

Full Transfer Potential in L3/Ln acquisition: Crosslinguistic influence as a property-by-property process

Marit Westergaard, Natalia Mitrofanova, Yulia Rodina & Roumyana Slabakova

1. Introduction

This chapter discusses L3 acquisition as a step-by-step acquisition process. From the perspective of two relatively new models in the field, the Linguistic Proximity Model (Westergaard et al., 2017, Westergaard, 2021a, b) and the Scalpel Model (Slabakova, 2017), we focus on theoretical arguments for crosslinguistic influence taking place property by property from either or both previously acquired language(s) and discuss methodological issues for studies that aim to identify hybrid influence. We also provide a brief overview of empirical studies finding support for this position.

2. Background

The formal study of L3/Ln acquisition is a field that has developed rapidly over the last couple of decades, informed by previous work on L2 acquisition (SLA). Especially important is the discussion about the initial state of L2 acquisition from the 1990s, where one of the main issues concerned L1 transfer, more specifically how much would be transferred from the L1 into the L2 – everything, nothing, or something in between. Two important models from this time are Full Transfer/Full Access (Schwartz & Sprouse, 1996), arguing that the initial state of L2 acquisition is the complete L1 grammar, and Minimal Trees (Vainikka & Young-Scholten, 1996), arguing that only parts of the L1 grammar are available for transfer, notably lexical elements but no functional elements above the VP.¹ Much of this thinking has been extended to the field of L3/Ln acquisition. This is clearly visible in the work of Leung (1998, 2003), who argues for a direct extension of the Full Transfer model to L3 acquisition, later referred to as the Interlanguage Transfer Hypothesis (Jin, 2009), which, however, was quickly abandoned already in Leung (2005). A revision of these ideas has later appeared as the Typological Primacy Model (TPM), where a number of modifications have been made in order to maintain the idea of full (wholesale) transfer, e.g. a change of focus from the initial *state* to initial *stages*, allowing some time for the parser to make a decision about which of the two previously acquired grammars to copy (Rothman, 2015). Other approaches to L3 acquisition have taken a different perspective, e.g. the Cumulative Enhancement Model (CEM), focusing on the cumulative and facilitative nature of L3 acquisition (Flynn et al., 2001, 2004), or the L2 Status factor (L2SF), emphasizing the importance of the order of acquisition of the three languages involved and arguing that the L2 will be the main source of crosslinguistic influence, especially at early stages (Bardel & Falk, 2007, 2012).

In this chapter, we concentrate on two recently proposed L3 acquisition models, the Scalpel Model (Slabakova, 2017) and the Linguistic Proximity Model (LPM, Westergaard et al., 2017, Westergaard, 2021a, b). These models stand on the shoulders of previous approaches, more specifically the TPM and the CEM, in that both argue for the importance of structural/typological similarity for crosslinguistic influence (like the TPM) and view L3

¹ Investigating data from L1 Korean, Turkish, Spanish and Italian L2 learners of German, Vainikka and Young-Scholten (1996) find that learners transfer the L1 word order within the VP; i.e. Spanish and Italian learners transfer VO, while Korean and Turkish learners transfer OV, the latter thus being immediately target-consistent in their L2. In contrast, all learners start out with the same (UG default) word order in functional projections (IP and CP), and the authors argue that, while L1 lexical categories are part of the L2 initial state, functional categories develop as a result of interaction between UG and the L2 input.

acquisition as a cumulative process (like the CEM). The LPM and the Scalpel Model explicitly define property-by-property influence as the major distinguishing property of the models. Importantly, property-by-property development in L3 acquisition is different from the L2 partial transfer models of the 1990s, in that any linguistic property is argued to be able to transfer. However, this is also different from Full Transfer (as wholesale transfer), in that crosslinguistic influence is not assumed to take place in one fell swoop. Our position is thus called Full Transfer Potential (FTP), meaning that *anything can transfer*, not that *everything does transfer*. Here we focus on the two models' answers to several important research questions in the field, what constitutes the initial state/stages of L3A, and how building the L3 grammar proceeds.

3. The LPM and the Scalpel Model

3.1 Transfer or CLI - or CLE?

The term “transfer” originates in the behaviorist framework of the Contrastive Analysis Hypothesis of the 1960s (e.g. Lado, 1957) as a mechanistic process in L2 acquisition predicting that any property in the L2 that is different from the L1 would be difficult to acquire, while a property that is similar would be easy to acquire. This behaviorist idea was rejected in the generative framework, which instead developed an approach that emphasized the active involvement of the human mind in the learning process, referred to as Creative Construction (e.g. Dulay et al., 1982). Sharwood Smith (1983) suggested “crosslinguistic influence” (CLI) as a better term than transfer, defined as any L1 influence that may be found in the L2 acquisition process, including e.g. the avoidance of certain structures or the persistence of errors in one group of L2 learners compared to another group (with different L1s).

Transfer and CLI are often used interchangeably as synonyms in L2 acquisition research, e.g. Odlin (2012). There is a tendency in generative SLA to prefer the term transfer, defining it narrowly within grammatical representations: the effect of L1 grammar rules or features on the L2, i.e. grammatical competence. But if one espouses the view that language use is rooted in mental representations, transfer affects not just linguistic representations, but also language processing. The underlying grammar provides the structure for parsing incoming sentences, crucial in both comprehension and production. Additional processing strategies and other sources of information manipulate these structures during processing, potentially influencing how they are interpreted.

