Hungarian learners of English and French, the author analysed essays from a free writing task. The results indicated that learners used their L1 more creatively than monolingual control peers – in particular, they produced a greater number of subordinate clauses, which were also more complex. Kecskés interpreted this as evidence of facilitation arising from the acquisition of different L2s.

Subsequently, Cook et al. (2003) investigated Japanese, Greek, and Spanish learners of English. By presenting sentences with varied word order, they examined the role of animacy, case, and number cues in subject identification within each item. The results revealed an overreliance on these cues in the Japanese group, together with reduced sensitivity in the Greek and Spanish groups. Although the study initially assumed that L2 English acquisition would directly influence subject identification, the authors proposed instead that the effects were indirect and largely due to enhanced metalinguistic awareness.

Comparable results were reported by Ewert (2008), who explored the influence of L2 French on L1 Polish. Using an acceptability judgement task, the author tested speakers' perceptions of the naturalness of different syntactic structures. It appeared that bilingual learners were more concise and displayed less variation than monolinguals. This heightened sensitivity to non-standard forms was likewise interpreted as evidence of a broader, more global effect of L2 acquisition.

In terms of language processing, Oliveira et al. (2017) tested Brazilian Portuguese–English learners with a battery of tasks targeting resultative and depictive constructions; while resultatives are licensed only in English, depictives occur in both these languages. A speeded acceptability judgement task revealed no differences between the bilingual group and monolingual controls. A maze task, however, showed that the bilinguals processed both types of constructions faster – with a comparatively stronger effect for the construction present in both L1 and L2 – which the authors interpreted as a sign of L2 facilitation.

In a related study, Requena and Berry (2021) investigated clitic placement among Spanish–English bilinguals. In Spanish, clitics can occur in both pre- and postverbal positions, whereas in English, they are restricted to a postverbal position. The results showed that at the point of structural L1–L2 overlap, where both languages align, bilinguals experienced processing facilitation in the L1 compared to monolingual controls.

Finally, Cedden and Aydın (2019) employed a self-paced reading task to examine non-canonical word order patterns among Turkish mono-, bi-, tri-, and quadrilinguals. Their results indicated an overall facilitative effect of additional language learning on the L1, with the L4 group showing the greatest processing efficiency.

6.2. Neutral influence

Turning to studies that report effects best characterised as neutral, these primarily examine pragmatics-related phenomena and consequently report preference shifts rather than L2-induced grammatical violations.

One strand of this research highlights the role of immersion. Dussias and Sagarra (2007) contrasted Spanish–English bilinguals with limited versus extensive immersion in an L2 environment. Using an eye-tracking experiment on relative clause attachment, they found that only the immersed group adopted L2-like parsing strategies, suggesting that extensive exposure may sometimes be necessary for the effects to emerge.

In a related investigation, Martín-Villena (2023) compared two groups of Spanish–English bilinguals, residing in either an L1 or L2 environment. Omission and insertion of subject-referring expressions were tested in a battery of tasks: two video-based oral narration tasks, a picture selection task, and a self-paced reading task. The results showed that both instructed and immersed bilinguals were more pragmatically anomalous in oral production, with the effect being stronger for the immersed group and limited to the cognitively more demanding task. In the picture selection task, no group-level differences emerged, but L2-dominant bilinguals displayed stronger L2-like preferences. Finally, the self-paced reading task revealed that, unlike monolinguals, bilinguals did not incur additional processing costs when reading overtly expressed co-referents. In the latter two tasks, the attested variation was further modulated by length of residence among immersed bilinguals.

Employing a similar oral elicitation task, Liu et al. (2020) investigated subject omission among Chinese–English bilinguals. When narrating a muted story, participants produced more overt subjects and fewer null subjects compared to control monolinguals, indicating an L2-induced quantitative shift in preference.

Turning to a different population, Długosz (2021) conducted an acceptability judgement task with Polish learners of English and German, treated as two L2s of equal status. The study targeted anaphoric object pronouns and verb placement in wh-questions. In the former case, pro-drop Polish was influenced by the L2s, in which pronouns in a non-topic position must be expressed overtly. Since both English and German share this constraint, their individual effects could not be disentangled, pointing instead to possible combined rCLI, whereby both L2s jointly impacted the L1. By contrast, verb placement in Polish appeared unaffected by the fixed word order of the L2s.

