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## 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, 2019) and the Scalpel Model (Slabakova, 2017), we focus on theoretical arguments for crosslinguistic influence taking place property by property from both previously acquired languages and provide a brief overview of empirical studies finding support for this position. We also discuss methodological issues that are important in studies that aim to identify such hybrid influence.

### 2. Background

The formal study of L3/Ln acquisition is a field that has developed rapidly over the last couple of decades, informed both by previous work on L2 acquisition and current work on processing and inhibitory control in bi- and multilinguals. 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 transfer 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 will be available for transfer, notably lexical elements but no functional elements above the VP. 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, which however, was quickly abandoned 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. the 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 route, e.g. the Cumulative Enhancement Model (CEM), focusing on the cumulative and facilitative nature of L3 acquisition (Flynn et al., 2001), 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, 2019). True to their linguistic provenance, both 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 acquisition as a cumulative process (like the CEM). The LPM and the Scalpel Model explicitly define property-by-property transfer as the major distinguishing property of the models. Importantly, this is different from the partial transfer models of the 1990s, in that any linguistic property is argued to be able to transfer. But 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*. We focus our presentation here on the two models' answers to several important research questions in the field, namely, what constitutes the initial state/stages of L3A, and how restructuring of the L3 grammar proceeds.

### 3. The LPM and the Scalpel Model

#### 3.1 *Transfer or CLI - or CLE?*

The term transfer originates in the framework of the Contrastive Analysis Hypothesis of the 1960s (e.g. Lado, 1957), as a mechanistic process in L2 acquisition predicting that any property that is different in the L2 would be difficult, while a property that was similar would be easy. This behaviorist idea was abandoned in the generative framework, which instead developed an approach that considered the active involvement of the human mind in the learning process, referred to as Creative Construction at the time (e.g. Dulay, Burt & Krashen, 1982). Sharwood-Smith (1983) suggested crosslinguistic influence (CLI) as a better term for the process of L1 effects on the L2, defined as any influence that may be found in the L2 acquisition process, including e.g. avoidance or persistence of certain structures.

Nevertheless, transfer and CLI have often been used interchangeably as complete synonyms by a wide variety of frameworks in L2 acquisition research, for example Odlin (2012) in cognitive SLA. There is a tendency in generative SLA to prefer the term transfer, defining it more narrowly within grammatical representations: the effect of the native grammar parameter values or grammatical features on the L2A process, i.e. grammatical competence. However, if one espouses the view that language use is rooted in linguistic mental representations, transfer affects not just linguistic representations, but also language processing. The underlying grammar provides the structure for parsing incoming sentences, and that structure is crucial in comprehension as well as production. Additional processing strategies and other sources of information, such as the context, manipulate these structures during processing, potentially changing their interpretation.

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. According to this model, transfer happens only once at the very initial stages; in effect it is a copying of one of the previously acquired grammars as a shortcut to the L3 grammar. This wholesale copying is what Schwartz & Sprouse (2020) have dubbed "The Big Decision." The rest of the time, learners experience CLI, which includes processing effects, strategies, and generally more transient processes. This division of labor allows the authors to use transfer to explain influence from one language and CLI to explain influence from the other language, the one not chosen for copying. However, such a terminological stance renders the wholesale transfer or the Big Decision claim untestable (more on this in section 4 below).

In recent theorizing, Rothman et al. (2019) propose a third term, crosslinguistic effects (CLE), in order to be able to keep the term CLI as an overarching term that includes both representational transfer and processing effects. 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,<sup>1</sup> and attraction effects<sup>2</sup> in functional morphology processing.

<sup>1</sup> In processing sentences such as *Mary greeted the mother of the woman [RC who was talking on the phone], the relative clause in brackets can be interpreted as modifying the mother, which is known as high attachment, or the woman, called low attachment. Different languages have different preferences in this respect, with English, Norwegian, Romanian, and Swedish speakers preferring low attachment, while Spanish, Italian, Russian, Dutch and Greek speakers prefer high attachment (Cuetos & Mitchell, 1988).*

<sup>2</sup> Attraction effects are processing effects, where errors occur in the agreement between two phrases due to the presence of interfering elements. These errors occur even though the underlying grammatical construction has