In L3 acquisition research, a possible distinction between transfer and CLI has been utilized by proponents of the TPM to argue that transfer affects grammatical representations, while CLI is used for effects of processing (González Alonso & Rothman, 2017). According to this model, (wholesale) transfer means making a copy of one of the previously acquired grammars as a shortcut to the L3 grammar, what Schwartz and Sprouse (2021a: 16) have dubbed “The Big Decision.” In contrast, CLI includes processing effects, strategies, and generally more transient processes. In recent theorizing, Rothman et al. (2019) also propose a third term, cross-language effects (CLE), in order to be able to keep CLI as an overarching term that includes both representational transfer and processing. Thus, CLE is akin to ‘interference’ (Herdina & Jessner, 2002), which covers mental lexicon access and language processing effects. Examples

include tip of the tongue states (Ecke, 2004), variable relative clause attachment,² and attraction effects³ in processing.

If one considers the examples given by Rothman et al. (2019) and extrapolates, one could recognize CLE cases as superficial events in processing that do not occur systematically and, although predictable, are transient. Both the LPM and the Scalpel model obviously accept the existence of CLE, but contend that, from a linguistic knowledge perspective, it is not that remarkable. Undoubtedly, CLE can be an indication of processing difficulty, which is clearly a factor in language acquisition, but this is not an approach taken by TPM proponents to justify the distinction. Furthermore, since we reject the necessity of copying one previously known grammar at the L3 initial stages, the distinction between representational transfer and CLI/CLE is superfluous. In fact, there is no need for the term transfer. Thus, we in principle agree with Sharwood Smith (2021), who suggests that the field abandon this term as it is fundamentally misleading (there is no “movement” of properties involved) and it maintains an unfortunate division between the grammar and the parser. We therefore prefer the term CLI, but given that the term *transfer* is so established in the field, often with reference to crosslinguistic influence in general, we occasionally also use this term to refer to the same process.

3.2 Activation and Inhibition in Language Acquisition Research

Generative language acquisition has recently incorporated concepts from psychology in describing how learners go from one state of knowledge to another in acquiring a first or second or additional language. Important for the discussion in this chapter are the concepts of “activation” and “inhibition.” While the application of these concepts to linguistic research is beyond the scope of this chapter (but see e.g. Lemhöfer, this volume), we provide working definitions from neuro- and psycholinguistics. The term degree of activation refers to the relative magnitude of language engagement (e.g. Incera & McLennan, 2018) of the two languages of a bilingual at any given time, affecting e.g. speed of lexical recognition (Grosjean, 1998, 2001). Inhibition describes the constant monitoring of the language not in use, so that it is suppressed and does not interfere with the language being used (Green, 1998). Activation and inhibition can be thought of as opposing cognitive processes. Although a bilingual’s two languages are in a constant state of activation, Green and Abutalebi’s (2013) Adaptive Control Hypothesis argues that the relative degree of activation is dynamically adaptive, because of the constant need for inhibition of one language in various circumstances. In the next section we discuss how the activation of two candidate grammars becomes an important factor in identifying crosslinguistic influence in L3 acquisition.

3.3 Wholesale or Property-by-Property Transfer

As mentioned above, the initial state of L2 acquisition has attracted considerable attention and debate. In our view, there is substantial evidence in favor of the Full Transfer Full Access Hypothesis (FTFA, Schwartz & Sprouse, 1996), which argues that at the initial state, learners use the complete native grammar as an initial hypothesis of the L2 grammar. If later on in the process the incoming input cannot be parsed with the L1 grammar, the interlanguage grammar is adjusted.

² In sentences such as *Mary greeted the mother of the woman [RC who was talking on the phone]*, the relative clause can be interpreted as modifying *the mother*, which is known as high attachment, or *the woman*, called low attachment. Preferences differ across languages, with English, Norwegian, Romanian, and Swedish speakers preferring low attachment, while Spanish, Italian, Russian, Dutch and Greek speakers prefer high attachment (Cuetos & Mitchell, 1988).

³ Attraction effects are processing effects, where errors occur in the agreement between two phrases due to the presence of interfering elements (Bock & Miller, 1991), even though the underlying grammatical construction has been fully acquired. For example, in a sentence such as *The key to the cabinets work-s well*, erroneous plural agreement may be accepted or produced (even by native speakers).

Extending the FTFA hypothesis, the TPM argues that full transfer also applies in L3 acquisition, and that either the L1 or the L2 is copied in one fell swoop onto the L3 (Rothman, 2015). After this wholesale transfer, the process of feature adjustment unfolds as in L2 acquisition. The motivation for this is the concept of cognitive economy, meaning that it is simpler for the brain to transfer once rather than many times and correspondingly more costly to maintain “activation of both the L1 and the L2 at sufficiently high levels for comparison for the extended period of acquisition” (Rothman et al., 2019: 158). Rejecting cognitive economy, Schwartz and Sprouse (2021b) refer to the simplicity and elegance of the model as the main rationale for full transfer. In addition, the structurally rich copied grammar does not just “generate sentences but also constrains the system” (Schwartz & Sprouse, 2020: 9).