With a similar focus, Olszewska (2025) examined word order and compared four groups of learners: Polish–English bilinguals, Polish–English–German trilinguals, Polish–English–Scandinavian trilinguals and Polish–English–German–Scandinavian quadrilinguals. Results from an offline acceptability judgement task revealed the strongest rCLI in the last group, underscoring the combined effect of L3 and L4. This influence was more robust with increasing Ln proficiency. Further, it was modulated by the frequency of the relevant structure in Ln and the optionality permitted by the L1, highlighting the importance of additional, structure-related factors.

7. GENERAL DISCUSSION

Taken together, these findings point to several recurring tendencies that will now be discussed to outline their broader implications for future research on rCLI. Crucially, half of the studies (15 of the 30 overall) have investigated facilitative rCLI. The reported effects were either indirect – manifesting as enhanced metalinguistic awareness, greater noticing of patterns, or more efficient processing (e.g. Ewert, 2008; Velnić et al., 2026) – or more explicit, when the presence of a structure in both L2 and L3 led to a lower incidence of L2 errors (e.g. Hui, 2010; Xiao, 2018). This reinforcement of a previously acquired system aligns with the well-established line of research in which bi- and multilinguals benefit from a multilingual advantage, i.e. the additive effect of multilingualism more generally (e.g. Długosz, 2023b).[6] By contrast, non-facilitative influence has been addressed less frequently – in 7 of the 30 studies – making it more difficult to pin down. Still, it is now clear that acquiring a new language can come at a certain cost, most often reflected in inflated ratings of non-target L2 structures or in reduced sensitivity to errors during processing (e.g. Aysan, 2012; Puig-Mayenco, 2023). A small subset (2 of the 30 studies) has focused on both facilitative and non-facilitative effects, depending on the tested structure or language constellation (Ahn and Jang, 2019; Tsang, 2016b). Finally, a number of studies (6 of the 30) have also addressed neutral influence, where the addition of an Ln results in a preference shift or attenuated sensitivity in processing, but does not lead to ungrammaticality (e.g. Dussias and Sagarra, 2007; Liu et al., 2020).

A further recurring theme concerns the combined effects arising from two languages working in parallel. This influence cannot be at times attributed to a single language, as L2 and L3 both license the same feature (Cabrelli Amaro, 2017b; Długosz, 2021), or it emerges only in groups with knowledge of both (Olszewska, 2025). Similarly, the Sandwich Effect predicts that L2 is particularly vulnerable when influenced simultaneously by L1 and L3 (Puig-Mayenco, 2023). At the same time, some studies report null effects (Ahn and Mao, 2019; Chuang, 2002; Fung and Murphy, 2016), which at present cannot be reliably attributed to a specific cause.

Another dimension to be considered is the differential vulnerability of L1 and L2, directly investigated by three studies. Here, Cabrelli Amaro (2017b) and Puig-Mayenco (2023) highlight the role of age of acquisition, reporting stronger effects on L2 rather than L1, whereas Brown-Bousfield and Chang (2023) find influence only on L1. Other studies focused exclusively on either the influence between non-native systems – predominantly L3-to-L2 (e.g. Cheung, et al. 2011), but also L4-to-L3 in one case (Llinàs-Grau and Puig-Mayenco, 2016) – or on the influence of Ln on the native system (e.g. Requena and Berry, 2021). Overall, 1 of the 30 studies targets influence on an L3, 15 focus on influence on the L2, 11 – on the L1, and 3 consider the L1 and L2 simultaneously. While both L1 and L2 clearly remain susceptible to regressive influence, the available evidence does not yet allow firm conclusions about their relative vulnerability, as rCLI appears to be mediated by additional factors.

[6] It should be noted that rCLI studies generally target phenomena for which a direct structural overlap between the languages makes the influence possible. However, some studies report broader, indirect effects when the experimental and control groups differ in their responses even though the relevant structure has not yet been acquired and therefore could not have exerted direct influence (e.g. Velnić et al., 2026). While these indirect consequences of multilingual acquisition may facilitate rCLI, they do not themselves constitute rCLI in the strict sense.