It would be beneficial to our field to disentangle transfer and CLI and CLE, in order to keep the terminology straight. If one sticks to the examples given by Rothman et al. (2019) and extrapolates, one could recognize CLE cases as superficial events in processing that do not occur regularly and, although predictable, are transient. For example, it is widely assumed that all speakers, including native speakers, who succumb to attraction errors possess the underlying knowledge of how agreement marking works, but they occasionally make agreement errors in language use. Both the LPM and the Scalpel model would obviously accept the existence of CLE, but acknowledge 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 TPM proponents do not take this approach to justify their distinction. Furthermore, since we reject the necessity of copying one previously known grammar at the L3 initial state/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 (2020), who suggests the field abandon this term as it is fundamentally misleading (there is no “movement” of properties involved and there is no representational copying). However, given that transfer is such a handy term and so established in the field, in the rest of this chapter we use transfer and CLI interchangeably as synonyms.

### *3.2 Activation and Inhibition in Language Acquisition Research*

Generative language acquisition has recently incorporated concepts from psychology in its transition theory; that is, 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 a lot more clarity is needed in determining how these psychological processes actually fit with linguistic concepts, a discussion beyond the scope of this handbook chapter, we provide working definitions from neuro- and psycholinguistics. The term “degree of activation” refers to the relative magnitude of language activation (e.g. Incera & McLennan, 2018) of the two languages of a bilingual, affecting for example speed of lexical recognition (Grosjean, 1998, 2001). “Inhibition” describes the constant managing and 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 each language activation is dynamically adaptive, because of the constant need for inhibition of the other language in various circumstances. We need to keep in mind this fairly well-accepted picture of bilingual language use when we think about the initial state of third language acquisition. This is because the activation of two candidate grammars becomes an important factor in deciding what transfers and from where. We turn to this issue in the next section.

### *3.3 Wholesale or Property-by-Property Transfer*

Starting in the 1990s, the initial state of second language acquisition has attracted a lot of research attention and debate. The all-important question is what happens when an adult learner is faced with a new language that she has to acquire. To what extent and how exactly does she use her native language to get a handle on the target grammar? Various proposals have debated this issue, with answers ranging between “No part of the native grammar transfers” to “All of the native grammar transfers,” and some answers in between. The uncontested winner of this

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been fully acquired. For example, in a sentence such as *The key to the cabinets work-s well*, since the closest noun to the agreeing verb is plural, erroneous plural agreement is accepted or produced.

debate is the Full Transfer Full Access Hypothesis (FTFA, Schwartz & Sprouse, 1996), which argues that at the initial state, L2 learners use the whole of their native grammar as a blueprint, or an initial hypothesis, of the target language grammar. If later on in the process the incoming input cannot be parsed with the L1 grammar, then the interlanguage grammar is adjusted.

Extending the FTFA hypothesis, the TPM argues that Full Transfer also applies in third language acquisition, and that either the L1 or the L2 transfers in one fell swoop (e.g. Rothman 2015, Schwartz & Sprouse 2020). The process is dubbed “wholesale transfer” since all the representations of the chosen grammar become the initial L3 representations. The process of feature adjustment after the initial state unfolds as in L2 acquisition. What is the motivation for this proposal? Rothman et al. (2020) refer to the concept of cognitive economy, as it is somehow simpler for the brain to transfer once rather than many times and correspondingly more costly to keep both previously acquired grammars active for the extended acquisition process. Schwartz & Sprouse (2020) also insist that wholesale transfer is the simplest solution and add that individual structures and properties “cannot be excerpted from the cognitive state” of the chosen grammar (Schwartz & Sprouse, 1996: 66). In addition, the structurally rich copied grammar does not just “generate sentences but also constrains the system” (Schwartz & Sprouse, 2020: 9), acting as the primary structure for parsing L3 input. It is worth keeping in mind that L1 transfer is a logical necessity in L2A, but certainly not in L3A, where two grammars are active in a bilingual’s brain.

The LPM and the Scalpel Model take issue with this mechanistic approach to crosslinguistic influence in L3 acquisition. These models explicitly argue for property-by-property transfer, meaning that, in the acquisition of an L3 grammar, the parser relies on both previously acquired grammars, whose features and constructions are activated in the integrated cognitive space. This takes place at the initial state/stages as well as all subsequent stages. A grammar is not monolithic but represents an assembly of separate yet amalgamated mental representations of sounds, lexical items, formal features, morphemes with feature bundles, syntactic and semantic operations. 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. As both the L1 and the L2 features are natural language features, the interlanguage grammar is UG-sanctioned, and there is no need for wholesale transfer to constrain the acquisition process.