The LPM and the Scalpel Model take another approach to crosslinguistic influence in L3 acquisition. These models view grammar not as monolithic but comprising an assembly of separate yet amalgamated mental representations of sounds, lexical items, formal features, morphemes with feature bundles, syntactic and semantic operations. Hence, these models explicitly argue for property-by-property influence, meaning that, in the acquisition of an L3 grammar, the parser relies on both previously acquired grammars, whose functional lexicon items, features, and constructions are activated in the dynamic and integrated cognitive space. This takes place at the initial state/stages as well as at all subsequent stages. Even though the L1 is initially used to parse L2 input, the adjustment process mixes and matches these elements until an interlanguage L2 grammar is achieved. There is no going back from this point. The L1 and L2 linguistic units (phonemes, morphemes, features, etc.) remain activated because bilinguals use them all the time, in switching between their two languages. Just as the mental lexicon of multilinguals is dynamic and integrated (Libben & Schwieter, 2019), so are their syntactic representations (see Benati & Schwieter, 2017: 267). Since both the L1 and the L2 are natural languages, an interlanguage built from them is necessarily also compliant with whatever computational restrictions we take to apply to all natural languages.

The notion of activation is of paramount importance here. We know from extensive research on bilingual word recognition that words in both languages are co-activated when one of the languages is being used. Priming experiments show that co-activation based on semantic relations (e.g. *bread* and *butter*) happens between languages (Altarriba & Basnight-Brown, 2007, a.o.), between languages with different script (Gollan et al., 1997), and in bilinguals of different proficiency (Basnight-Brown & Altarriba, 2007). Furthermore, co-activation occurs when words are either phonologically or orthographically related (Sunderman & Kroll, 2006, a.o.). These effects are attested even when the activated language is not used in the experiment (Marian & Spivey, 2003, Thierry & Wu, 2007).

Word recognition findings have significance beyond the mental lexicon. In a minimalist approach to grammar, UG is pared down to a few universal principles, and the functional lexicon contains the specific grammar rules. One influential view of UG, the Borer–Chomsky Conjecture, maintains that variation among languages is restricted to functional features in the lexicon, and that the “inventory of inflectional rules and of grammatical formatives in any given language is idiosyncratic and learned on the basis of input data” (Borer, 1984: 29). If we take this view seriously (Slabakova, 2016), the grammatical features that determine the morphosyntax of any language are associated with lexical items – not just functional morphemes but also open-class lexical items such as nouns and verbs. The acquisition of any additional grammar, then, must proceed through acquiring the functional features expressed on lexical items. The logical conclusion is that all grammar features of both previously acquired languages are co-activated in the L3 acquisition process, because the words and morphemes

that express these features are co-activated.⁴ This process allows for considerable flexibility, therefore is more economical of cognitive resources. However, since most priming studies are done in the realm of the mental lexicon (Lago et al., 2021: 168), co-activation of grammatical features remains an empirical question and is clearly subject to a host of other variables such as proficiency and dominance.

3.4 CLI in Further L3 Development

CLI beyond the initial state/stages comes from both, or all, previously acquired languages. This claim is much less controversial, and most L3 models are in agreement on this point. In fact, although the TPM is strictly speaking not an L3 acquisition model, but a model of the initial stages, it acknowledges that after the alleged wholesale transfer, crosslinguistic influence is a step-wise process, and Rothman et al. (2019) speculate that L4 acquisition may proceed property-by-property entirely. Indeed, the processes of multilingual development are based on access to the multiple grammars already built and being built. The grammars also utilize the same processing network, as argued by e.g. Cunnings (2017) and Del Maschio and Abutalebi (2019). The three (or more) languages constantly interact in the minds of multilingual speakers and the one(s) not in use must be inhibited. This extensive interaction 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.

An important question in multilingual acquisition research is whether L3 grammars always pick the most helpful features from all available sources. In other words, is L1 or L2 transfer only facilitative? The Cumulative Enhancement Model (CEM, Flynn et al., 2004) takes such a position. However, there is ample evidence for CLI being less than beneficial. An example comes from Rothman and Cabrelli Amaro (2010), who investigate knowledge of null-subject-related properties in L3 French of L1 English–L2 Spanish speakers. The learners treated their L3 French as a null-subject language, while their native English would have been a better source of transfer, French and English being languages with obligatory overt subjects. The authors argue for typological similarity between French and Spanish having caused wholesale transfer from Spanish.

What are the factors which can influence, even determine, the source language of transfer? The LPM points to linguistic, structural proximity as the most important factor. As the model assumes no representational copying, learning is a result of processing (both in comprehension and production; see Westergaard, 2021b). That is, upon exposure to the L3, the parser searches for potentially useful structures in the previously acquired languages. If an existing linguistic representation is found to be suitable for parsing the new input, it will be used and thus incorporated into the L3 grammar, which is being built up incrementally. This L3 structure is initially a weak representation, which will be strengthened with further input and use (or alternatively washed out if further input provides conflicting cues). The frequency of the relevant input also plays a role, with frequent constructions achieving higher activation faster.

⁴ An anonymous reviewer suggests that if non-selective activation is applied to grammatical features at the outset, the L3 initial stages will be characterized by variation and inconsistency. In our opinion, it accurately describes what we see at early stages of L3 acquisition. One theoretical proposal that envisages just such a process is Amaral and Roeper's (2014) Multiple Grammars Theory. Second and additional language grammars are indistinguishable from monolingual grammars, since they contain multiple features with values tagged for the specific language. Roeper (2016) suggests that the widely attested optionality in L2 and Ln speakers' grammars could be explained if they maintain two or more sub-grammars with optional linguistic features tagged and linked to the respective functional categories. Thus, optional (variable) linguistic behavior might be due to the competition of activated L1 and L2 formal features, until sufficient input settles the choice.

