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Crosslinguistic influence in L3 acquisition across linguistic modules

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ABSTRACT

In this study, we investigated crosslinguistic influence (CLI) at developmental stages of third language (L3) acquisition of English by Russian–Norwegian children ($N = 31$). We tested seven linguistic properties within three linguistic modules (morphology, syntax and syntax-semantics). We compared the L3 learners to Norwegian ($N = 90$) and Russian ($N = 74$) second language (L2) learners of English. We predicted simultaneous facilitative and non-facilitative CLI in the L3 group within all modules, as the previously acquired languages offered conflicting options. Our predictions were partly supported. On one property, the L3 learners were different from both L2 groups, which is in line with cumulative CLI from both previously acquired languages. On four conditions, the L3 learners performed like the more accurate L2 group, indicating facilitative influence. On two conditions, all groups performed alike, showing high rates of accuracy. Taken together, the results indicate that CLI obtains on a property-by-property basis, with none of the L1s being the sole or primary source of CLI. Finally, we found CLI in all linguistic domains, but the developmental slopes for the properties were not equal, which suggests that factors such as complexity and saliency needs to be taken into account when we compare CLI.

Introduction

This paper presents a study that investigated crosslinguistic influence (CLI) at selected developmental stages of third language (L3) acquisition of English by Russian–Norwegian bilinguals. We examined how the previously acquired languages, Russian and Norwegian, affected the acquisition of the L3 across three linguistic modules: syntax, morphology and the syntax–semantics interface. At the syntax–semantics interface, we tested genericity and definiteness; in the morphological domain, we tested

subject-verb agreement and the use of the copula in the present tense, and in the syntactic domain, we tested word order. In each domain, at least one condition targeted a property that was similar between Norwegian and English (while Russian was different) and one represented a similarity between Russian and English (while Norwegian was different). Our goal was to investigate whether both previously acquired languages contributed to CLI and whether CLI was always facilitative. Finally, and importantly, studies of CLI, in general, tend to only consider one language domain, and this is true of studies of L3 acquisition as well (for a discussion, see Lago et al., 2021). In the current study, we fill this gap by considering CLI across different linguistic domains.

Following the framework of the Linguistic Proximity Model (LPM; Mykhaylyk et al., 2015; Westergaard et al., 2017) and the Scalpel Model (Slabakova, 2017), we assume that both previously acquired languages would be active during the process of L3 acquisition and will contribute to the building of increasingly more stable L3 representations. This leads to three different scenarios in the case of L3 English acquisition by 2L1 Russian–Norwegian learners.

1. The L3 group could be similar to the low-accuracy group, but this should only happen before they discover the structural similarities between the properties (earliest stages);
2. L3 learners would be in-between the L2 groups due to co-activation of competing related structures in both previously-acquired languages;
3. L3 learners would be similar to the higher-accuracy group, when they learn to inhibit the non-facilitative language.

Outcome 1 is compatible with the LPM and Scalpel Model, but also the Typological Primacy Model (TPM; Rothman, 2011, 2015; if the L3 group patterns with the linguistically more similar L2 group). Outcome 3 is compatible with both the LPM, the Scalpel Model and the Cumulative Enhancement Model (CEM; Flynn et al., 2004), while outcome 2 is only predicted by the LPM and the Scalpel Model, and would go against both the CEM and the TPM. If the L3 speakers' accuracy lies in between the two L2 groups, the LPM's interpretation of this result is that this is due to simultaneous facilitative and non-facilitative influence from the previously acquired languages (see Westergaard, 2021 for more details on this methodology and general predictions). We tested our predictions by comparing Russian–Norwegian learners of L3 English to age- and proficiency-matched groups of L2 learners with Norwegian and Russian as their L1s in an offline acceptability judgment task (AJT).