7.1. Ln proficiency

One of these mediating factors is Ln proficiency, which has been widely identified as central to rCLI. A recurring limitation in previous research lies in the insufficient reporting of participants' proficiency levels, often reduced to measures such as instruction hours or length of exposure. In other cases, the authors at times resort to stating that the experimental and control groups were comparable in terms of language knowledge, without providing detailed assessments (e.g. Hui, 2010; Velnić et al., 2026). Such approaches considerably limit the generalisability and replicability of findings. By contrast, studies that report proficiency more explicitly reveal a rather complex interplay between L2 and L3.

With respect to the language exerting an influence, an often-undertaken approach has been to specifically target advanced Ln learners and exclude those who do not reach a certain proficiency threshold (e.g. Cabrelli Amaro, 2017b; Kim, 2023). While this follows the rationale that the relevant structure must first be acquired before it can exert an influence, this restriction can actually hinder our understanding of how rCLI develops. Notably, two studies with intermediate Ln learners equally reported signs of influence (Cheung et al., 2011; Llinàs-Grau and Puig-Mayenco, 2016).

The limited research which included Ln development in the design further suggests that this assumption may be premature. Tsang (2016a, 2016b) divided participants into three proficiency-based groups and observed rCLI only in the advanced subgroup. In contrast, Xiao (2018) approached the issue longitudinally, testing the same learners at the onset of acquisition and after one year, and comparing them with another group of learners after four years of study. While verbal agreement in the L2 significantly improved after just one year of L3 instruction with no further facilitation thereafter, the article system appeared to benefit from longer L3 exposure – both after one year and after four years. These findings point to property-specific rCLI, which is not necessarily tied to overall proficiency. Similar conclusions are drawn by Olszewska and Długosz (2025). In their cross-sectional study, rCLI involving acquisition-wise less demanding preposed particle placement emerged at intermediate levels, whereas for more demanding post-posed particle placement it surfaced only at advanced levels. The authors therefore argue that additional factors play a substantial role in the process.

Turning to the language undergoing change, if it is not native (e.g. Cook et al., 2003), it is most often also acquired to an advanced degree, leading to a close L2–L3 balance (e.g. Park and García Mayo, 2024; Puig-Mayenco, 2023). This likely reflects practical considerations, as learners who begin acquiring a third language typically already have considerable experience with another language. In a few cases, however, the affected language had only been acquired to an intermediate level (Ahn and Jang, 2019; Aysan, 2012).

To summarise, current evidence indicates that the language exerting an influence does not need to be acquired to an advanced level for rCLI to arise. Although most studies investigate this scenario, rCLI has also been observed shortly after the onset of acquisition. Likewise, the language undergoing change appears vulnerable regardless of whether it is native or non-native, intermediate or advanced – though the majority of evidence still concerns native or advanced systems. This underscores the need to examine relative language balance more systematically. Studies tracking learners across different proficiency levels in the source language are imperative for understanding the developmental trajectory of rCLI, but equally important are studies testing varying proficiency levels in the target language. While it seems plausible that a language acquired to a lesser degree may be more susceptible to Ln influence, the limited evidence to date leaves this an open question for future research to address.

7.2. Language constellations

In terms of language pairings, numerous studies have focused on learners with L1 Chinese (Cantonese and Mandarin) or Korean, who acquired English as an L2 and an additional Indo-European language as an L3 – typically German, French, Portuguese, or Spanish (e.g. Cheung et al., 2011; Park and García Mayo, 2024). Another common line of work examines English in relation to other Germanic languages such as German, Norwegian, Swedish, and Danish (e.g. Llinàs-Grau and Puig-Mayenco, 2016; Velnić et al., 2026; Olszewska and Długosz, 2025), or in relation to Romance languages (e.g. Cabrelli Amaro, 2017b; Martín-Villena, 2023; Requena and Berry, 2021). This emphasis on typologically similar pairings likely reflects the expectation that similarity increases the likelihood of CLI, as recently suggested by the Similarity Convergence Hypothesis (Brown-Bousfield and Chang, 2023).