Importantly, the parser may misanalyze the input or opt for a partial-match strategy (e.g. Reder & Kusbit, 1991), which will result in non-facilitative influence. Non-facilitation will also typically be the result of processing for production: If the representation for the L3 is non-existent or too weak, the learner must resort to the previously acquired languages, which will both be activated, and when the two differ (say, in word order or in allowing null subjects), the parser may choose the wrong language, especially in cases where one of the previously acquired languages is lexically very similar to the L3, as in the case of the L1 English–L2 Spanish–L3 French learners in Rothman and Cabrelli Amaro (2010) just mentioned. That is, superficial lexical or phonological similarity (which is immediately available to the learner) may cause a stronger activation also of the morphosyntax of this language and thus override structural morphosyntactic similarity in such cases, especially at early stages of the acquisition process. The LPM nevertheless maintains that, as the L3 acquisition process unfolds, structural similarity should become an increasingly dominant factor.

According to the Scalpel Model (Slabakova, 2017), CLI can also be due to additional factors, including various experiential factors, variable construction frequency, misleading input, and necessity of negative evidence, among others. If one wants to test the effect of construction frequency, for example, a possible design would involve the L3 acquisition of a property where the L1 is structurally closer to the L3 but the L2 exhibits the property with a (much) higher frequency, provided that the L1 and the L2 features differ. Such a design was used by Slabakova and Garcia Mayo (2015), and in this particular case, frequency won over beneficial structural similarity. In another relevant study, Fallah et al. (2016) investigated Mazandarani–Persian bilinguals learning L3 English, finding that crosslinguistic influence was stronger from the language the learners used the most in their everyday life. In this case, then, experience trumped structural similarity. Furthermore, the factors dominance and proficiency were explored by Angelovska et al. (2020), who used the moving window paradigm (online processing) and a timed grammaticality judgment task to examine V3 structures in the L3 English of L2 German speakers with a variety of non-V2 native languages. Their findings showed that dominance was an important factor but only in interaction with proficiency. Determination of such potentially important factors is ideally done in advance of testing, following a careful consideration of all variables in the three languages (e.g. Clements & Dominguez, 2018). Thus, while the general prediction of the LPM and Scalpel Model is that linguistic (or at early stages, also surface typological) proximity is the decisive factor determining transfer from previously learned languages, this can be obviated by additional experiential and linguistic factors.

4. Methodology for Research on Property-by-Property Influence

4.1 Introduction

We devote this section to the methodology that is suitable to investigate CLI as a property-by-property phenomenon. In order to identify possible influence from both previously acquired languages, we need a methodology that clearly separates the influence from each language. This is difficult to do with mirror-image groups (swapping the L1 and L2) but is possible by keeping the target language constant and comparing an L3 group with two L2 groups, each with an L1 that is one of the previously acquired languages of the L3 group.

Needless to say, all types of methodologies ranging from corpus analysis and acceptability judgements to online behavioural and neuroimaging experiments, testing both production and comprehension, can be used in acquisition and processing studies, including L3A research. At the same time, there are research questions which impose particular requirements on the design of L3A studies. We consider three methodological parameters which play a crucial role: 1) the choice of participant groups (*who* should be tested); 2) the choice of linguistic properties and

language combinations (*what* should be tested); and 3) timing (*at what developmental stage* should participants be tested). Moreover, previous studies have identified further factors that may need to be taken into consideration, including but not limited to, overall typological proximity, order of acquisition, dominance and recency of exposure/use. Due to space limitations, we focus on the three main parameters mentioned here and only briefly address the remaining factors.

Contemporary models of L3 acquisition are mainly focused on – and are differentiated by their answers to – questions related to CLI. These include: 1) the source of CLI (L1, L2, typologically closest language, the most recently used language etc.); 2) the type of CLI (only facilitative, or also non-facilitative); and 3) the extent of CLI (wholesale, or property-by-property). The choice of methodology should be determined by the specific research questions of a particular study.

4.1 Participant Groups

A considerable number of L3 studies employ what can be referred to as a *single group methodology*. In such studies, only one group of L3 learners is tested (e.g. Bruhn de Garavito & Perpiñán, 2014). The L1 and the L2 differ with respect to a particular grammatical property, and the L3 is similar to only one of these languages. Importantly, while studies applying this methodology can potentially point to important insights and directions for further research, they cannot in themselves provide an answer to the research questions 1–3 above. In order to confirm or reject the hypotheses of the models regarding the source, type and extent of CLI, baseline comparison groups are necessary, as we argue below. The patterns observed in studies employing the single group methodology are in principle compatible with a number of alternative explanations that do not involve CLI, e.g. general learning effects, emergence of typologically unmarked structures, etc.

Mirror-image groups provide a more advanced alternative. In this methodology, the target L3 is kept constant while the order of acquisition of the previously acquired languages is manipulated. For example, we could compare L1 English–L2 Spanish–L3 Russian learners to the performance of L1 Spanish–L2 English–L3 Russian learners. As noted in Puig-Mayenco et al. (2020: 49), “this design was explicitly devised <...> to tease apart order of acquisition (either L1 or L2) from other potentially explanatory variables for transfer source selection.” Thus, if we control for additional factors, and still find that the mirror image groups *differ* in their performance in the L3, we can reject the null hypothesis that the order of acquisition does not matter for L3 acquisition. Such results can provide support for theories that argue for a different role of the L1 and L2. Surprisingly, however, the lack of significant differences between the groups has been primarily used as an argument that order of acquisition does *not* play a significant role in L3 acquisition (e.g. Puig-Mayenco & Marsden, 2018: 508, who conclude that “the null hypothesis was confirmed” when no significant differences were found between the two L3 groups; see also Rothman 2011: 120, etc.). As pointed out by Lakens et al. (2020: 45), “it is neither logically nor statistically correct to conclude an effect is absent when a hypothesis test is not significant” (see also Lehman & Romano, 2005 among many others, as well as Lago et al., 2020 for a similar observation about existing mirror-image studies).⁵