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, Forster & Frost 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).

Word recognition findings have significance beyond the mental lexicon. In a minimalist approach to the 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. “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 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 grammatical features of both previously acquired languages are co-activated in the L3 acquisition process, because the words that express these features are co-activated. This process allows for much more flexibility, therefore is more economical of cognitive resources. Thus, there is no need for a Big Decision and wholesale transfer.

### *3.4 CLI in Further L3 Development*

Transfer or CLI beyond the initial state 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 may take place property by property, and Rothman et al. (2020) speculate that L4 acquisition may proceed property-by-property entirely.<sup>3</sup> Indeed, the processes of multilingual development are based on access to the multiple grammars already built and being built. They 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 leads to representational changes, mainly in the language to be learned, but also in 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 positive and beneficial? The Cumulative Enhancement Model (CEM, Flynn, Foley & Vinnitskaya 2004) takes such a position. Unfortunately, there is ample evidence for transfer being less than beneficial, sometimes even clearly wrong. An example comes from Rothman and Cabrelli Amaro (2010), who investigated knowledge of null-subject-related properties in the L3 Italian and French grammars 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. Why would they do that? The authors argued for typological similarity between French and Spanish having played a role.

What are the factors which can influence, even determine, the source language of the 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 parsing. That is, upon exposure to the L3, the parser searches for similar structures in the previously acquired languages, and if an identical or similar structure is found, this will be used to parse the input and build up the L3 grammar incrementally. This 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). 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. This will also (and perhaps especially) be the result during processing for production. If the representation for the L3 is non-existent or too weak, the learner must resort to the previously acquired languages, 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 very similar to the L3, as in the case of the L1 English–L2

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<sup>3</sup> It is not entirely clear what makes L3 and L4 acquisition so different that the former needs initial wholesale transfer but the latter may not.

Spanish–L3 French learners in Rothman and Cabrelli Amaro (2010) just mentioned. That is, superficial lexical similarity may override structural similarity in such cases, especially at early stages of the acquisition process. The LPM nevertheless maintains that, as the L3 acquisition process proceeds, structural similarity should become an increasingly important factor.

But CLI can be due to additional factors as well, for example experiential and input factors. The Scalpel model (Slabakova, 2017) is particularly focused on such factors. They include 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, Jabbari, and Fazilatfar (2016) investigated Mazandarani–Persian bilinguals learning L3 English. The two previously acquired languages affected the L3 quite differently based on which one the learners used the most in their everyday life. In this case, then, experience trumped structural similarity. Determination of such potentially important factors should ideally be done in advance of testing, as well as carefully considering all variables in the three languages.

The LPM and the Scalpel Model use these factors to predict behavior. While the general prediction is that linguistic (or at early stages, surface typological) proximity is the decisive factor determining transfer from either previously learned language, it can be obviated by additional factors and acquisition pressures. These factors are testable one by one, with careful research designs, which we return to in section 4.

### *3.5 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 has mainly been 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), language dominance (Lloyd-Smith et al., 2018), or language use. Thus, most studies test very few linguistic properties; in fact, often only one. In such cases it is of course difficult to find transfer from both languages. Nevertheless, in Rothman et al.'s (2020) systematic review of as many as 92 studies, 18 of them display hybrid transfer, i.e. an influence of both previously acquired languages, either for different linguistic properties (one from one language, another from the other language) or influence from both languages on the same property, so that L3 learners behave differently from two L2 groups (see section 4 for more on this). 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 and that we argue below is simply untestable.

In the original article introducing the LPM (Westergaard et al. 2017), the study presented 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. (under review) added two further properties (determiner use and XPVS/XPSV word order) 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 two conditions (Adv-V/V-Adv and determiner use), scoring between the two groups. Importantly, the two L2 groups showed a higher-than-average sensitivity on one of the conditions (the one that was similar to their L1) and a correspondingly lower sensitivity on the other (the one that was different from their L1). However, the L3 learners behaved differently, as clearly shown in Figure 1 (from Kolb et al. under review, p. 17). This strongly suggests that the L3 learners were influenced by both Russian and German.