However, focusing mainly on closely related languages limits our understanding of what happens when the languages involved are typologically distant. While such pairings may also lead to convergence, they may equally heighten learners' sensitivity to contrasts. Although current research is understandably shaped by practical factors such as learner availability and the central role of English in multilingual repertoires, future studies on rCLI would benefit from including language constellations that are more diverse and typologically dissimilar.

7.3. Sample sizes

Continuing with the discussion of practical considerations, a common shortcoming of rCLI research is that many studies are largely underpowered. Several rely on exceptionally small samples of around 10 participants (e.g. Cabrelli Amaro, 2017b; Kim, 2023). Most fall into a more moderate sample size of approximately 20–25 participants (e.g. Aysan, 2012; Requena and Berry, 2021), with only a handful exceeding this threshold. Notable exceptions include studies testing between 34 and 60 trilingual learners (e.g. Tsang, 2016a, 2016b; Xiao, 2018), as well as larger samples such as 87 quadrilinguals (Olszewska, 2025) or 98 trilinguals (Olszewska and Długosz, 2025). Similarly, Martín-Villena (2023) tested 80 instructed and 94 immersed bilinguals. While small-scale studies have undoubtedly contributed valuable insights, their reduced statistical power limits the generalisability and validity of findings. Consequently, replication with larger samples is essential to allow more reliable comparisons across the field.

7.4. Tested phenomena

Regarding the subject of investigation, the studies encompass a broad spectrum of grammatical phenomena. A substantial body of work focuses on structures at the syntax–semantics and syntax–pragmatics interfaces, including the omission or overt expression of arguments (e.g. Długosz, 2021; Martín-Villena, 2023), specificity and definiteness encoded in the article system (e.g. Park and García Mayo, 2024), resultative and depictive constructions (Oliveira et al., 2017), relative clause attachment (Dussias and Sagarra, 2007), or genericity (e.g. Velnić et al., 2026; Kim, 2023).

Another cluster of studies investigates morphosyntax, such as plural marking, past tense (Tsang, 2016a, 2016b), subject–verb agreement (Xiao, 2018), and negative concord (Puig-Mayenco, 2023).

Word order has also attracted considerable attention. Some work investigates non-canonical orders more broadly (e.g. Cedden and Aydin, 2019), while others focus on the placement of specific elements such as verbs (e.g. Długosz, 2021; Olszewska, 2025), adverbs (Tsang, 2016b), clitics (Requena and Berry, 2021), or particles (Olszewska and Długosz, 2025).

Beyond word order, individual studies have explored complementiser omission (Llinàs-Grau and Puig-Mayenco, 2016), well-formedness of relative clauses (e.g. Hui, 2010), or subject-to-subject raising across a dative experiencer (Cabrelli Amaro, 2017b).

Despite some null findings, the overall picture suggests that all these phenomena are susceptible to rCLI. While effects appear particularly pronounced at the syntax–semantics and syntax–pragmatics interfaces, recent evidence shows that morphosyntactic and syntactic phenomena are also affected. Future research should, therefore, investigate multiple types of structures within the same learner population in order to assess not only the presence of rCLI but also potential differences in its robustness and longevity across phenomena.

7.5. Task effects

Finally, rCLI has been investigated through a wide range of tasks targeting both comprehension and production, often with diverging outcomes between the two. In comprehension, acceptability judgement tasks predominate, appearing in 17 of the 30 reported studies. These are typically untimed and scale-based, though some studies add contextualisation (Velnić et al., 2026), additional correction procedures (e.g. Aysan, 2012), or time constraints (e.g. Tsang, 2016a, 2016b). Despite their popularity, AJTs also yield the highest rate of null results: in 7 of the 18 studies, no group differences in ratings were observed (e.g. Chuang, 2002). Other comprehension-based measures are less common, including truth-value judgement tasks – where participants evaluate sentence accuracy against a preceding story (e.g. Kim, 2023), subject identification (Cook et al., 2003), multiple-choice cloze tests (Tsang, 2016b), and picture selection tasks (Martín-Villena, 2023).