Crucially, the mirror image group methodology cannot provide an answer to the question whether only one or both of the previously acquired languages are the source of CLI in an L3

⁵ Several recent studies have addressed the problem of drawing meaningful inferences from the lack of an effect and suggested ways to disambiguate the absence of evidence from evidence of absence. For instance, Harms & Lakens (2018) and Lakens (2020) propose to statistically evaluate null results using equivalence tests, Bayesian estimation, and Bayes factors, while Quertemont (2011) provides a detailed review of how two further approaches, the statistical power test and the confidence interval approach, can be used to show the absence of a meaningful effect.

(cf. a similar observation in Green, 2017). In order to isolate the role of individual languages and to address the questions concerning wholesale vs cumulative CLI, one would need to employ what can be referred to as a *subtractive language group design*.

In experiments employing this design, the performance of the L3 group is compared to L2 controls – where the target language is kept constant, but the other languages are varied parametrically. This methodology allows us to assess individual effects of the two previously acquired languages on the L3. For example, if the target group has L1 English–L2 Spanish–L3 Russian, we can isolate the effects of English and Spanish on the development of the L3 by comparing the performance of this group to the performance of an L1 English–L2 Russian group and an L1 Spanish–L2 Russian group. If we find significant differences between the L3 groups and the L2 control groups we can reject the null hypothesis that the subtracted language does not exert influence on the L3 (in other words, we can reliably state that this language *does* influence the learners’ grammatical behavior in the L3). The subtracted language group design does not allow us to assess the role of the order of acquisition; thus, it should not be employed in studies that focus on this question.

Finally, a further logical possibility is to have a *fully combined design*, with four experimental groups: two L2 control groups and two mirror image groups. For instance, an L1 English–L2 Spanish–L3 Russian group could be compared to an (otherwise matched) L1 Spanish–L2 English–L3 Russian group to assess the effect of order of acquisition and also to two L2 control groups (L1 English–L2 Russian and L1 Spanish–L2 Russian to assess the CLI effects from Spanish and English, respectively). Undoubtedly, such a design is quite challenging and would only be justified if the study is simultaneously seeking to answer both the effect of the order of acquisition and CLI from individual previously acquired languages.

4.2 Choice of Properties

There is extensive empirical evidence (predominantly from L2 research) that language learners experience *facilitation* with respect to grammatical properties that are similar to their previously acquired language, as compared to learners who acquire a property that is different or absent from their previously acquired language.

However, in L2 research it is not always easy to differentiate between *facilitation* and *non-facilitation* if the experiment compares two L2 groups where CLI from one of the L1s is expected to be facilitative and CLI from the other L1 is predicted to be non-facilitative. This question can be clarified in L3 research. Consider an experimental design with two grammatical properties (1 and 2) and a combination of three languages, A, B and C, where Language C is the target language; see Table 1. Property 1 is shared by Languages C and A, contrasting with Language B: $L_C=L_A \neq L_B$. Property 2 is shared by Languages C and B, which differ from Language A: $L_C=L_B \neq L_A$. For the L2 groups we would expect to find the following differences: The L_A group would outperform the L_B group on Property 1, while the L_B group would outperform the L_A group on Property 2. Another prediction is that the L_A group would perform more accurately with respect to Property 1 than Property 2, and the reverse would be observed for the L_B group.

Table 1: Combinations of properties to be investigated in a subtractive experimental group design

	Property 1 $L_C=L_A \neq L_B$	Property 2 $L_C=L_B \neq L_A$
L_A - L_C group	L_A group \gg L_B group	
L_B - L_C group		L_B group \gg L_A group
L_A - L_B - L_C group	facilitation from L_A , non-facilitation from L_B	facilitation from L_B , non-facilitation from L_A

Adding an L3 group to the mix will allow us to additionally disentangle the effects of individual languages and the type of CLI, only facilitative or both facilitative and non-facilitative. If the L3 group scores in between the two L2 groups on either of the properties, and significantly differently from *both* groups, this can be interpreted as strong evidence in favor of cumulative activation of both previously acquired languages and combined (facilitative and non-facilitative) crosslinguistic influence. This is what is observed in Westergaard et al. (2017), Jensen et al. (2021), and Kolb et al. (2022); see section 5.

To illustrate, let us consider a design which involves a linguistic property 1 that is similar in languages A and C—while language B is different—and three experimental groups: one L3 group and two L2 control groups. The LPM would predict that the L3 learners will be better or equal (in case of a floor effect) to the L2 group with Language B and less accurate than or equal (in case of a ceiling effect) to the L2 group with Language A. In other words, we predict the following outcome for property 1: $L2(\text{language A}) \geq L3 \geq L2(\text{language B})$. At the same time, the LPM does *not* predict that L3 learners will be less accurate than the L2 group with Language B or more accurate than the L2 group with Language A. Such results would falsify the model.

4.3 Timing

Property-by-property approaches to L3A do not make a sharp distinction between ‘initial’ and further stages of acquisition. However, timing is still important, as the effects of CLI are expected to be modulated by the developmental stage of the learner as well as the trajectories of individual linguistic properties. Careful assessment and piloting can help determine specific developmental trajectories for the properties in question. If several properties are included in a study with the same group of learners, the properties should be matched in terms of relative ‘stage’ of acquisition – to avoid floor and ceiling effects.