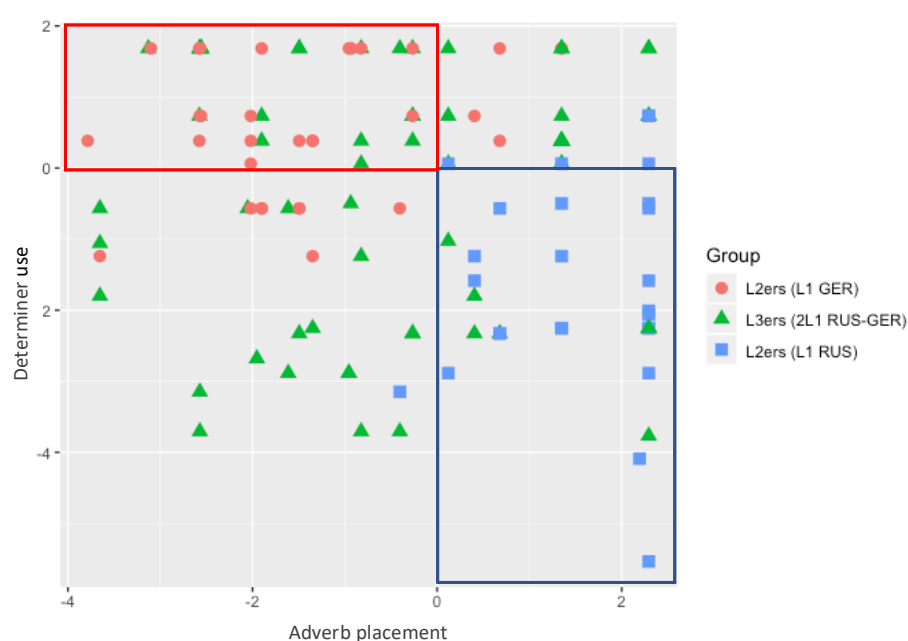


Figure 1: Distribution of random effect sizes for two critical conditions (Determiner use and Adverb placement), showing that Russian-German L3 learners of English are different from both of the corresponding L2 groups.

Other studies have attested similar phenomena. Stadt, Hulk, and Sleeman (2016, 2018a, 2018b, 2020) conducted a series of studies of word order in L3 French and L3 German acquisition with speakers of L1 Dutch/L2 English. In an earlier longitudinal study, Stadt et al. (2018b) considered early and later acquisition stages of sentence adverbial and topicalized structures 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: L1 Dutch and L3 French display similarity in declaratives with sentence adverbials, i.e. V-Adv (V2) word order. Yet, L3 French is similar to L2 English in topicalized structures, where both exhibit non-V2, XP-S-V word order. The results from first-year students with 50% English immersion demonstrate strong influence from Dutch, since V2 is used in both structures: correctly with sentence adverbials and erroneously in topicalized sentences. However, the erroneous V3 word order (i.e. the English Adv-V) is attested at a rate of 14.6% and 34.7% in a Gap Filling and Grammaticality Judgment Tests respectively. Furthermore, V3 is used appropriately at approximately the same rates (20.1% and 44.1%) with topicalized structures. These results



indicate that both previously acquired languages are activated and available for transfer at the initial stages of L3 acquisition.

Crucially, additional factors are brought into the picture in a later comparison of the acquisition of VAdv word order by intermediate L3 German and L3 French learners in order to explain a higher occurrence of \*SAdvV errors in the latter group. It is suggested that the substantial activation of L2 English happens only when learners are sufficiently exposed to the L2 on a daily basis and when they have had enough L2 exposure (as is the case in the L1 Dutch–L2English–L3 French group). In the case of L1 Dutch–L2English–L3 German, a high frequency of V2 structures in the L1 and L3 increases learner awareness of the structural resemblances between the languages at later stages, when sufficient exposure to the L3 is reached. This is when L1 Dutch becomes the most suitable language for transfer in L3 German. Thus, multiple group methodology and cross-sectional design can provide important insights into CLI at the initial stages and beyond.