Written production tasks form the second most common category, being adopted in 8 of the 30 studies. This usually involves topic-based essay writing (e.g. Cheung et al., 2011), but also picture-based elicitation (e.g. Hui, 2010), or sentence-combination tasks (e.g. Llinàs-Grau and Puig-Mayenco, 2016). rCLI is typically operationalised through frequency counts of targeted structures. Single studies have also employed translation and proofreading tasks (Chuang, 2002; Fung and Murphy, 2016), which yielded no effects, and cloze tasks with article or verb insertion (e.g. Xiao, 2018).

Processing measures represent a third group. Self-paced reading tasks have been adopted in 6 of the 30 studies (e.g. Olszewska and Długosz, 2025; Puig-Mayenco, 2023), while maze tasks (Oliveira et al., 2017) and eye-tracking (Dussias and Sagarra, 2007) remain rare. Unlike AJTs, processing-based measures consistently reveal rCLI, suggesting that they may be especially well suited for capturing these time-sensitive effects.

By contrast, oral production has been tested least often, with existing evidence limited to video-based story narration (Liu et al., 2020; Martín-Villena, 2023). These studies show that bilinguals produce significantly more L2-like structures. Interestingly, in Martín-Villena (2023), the effect appeared only in the cognitively more demanding task and was further modulated by context, with stronger effects among immersed rather than instructed learners.

Overall, the field remains heavily reliant on acceptability judgement tasks, with a smaller but still notable proportion of studies targeting written production. Processing measures appear the most reliable for detecting rCLI, though they are still gaining traction – self-paced reading remains relatively underused, and eye-tracking is virtually absent. Oral production has likewise been examined only rarely.

Importantly, studies applying multiple measures to the same learners sometimes converge (e.g. Olszewska and Długosz, 2025; Xiao, 2018), but otherwise, the effects tend to more often appear in production than in comprehension (e.g. Tsang, 2016a, 2016b). This underscores the need for research that systematically combines comprehension, production, and processing measures on the same structures and within the same learner populations, in order to determine whether rCLI is modality-dependent. This question is also closely tied to theory-driven debates and to whether online and offline measures are reflective of processing effects or representational changes. Addressing this issue will however require not only more varied task designs but also longitudinal testing of the same learner population before, during, and long after intensive Ln exposure, to establish whether rCLI is sustained over time.

7.6. Theoretical relevance and implications

Taken together, early L2-to-L1 research, often grounded in the notion of multicompetence, demonstrated that the L1 does not reach a steady state but constitutes part of a more complex bilingual system (e.g. Cook et al., 2003; Kecskés, 1998). From this perspective, L1 change becomes not only plausible but worthy of a research agenda in its own right. Following this line of inquiry, the majority of L3-to-L2 work sought primarily to establish whether such regressive influence could occur at all, centring its research questions on differential bilingual and trilingual performance (e.g. Chuang, 2002; Fung and Murphy, 2016, Park and García Mayo, 2024). With this evidence base now established, recent work has begun to shift focus – from the mere occurrence of rCLI to the precise conditions under which it emerges, and to what this reveals about the architecture of language in the bi- or multilingual mind.

In this regard, Cabrelli's (2017b) Differential Stability Hypothesis argues that although native-like L2 acquisition in adulthood is possible, its representations are inherently less stable when acquired after the critical period. This supports the idea that L1 and L2 grammars differ fundamentally in their architecture. Similarly, Puig-Mayenco (2023) provides evidence for differential stability by showing that even when the age of L2 onset falls between 3 and 6 – well before the traditionally assumed critical threshold of 12 – the L2 is affected differently than the L1. In contrast, the Linguistic Proximity Model (Westergaard et al., 2017) assumes no fundamental differences between L1, L2, and L3 acquisition. This warrants the proposal that the same mechanism govern both progressive and regressive CLI (e.g. Olszewska and Długosz, 2025). While more empirical work is needed, it is increasingly clear that rCLI research can inform theoretical debates that remain difficult to access through studies of progressive acquisition alone.