A more general question that L3 studies have only begun to address is related to the global effect of cumulative experience on the dynamically changing linguistic representations in the mind of L3 learners. A growing body of evidence from psycho- and neurolinguistic research indicates that the mind/brain adapts to a new language and gradually integrates it into the existing system of representations and connections – with new representations and networks being created, strengthened, and consolidated, and resting level activation of representations from different languages changing over time (Green & Abutalebi, 2013, Sharwood-Smith, 2019; Hernandez et al., 2019; cf. section 3.2). Thus, it may be expected that, all other things being equal, the effects of CLI will be modulated by the developmental stage of the learners and their relative *experience* with activation and inhibition of different linguistic representations (e.g. DeLuca et al., 2019). For instance, it is likely that at early stages of development, the phonological, lexical and grammatical representations of an L3 are relatively unstable, while the activation level of the previously acquired languages are higher, leading to stronger effects of CLI. Conversely, at later developmental stages when learners have accumulated substantial experience with the L3 and learned to inhibit representations from other languages, the effects of CLI may be diminished. Additional factors such as absolute and relative proficiency in the different languages, the amount, intensity and quality of input and output, recency of use etc. may also account for the dynamic changes that a multilingual mind is undergoing (Slabakova, 2017; see also Angelovska et al., 2020). We believe that this line of research will be fruitful, generating qualitatively new results that will enhance our understanding of the complex and dynamic process of L3 acquisition.

Overall, models that assume co-activation of both previously acquired languages in the process of L3 acquisition and emphasize the role of structural similarity make the following predictions:

- In a subtractive language group design, where only one of the previously acquired languages is expected to be facilitative (due to structural similarity between this language

and the L3 with respect to the property in question), L3 learners are predicted to perform in-between the two L2 groups. This would indicate co-activation of competing related structures from both previously acquired languages. This result is expected at a developmental stage when L3 learners have already discovered the structural similarity between the L3 and one of the previously acquired languages (and experience facilitation), but have not yet learned to inhibit the non-facilitative influence from the other language.

- At later developmental stages, the effects of CLI are expected to diminish. The L3 representations will become more stable and consolidated, and learners are predicted to become better at inhibiting non-facilitative representations from previously acquired languages. At this stage, we expect L3 learners to pattern with the higher-accuracy L2 group.

5. Empirical Support for Property-by-Property Influence

In this section, we provide a non-comprehensive overview of empirical studies that support the idea of property-by-property transfer from both previously acquired languages, mainly focusing on relatively recent work. During the first two decades of formal investigations of L3 acquisition, the research focus was mainly on which of the two previously acquired languages would provide most of the influence (and in the extreme case of the TPM, *all* of the influence at initial stages), in order to identify which factors play the most important role, e.g. order of acquisition (Bardel & Falk, 2007, 2012), typological/structural similarity (Rothman, 2011, 2015, Westergaard et al., 2017), or language dominance (Fallah & Akbar Jabbari, 2016; Lloyd-Smith et al., 2018; Puig-Mayenco et al., 2018; Angelovska et al., 2020). Thus, most studies test very few linguistic properties; in fact, often only one. In such cases it is of course difficult to find CLI from both languages. Nevertheless, in Rothman et al.'s (2019) systematic review of as many as 92 studies, 18 of them display hybrid transfer, i.e. influence from both previously acquired languages, either on the same or on different linguistic properties. This means that there is no lack of studies showing some kind of influence from two different languages, thus by definition also property-by-property transfer. As noted in section 3.1, proponents of wholesale transfer would explain such data by making a distinction between transfer and CLI/CLE, so that influence from one language is the result of wholesale representational copying at the initial stages, and influence from the other is the result of transient processing issues – a distinction that is not made by property-by-property approaches.

In the original article introducing the LPM (Westergaard et al., 2017), the study compares Russian-Norwegian learners of English as an L3 (n=22) with two groups of L2 learners, one with L1 Norwegian and the other with L1 Russian. The study investigates two word-order phenomena, one where English is similar to Russian and one where English is similar to Norwegian. While one of the properties was already acquired by all learners (S-aux inversion), the other (Adv-V/V-Adv word order) showed that the L3 learners scored between the two L2 groups, indicating that they were experiencing influence from both previously acquired languages. In a follow-up study, Kolb et al. (2022) added two further properties (Determiner use and V2 word order in non-subject-initial declaratives) in an investigation of Russian-German learners of L3 English (n=66), comparing them with corresponding L2 groups. The results showed that the L3 learners were significantly different from both L2 groups in three of the four conditions (V2 word order, Adverb placement, and Determiner use), scoring between the two groups, while there was no significant difference between the three groups for S-aux inversion, as in Westergaard et al. (2017). Importantly, the two L2 groups showed a higher-than-average sensitivity on the condition(s) that was/were similar to their L1 and a correspondingly lower sensitivity on the one(s) that was/were different from their L1.

One theoretically plausible explanation of the observed in-between performance of the L3 group could be that the mean is a result of two distinct distributions (half of the L3 participants' behavior comparable to the Language A group and the other half patterning like the Language B group). Therefore, it is important to consider a by-participant analysis and individual deviations from the group mean. Figure 1 plots individual results from the three participant groups on two of the conditions, Determiner use and Adverb placement. While the L1 German speakers' individual scores are above average on Determiner use and below average on Adverb placement (the red frame) and the L1 Russian speakers display the opposite pattern (the blue frame), the L3 learners' individual performance (the green triangles) is generally found in the middle. This illustrates that the L3 group mean is not a result of a bimodal distribution, but genuinely reflects CLI from both previously acquired languages. In other words, we can argue for cumulative CLI at both group *and* individual levels.