In a similar study, Dahl, Listhaug and Busterud (in press) examined the acquisition of sentence adverbials in L1 Norwegian–L2 English–L3 German in an Acceptability Judgement Test. Additionally, they compared this property to the acquisition of topicalized structures 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 (VAdv and XPVS). In the earliest learners (years 1–2 of German instruction), Dahl et al. (in press) find no clear evidence of transfer from either L1 Norwegian or L2 English, since the mean scores on both structures were around the middle of the Likert scale, showing no preference for V2 or V3 (i.e. the English AdvV and XPSV). The same is observed in the individual data, where no participant consistently accepted V2 and rejected V3. According to the authors, this indicates insecurity rather than transfer from one language or the other, 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 (Westergaard, 2019)”. Interestingly, the lack of a preference for the grammatical V2 or ungrammatical V3 in L3 German in early years occurs despite their near target-like performance on both sentence types in L2 English (evident across all age groups). Thus, both word orders seem to compete in an emergent L3 grammar, but none is able to exert a major influence. In years 4 and 5, Dahl et al. (in press) observe a development towards target-like word order, which falls into place earlier with sentence adverbials than with topicalized structures.

Lloyd-Smith (2020) is a study with a design similar to that of Mykhaylyk (2016) and Westergaard et al. (2017), in that the participants are early bilinguals whose performance in an L3 is compared to the performance of two groups of monolingual controls. Lloyd-Smith investigates the acquisition of two properties: verb placement in embedded *wh*-questions and OV/VO word order in adult Italian-German bilingual learners of L3 English. German and English both exhibit SV order, while Italian is VS. Italian and English both have VO order, while German is OV. The results of an Acceptability Judgment Task show that Italian–German bilinguals perform equally well and almost target-like with both SV and VO orders. Nevertheless, there is non-facilitative influence from both languages: the non-target \*VS order is accepted 14.5% of the time, while non-target \*OV order is accepted 13.5% of the time. Importantly, as shown in Table X, the frequency of \*VS is similar in bilinguals and Italian controls (14.5% vs. 18.7% respectively). The frequency of \*OV in bilinguals is a rather close match to that of German controls (13.5% vs. 11.6% respectively).<sup>4</sup> The author concludes that

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<sup>4</sup>Lloyd-Smith (2020) notes that there is some degree of uncertainty with regards to CLI from German, since the L1 Italian control group accepted \*VS and \*OV at a similar rate. This is likely due to the fact that two out of the six stimuli sentences were more problematic than the others for the L1 Italian controls as well as for the bilinguals and L1 German controls.

transfer occurs from both languages and this is unrelated to the bilinguals' overall dominance in German or their proficiency in Italian. This finding is in line with the LPM proposal that both linguistic systems are equally available for CLI in L3A.

Not many studies investigate more than one or two properties, but Ben Abbes (2016, 2020) is an exception, in that the studies include several morphological and syntactic properties, including gender, number, articles, and word order in declaratives with sentence adverbs. The participants are L1 Spanish–L2 English and L1 Turkish–L2 English beginner learners of L3 French (who had a maximum of two years of French instruction and scored as beginners on a French proficiency test). To investigate influence from L2 English, the participants were tested on an English proficiency test and divided into a low-intermediate and an advanced group. Importantly, this proficiency measure allowed the author to isolate L2 influence in L3 acquisition in the L1 Turkish–L2 English–L3 French group. This supports property-by-property transfer. It should be noted that the L1 Spanish–L2 English–L3 French group does not present a good test case, since Spanish has a 100% overlap with L3 French across all five properties included in the studies (cf. Table 1). In contrast, both Turkish and English differ from L3 French in three properties and display structural similarity with L3 French with plural marking on nouns. The article system is thus the only property where L1 Turkish and L2 English pattern differently.

Table 1: Presence vs. absence of the properties tested in Ben Abbes (2016, 2020)

	L1		L2	L3
	Spanish	Turkish	English	French
Gender (assignment/concord)	✓	X	X	✓
Plural marking on N	✓	✓	✓	✓
Number concord on Det and Adj	✓	X	X	✓
Definiteness/specificity	✓	X	✓	✓
S-V-Adv	✓	X	X	✓

The findings show that, in the L1 Turkish–L2 English group, structural similarity between the L3 and the previously acquired languages can explain target-like performance with plural marking. In contrast, the lack of similarity appears to be responsible for profound problems with French gender, SVAdv order, and number concord. The studies are able to isolate positive evidence from L2 English in the case of definiteness/specificity, especially the use of indefinite articles, since L1 Turkish learners reach target-like knowledge of the indefinite article in L3 French only when they reach advanced proficiency in L2 English. In sum, the results of the L1 Turkish–L2 English group 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 (as is the case of the definite/indefinite articles in L2 English–L3 French), with proficiency as a confounding factor.