A second emerging strand of research moves beyond the question of whether rCLI occurs to investigate its modulators. Initial findings highlight the roles of L2 proficiency (Kim et al., 2025) and L3 proficiency (e.g. Tsang, 2016b; Xiao, 2018) on the process. Other potential modulators include structural optionality (e.g. Olszewska and Długosz, 2025), as the presence of two viable options in the target language appears to create particularly fertile ground for rCLI. Studies have also begun to probe the nature of rCLI by triangulating different methodological approaches (e.g. Xiao, 2018). Finally, environmental factors have received attention, with current evidence suggesting that immersed learners experience stronger effects (e.g. Martín-Villena, 2023).

8. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This review has shown that rCLI is not a marginal phenomenon, but rather a natural consequence of bi- and multilingual development. While it is attested across different linguistic phenomena and learner populations, most investigations remain limited to single studies, and further research is needed to deepen the evidence base and promote replication. Current evidence points to facilitative, non-facilitative, and neutral outcomes, with susceptibility to influence observed in both L2 and L1.

Methodologically, the field is still heavily reliant on judgement and written production data, and is often constrained by small sample sizes and overly homogenous or insufficiently reported learner proficiency profiles. Taken together, these methodological characteristics indicate that current evidence should be interpreted with caution, as substantial variability in study design, inconsistent or missing operationalisation of proficiency, and frequent reliance on statistical analyses that do not account for variability at the level of the individual participant may influence the strength and generalisability

of reported effects. Nevertheless, studies employing larger and more diverse learner groups, cross-sectional approaches, multimethod designs inclusive of processing measures, and analyses that model variability at both the participant and item/group level (e.g. mixed-effects approaches) are beginning to yield more robust insights. Such approaches are essential for not only establishing the conditions under which rCLI arises, but also for determining its strength, the point of its emergence and whether it is transient or sustained over time.

Beyond the discussed factors, future research would benefit from broadening its scope to include a wider range of variables. Among learner-related factors, greater attention could be given to language use, exposure and recency. Though often considered in progressive CLI (e.g. Castle et al., 2026), these factors appear particularly relevant in the regressive direction. Similar attention should be paid to relative language dominance, as well as cognitive factors such as working memory, which may lead to stronger susceptibility or inhibition of non-target influence in some individuals. Further comparisons between instructed and immersed learners (e.g. Martín-Villena, 2023), as well as investigations into the onset and length of immersion would help clarify contextual effects. rCLI may also manifest differently depending on age of acquisition, with potentially divergent outcomes for sequential versus simultaneous multilinguals (as initial evidence suggests that both are susceptible; Puig-Mayenco, 2023).

At the level of investigated linguistic structures, it appears important to systematically examine properties that vary in complexity, acquisition difficulty, and frequency in the input (e.g. Olszewska, 2025; Xiao, 2018). Further steps would include expanding research to structures from different linguistic domains (e.g. Jensen et al., 2023) to those with varying levels of optionality (e.g. Olszewska and Długosz, 2025), and to cases where two languages have a potential to exert combined influence (e.g. Puig-Mayenco, 2023).

Other necessary yet rarely adopted steps include testing whether a given structure has been acquired by probing it in both L2 and L3, thus offering more fine-grained insights into structural accuracy (e.g. Olszewska and Długosz, 2025). Another approach enabling the distinction between rCLI and a more general additive effect of multilingualism (e.g. Velnić et al., 2026) would involve recruiting a different learner triad that is equally multilingual but lacks the relevant structural configuration.

Overall, such efforts will allow the field to move beyond fragmentary findings towards a fuller account of how additional language acquisition affects previously acquired systems. Ultimately, clarifying the scope and mechanism of rCLI will provide a more comprehensive understanding of multilingual development as a whole.

DISCLOSURE OF USE OF AI TOOLS

The author declares the use of the generative AI tool GPT-5 OpenAI) exclusively for English language editing and revision purposes.

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No new data were generated in this study. Therefore, data sharing is not applicable.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Anna Olszewska reports financial support was provided by National Science Centre Poland. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Glossary

L1: first language
L2: second language
L3: third language
Ln: any language acquired after the first language
CLI: cross-linguistic influence
rCLI: regressive cross-linguistic influence