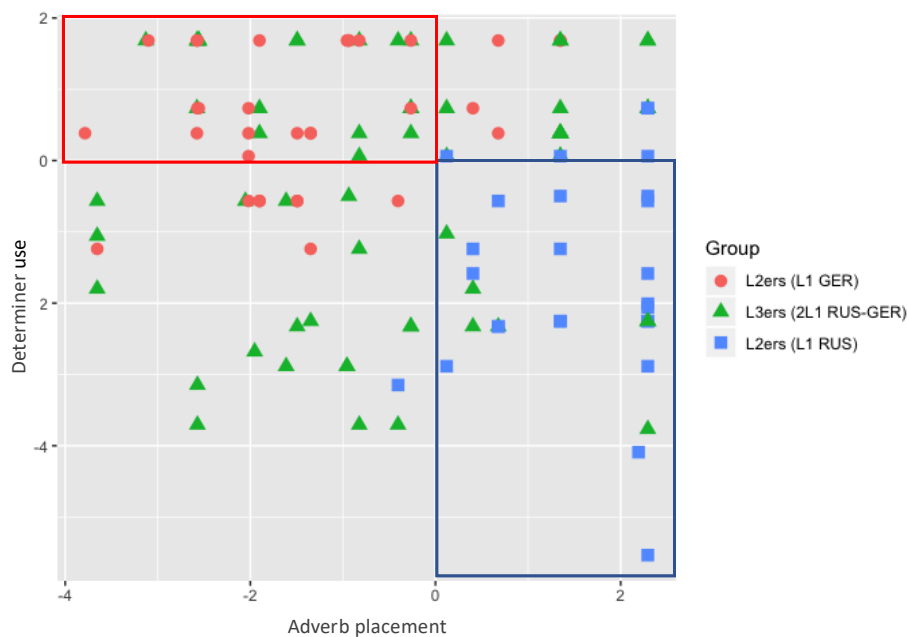


Figure 1: Distribution of random effect sizes for two critical conditions (Determiner use and Adverb placement), showing that Russian-German L3 learners of English are different from both of the corresponding L2 groups (from Kolb et al., 2022).

Other studies have attested similar phenomena. Stadt et al. (2016, 2018a, b, 2020) conducted a series of studies of word order in L3 French and L3 German with speakers of L1 Dutch–L2 English. In a longitudinal study, Stadt et al. (2018b) considered early and later acquisition stages of subject-initial and non-subject-initial declaratives in L1 Dutch–L2 English–L3 French (year 1–2 of French instruction). The three languages pattern in the following way with respect to word order: Dutch and French display similarity in subject-initial declaratives with sentence adverbials, i.e. V-Adv (V2) word order, while French is similar to English in non-subject-initial declaratives, where both exhibit XP-S-V (non-V2) word order. The results from first-year students with 50% English immersion demonstrate a strong influence from Dutch, as V2 is used in both structures, target-consistently in subject-initial and non-target-consistently in non-subject-initial declaratives. However, the ungrammatical V3 word order (i.e. the English Adv-V) is accepted at a rate of 14.6% and 34.7% in a Gap Filling and Grammaticality Judgment Test respectively. Furthermore, non-V2 is used appropriately at approximately the same rates (20.1% and 44.1%) in non-subject-initial declaratives. These results indicate that both

previously acquired languages are activated and available for CLI at early stages of L3 acquisition.

Additional factors are brought into the picture in a later comparison of the acquisition of V-Adv word order by intermediate learners of L3 German and L3 French in order to explain a higher occurrence of (non-target-consistent) Adv-V word order in the latter group (Stadt et al., 2020). It is suggested that the substantial activation of L2 English happens only when learners are sufficiently exposed to the L2 on a daily basis. In the case of L1 Dutch–L2 English–L3 German, the high frequency of V2 structures in the L1 and L3 increases learner awareness of the structural resemblances between these two languages at later stages, when sufficient exposure to the L3 is reached. This is when L1 Dutch becomes the more suitable language for transfer in L3 German. Thus, a multiple group methodology (e.g. with the same L1 and L2 and different L3s) and cross-sectional designs can provide important insights into CLI at the initial stages and beyond.

In a similar study, Dahl, Listhaug and Busterud (in press) examine the acquisition of subject-initial declaratives with sentence adverbials in L1 Norwegian–L2 English–L3 German in an Acceptability Judgement Test, comparing this property to the acquisition of word order in non-subject-initial declaratives across four age groups (years 1–4 of German instruction). For both phenomena, there is structural similarity between L1 Norwegian and L3 German in the form of V2 word order (V-Adv and XP-V-S). In the earliest learners (years 1-2 of German instruction), the authors find no clear evidence of transfer from either L1 Norwegian or L2 English, since the mean scores on both structures show no preference for either word order. The same is observed in the individual data. According to the authors, this indicates insecurity rather than transfer from one of the previously acquired languages, which could be “due to the potential availability for transfer of structures from two previously learned languages, e.g. along the lines of full transfer potential” (p. XX). Interestingly, the lack of a word order preference in L3 German in early years occurs despite the participants’ near target-like performance on both sentence types in L2 English (across all age groups). Thus, both word orders seem to compete in an emergent L3 grammar, suggesting that both previously acquired languages are activated. In years 4 and 5, a development towards target-like word order is observed, which falls into place earlier in subject-initial than non-subject-initial declaratives.