#### 4. Methodology

We devote this section to the type of methodology that is suitable to investigate crosslinguistic influence as a property-by-property phenomenon. Given that it is important for the LPM and Scalpel Model 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 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 associated specifically with L3A which impose particular requirements on the design of L3A studies. We consider three methodological parameters which play a crucial role in L3A experiments: 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 (*when* or *at what developmental stage* should the participants be tested). Moreover, previous studies have identified some further factors that may need to be taken into consideration when conducting L3A research, including but not limited to overall typological proximity, order of acquisition, dominance and recency. Due to space limitations, we focus on the three main parameters mentioned here and only briefly address the remaining factors.

Contemporary models of grammatical acquisition in an L3 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); 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 (*who should be tested*)

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 and included in the analysis (e.g. Bruhn de Garavito & Perpiñán, 2014; Bardel & Falk 2007). The L1 and the L2 differ with respect to the tested 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 a definitive answer to any of the research questions 1–3 above. In order to confirm or reject the hypotheses that the models make regarding the source, type and extent of CLI, baseline comparison groups are an obvious necessity. 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 to the *single group methodology*. In this methodology, the target L3 language is kept constant while the order of acquisition between the previously acquired languages is manipulated. For example, we could compare the performance of 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 the experimental groups matched in proficiency in L1, L2 and L3 *differ* in their performance in the L3, we can reject the null hypothesis that the order of acquisition does not matter for L3A, thus providing support for theories that argue for a differentiated role of L1 and L2 in L3A. However, it is important to note that the *lack* of significant differences between the groups cannot be used as a statistical argument to support the hypothesis that the order of acquisition doesn’t play a role (provided that traditional significance-based null-hypothesis testing is applied, see e.g. Lehman & Romano 2005). If researchers want to draw reliable conclusions from null results — and meaningfully disambiguate the absence of evidence from the evidence of absence — advanced methods based on e.g. equivalence testing, statistical power test, confidence interval approach

or Baayes factors need to be employed (see Harms & Lakens 2018; Quertemont, 2011; Lakens et al., 2020).

Crucially, the mirror image group methodology cannot provide a reliable answer to the question of whether only one or in fact both of the previously acquired languages are the source of CLI in the L3 (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 groups design*.

In experiments employing the subtractive language groups 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 one to assess individual effects of the two previously acquired languages on the L3. For example, if we take the group with 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 as well as to the performance of 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). At the same time, the subtracted language group design in itself 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, another logical possibility is to have a *fully combined design*, with four experimental groups: two L2 control groups and 2 mirror image groups. Such studies can meaningfully assess both the role of each of the previously acquired languages, as well as the effect of order of acquisition. Table X summarizes the types of research questions that can be formally (statistically) addressed in the available L3 methodologies.

Table 2: L3 methodologies and corresponding research questions

	Order of acquisition	CLI from individual languages
Single group	–	–
Mirror image groups	✓	–
Subtractive language groups	–	✓
Fully combined design (MI+SL)	✓	✓

#### 4.2 Choice of Properties (what should be tested)

The choice of linguistic properties depends on the language combinations involved in the study. There is extensive empirical evidence (predominantly from L2 research) that additional 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* from *non-facilitation* if the experiment only compares two experimental groups (the difference between the groups can be interpreted both ways). 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). Language C will be the target language. 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 that can be made 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.

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—cross-linguistic influence (this is what is observed in Westergaard et al., 2017 and Kolb et al., under review).

Table 3: Combinations of properties to be investigated in a subtractive experimental 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 $L_A$

Related to the experimental methodologies described above, it is worth pointing out that (contra what has been claimed by Cabrelli & Puig-Mayenco (2020) and Gonzalez Alonso & Rothman (2020) a property-by-property transfer model such as the LPM *does* make clear predictions for the potential outcome of L3 experiments.

Let's consider a simplified study design, which involves a linguistic property X 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. For this experiment, the LPM would predict that 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 X:  $L_2$  (language A)  $\geq$   $L_3$   $\geq$   $L_2$  (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.

The LPM could also be tested in a more complex experiment involving three types of linguistic properties: X, Y and Z (the properties should be carefully matched for frequency, complexity and be acquired at a similar developmental stage).

Property X is shared by all three languages: L3, Language A and Language B.