Not many L3 studies investigate more than one or two properties. Ben Abbes (2020) is one of the few studies designed to investigate several morphological and syntactic properties, including gender, number, and articles (definiteness/specificity) in two groups of beginner learners of L3 French with L1 Spanish–L2 English and L1 Turkish–L2 English. Despite this multiple-property design, only one structure presents a good test case, the definiteness/specificity distinction in the L1 Turkish–L2 English group, where L3 French is similar to English and different from Turkish. In this case, the study is able to isolate facilitative evidence from L2 English, since L1 Turkish learners reach target-like knowledge of the indefinite article in L3 French only when they have attained advanced proficiency in L2 English. These results suggest that both previously acquired languages are available for CLI in L3 acquisition, and that structural similarity with the L3 determines the property to be transferred, with proficiency as a confounding factor. The results from the L1 Spanish–L2 English language pair reveal no effects for any of the properties, since the participants perform at ceiling in L3 French. From the perspective of the LPM and the Scalpel Model, the results from L1 Turkish–L2 English–L3 French demonstrate that even a single group methodology can be revealing of incremental grammar construction in L3 acquisition.

More substantial evidence in support of the LPM and the Scalpel Model is reported in Jensen et al. (2021) from the acquisition of L3 English by Norwegian-Russian bilinguals across three linguistic modules: syntax (word order), morphology (subject-verb agreement and copula) and the syntax-semantics interface (genericity and definiteness). In each domain, at

least one condition targeted a property that was similar in Norwegian and English (while Russian was different) or similar in Russian and English (while Norwegian was different). The comparison of the bilinguals with two groups of monolingual controls (L1 Russian and L1 Norwegian) follows two scenarios: 1) the L3 learners pattern with the higher-accuracy L2 group, i.e. the L3-ers have learned to inhibit the non-facilitative language, or 2) they score in between the L2 groups (as in Figure 1 above). This is illustrated in Figure 2, which demonstrates simultaneous facilitative and non-facilitative influence from both previously acquired languages on subject-verb agreement. Additionally, the study highlights the importance of other factors such as complexity and saliency, which account for different developmental slopes across investigated properties.

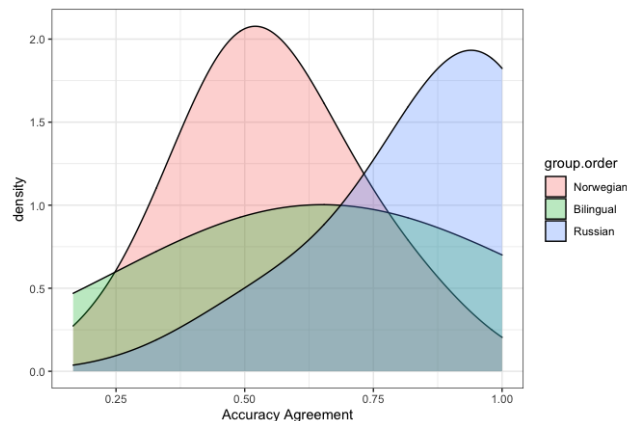


Figure 2: Distribution of individual accuracy scores on subject-verb agreement by group: Bilingual (2L1 Norwegian/Russian–L3 English), Norwegian (L1 Norwegian–L2 English), Russian (L1 Russian–L2 English) (from Jensen et al., 2021, p.13).

To conclude, the selected evidence reviewed in this section is in line with the LPM and Scalpel model’s proposal that an L3 grammar is built incrementally in small steps and that it is influenced by both previously acquired languages. While subtractive group and multiple property methodology is particularly useful in isolating the influence from previously acquired languages, cross-sectional and especially longitudinal designs present great potential, especially in the absence of control groups. Furthermore, in order to address relevant theoretical underpinnings, the study design must involve a high degree of sophistication, especially with regards to the selection of test properties, their linguistic characteristics, and acquisition trajectories. The relevance of these considerations is based on evidence from e.g. Slabakova and García Mayo (2015), Guo and Yuan (2020), as well as Feijoo and García Mayo (2021), where a set of factors is hypothesized to modulate CLI in important ways.

6. Summary and Outlook

In this chapter we have discussed crosslinguistic influence in L3 acquisition from the perspective of the LPM and the Scalpel Model, arguing for property-by-property acquisition. According to these models, the initial state of L3 acquisition is the entirety of the two previously acquired languages, which are always active in the L3 acquisition process. Like L1 and L2 acquisition, L3 acquisition is learning by parsing/processing, and the L3 grammar is built up incrementally in small steps. In this process, the full grammars of both previously acquired languages remain available for CLI, which we refer to as Full Transfer Potential. During processing of the L3, the previously acquired languages will be activated to different degrees, based on structural similarity with the L3 – and at early stages also superficial lexical/typological similarity. We have also devoted a section to the optimal methodology for

L3 research, focusing on the type of populations to compare, the combination of properties to investigate, and the timing of testing. For the LPM and the Scalpel Model, it is important 1) to use a subtractive language group design in order to isolate the effect of each previously acquired language, 2) to select properties that share similarities and differences across the three languages, and 3) to choose an acquisition stage that avoids ceiling and floor effects. Additionally, in line with the Scalpel Model, it is necessary to investigate (and/or control for) additional factors such as frequency, proficiency, recency, etc. The field of multilingual language acquisition is only in its infancy, and we believe we will see considerable development in this area in the coming years.

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