Property Y is shared by L3 and Language A, but not by Language B.

Property Z differentiates L3 from both Language A and Language B.

For this scenario, the LPM would predict cumulative CLI from both languages, which means that the L3 learners would acquire Property X earlier than Property Y, and Property Y earlier than Property Z (i.e.  $X > Y > Z$ ). Conversely, the LPM would not predict Z before Y, or Y before X, or Z before X.

#### 4.3 Timing (when or at what stage of development should the participants be tested)

Before we discuss the factor of timing in more detail, it is important to distinguish between two types of theories within contemporary L3A research. On the one hand, there are what we can call *broad theories of third language acquisition*, which are interested in the dynamic process of L3A in its entirety and aspire to account for the developmental trajectory that the learners follow throughout the process of L3 acquisition. Broad theories of L3A include most

contemporary models except for the TPM (i.e. the CEM, the L2 status factor model, the LPM, the Scalpel model, etc.). On the other hand, there are what we can refer to as *narrow theories of L3A*, which focus solely on certain specific stages within the L3A. There is currently only one model that we can classify as a narrow theory of L3A – the Typological Primacy Model. The TPM focuses on the so-called ‘initial stages’, which according to the model correspond to a designated period within L3A when wholesale transfer from one of the previously acquired languages takes place.

Timing is important for both types of L3A theories, although for slightly different reasons. For narrow theories of L3A timing is a core factor, since such theories only purport to make predictions regarding particular stages of the L3A process. Crucially, in order to avoid a vicious circle, the theory must provide independent empirical criteria for identifying the critical stage. Failing to do so leads to serious methodological problems and may ultimately render the model unfalsifiable (and consequently, unscientific). In practice, the TPM is yet to seriously address this issue. The definition of the ‘initial stages’ provided in the available TPM publications is circular and not theory-independent. As González Alonso & Rothman (2017) state, “[f]or the TPM, the initial stages are themselves defined as the period in which structurally driven wholesale transfer from the L1 or the L2 takes place”. In other words, the construct of ‘initial stages’ is defined by appealing to the (theory-internal) construct of ‘wholesale transfer’, while ‘wholesale transfer’ is predicted to happen during the initial stages defined as a period when this transfer takes place. In sum, unless the TPM provides any independent criteria for determining the boundaries and the duration of the initial stages, the predictions of the model will in effect remain untestable.

Turning now to the broad theories of L3A, timing is important for at least two reasons. From the point of view of the choice of linguistic properties for the experiment, it is crucial to avoid floor and ceiling effects. Careful assessment and piloting can help determine specific developmental trajectories for the properties in question. The critical linguistic features should then be matched in terms of relative ‘age’ of acquisition. This information will determine at what developmental stage the participants should be tested.

Secondly, a more general question that L3A 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 third language 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, see section 3.2). Thus, it may be expected that—all other things being equal—the effects of cross-linguistic influence will be modulated by the developmental stage of the learner and their relative *experience* with activation and inhibition of different linguistic representations (e.g. De Luca et al., 2019). For instance, it could be the case that at early stages of development, the phonological, lexical and grammatical representations of an L3 may be relatively unstable, while the activation level of the previously acquired languages may be 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 different languages, the amount, intensity and quality of input and output, recency of use etc. may also help account for the dynamic changes that a multilingual mind is undergoing (see Slabakova, 2017). We believe that this line of research can be very fruitful, generating qualitatively new results that will enhance our understanding of the complex and dynamic process of L3A.

## 5. 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. That is, the initial state of L3 acquisition is the combination of the two previously acquired languages, which are always active in the L3 acquisition process (but presumably inhibited/activated to varying degrees depending on lexical and structural similarities with the L3 and possibly other factors). This means that the initial state of L3 acquisition is the same – always both of the previously acquired languages, no matter what the nature of the L3 is. Furthermore, there is no need to deal with the elusive concept of initial stages, as there is no wholesale transfer of the complete grammar of one of the previously acquired languages after a certain period of L3 acquisition. Thus, like L1 and L2 acquisition, L3 acquisition is learning by parsing, 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 varying degrees, based on structural similarity – and at early stages also superficial lexical similarity – with the L3. We have also devoted a considerable 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 Scalpel model, it is important to use a subtractive design, in order to isolate the effect of each previously acquired language, to select properties that share similarities and differences across the three languages, and 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 years to come.

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