Background

In the field of L2 acquisition research, there is a strong consensus that the native language exerts a decisive influence, especially early in the acquisition process. This view has been advocated by the Full Transfer/Full Access Hypothesis (FT/FA, Schwartz & Sprouse, 1996) and before that by White (1985). The FT/FA argues for wholesale transfer: L2 learners copy their entire L1 system in one fell swoop, except for phonological features and lexical items, upon first exposure to a new language (Schwartz & Sprouse, 1996, 2020). This copy of the L1 system constitutes the initial state of L2 acquisition. If the learners receive input from the target language that cannot be parsed through their current L2

system, they restructure their L2 grammar (Schwartz & Sprouse, 1996, pp. 40–41). An opposing view to Full Transfer is the Full Transfer Potential approach (FTP, Westergaard, 2019). According to this view, any property from the L1 *may,* but does not have to, influence the L2. FTP argues that all language acquisition happens through parsing, meaning that in L2 acquisition, the new language is parsed through the L1 system. If the learner discovers a structure in the L2 input that matches a structure in the L1, the L1 representation of this property will be activated, resulting in CLI (the structures are referred to as micro-cues; see Westergaard, 2009, 2019 for a discussion of the Micro-cue Model). The learners' L2 system is not a complete copy of the L1 grammar. Instead, the grammar starts small and grows incrementally, i.e. CLI happens property by property. This also means that instead of being robust copies of L1 properties, the L2 structures may be vulnerable at the initial stages of the acquisition process and grow into more robust representations as more input is received from the target language. Misanalysis of the input may lead to non-facilitative influence (see Westergaard, 2021, for some examples).

The LPM aims to model CLI at all stages of the acquisition process and does not distinguish categorically between earlier and more advanced stages of the process. The model is non-default, meaning that it does not assume an L1 or L2 primacy effect. Instead, what drives CLI is structural proximity between the L3 and previously acquired languages. Learning happens in the same way as in L1 and L2 acquisition – by parsing. This suggests that learners use the L1 *and* the L2 systems to parse the L3 input. More specifically, the parser searchers for (micro-)cues that match with the L1 or the L2 representations. If a cue is found, it is used as a facilitative parse and is stored as a cue in the developing L3 system. As the experience in the L3 grows, the learners become more proficient in inhibiting the influence from the previously acquired languages. In practice, this means that we will see co-activation and influence from both the L1 and the L2 at the developmental stages of L3 acquisition.

The LPM argues that influence can be facilitative and non-facilitative. This distinguishes the LPM from the CEM (Flynn et al., 2004). According to the CEM, CLI can come from both previously acquired languages, but it is either facilitative or neutral. The LPM, on the other hand, argues that non-facilitative influence may be a result of a misanalysis of the input (or in some cases, lack of relevant input). This is based on the microvariation approach to language acquisition, cf. the Micro-cue model (Westergaard, 2009, 2019), i.e. that there are fine-grained linguistic distinctions between languages, and even when there are structural similarities between two languages, the properties are rarely identical. According to Westergaard (2019, p. 19), this may account for non-facilitative influence (see also Westergaard, 2021). This is a feature that this model shares with the Scalpel Model (Slabakova, 2017).

Previous studies in L3 acquisition have mainly examined one or two constructions within the same linguistic domain. For example, Flynn et al. (2004) looked at the production of restrictive relative clauses in L3 English by L1 Kazakh/L2 Russian speakers; Falk et al. (2015) examined the production of adjective placement in L3 Dutch by L1 Swedish speakers with previous knowledge of English and a Romance language; Rothman and Cabrelli Amaro (2010) examined null subjects in speakers of English and Spanish who acquired another Romance language; Westergaard et al. (2017) tested knowledge of subject–auxiliary inversion and adverb–verb word order in L3 English by

2L1 Russian–Norwegian speakers. Whether CLI works similarly within different parts of the grammar has not been investigated widely and within the same population. In our study, we address this question by testing an array of linguistic properties across three linguistic modules: morphology, syntax and the syntax–semantics interface.

Research questions and predictions

We investigated CLI in seven properties across three linguistic modules. For the L2 learners, at least one property was similar to their L1 and one was different within each module. For the L3 learners, there was always a conflict between their L1s. We focused on acquisition past the beginner stages, as the participants had been learning English in school for 5–6 years (cf. Participants). It should be noted that some L3 models, such as the L2 Status Factor (e.g. Falk & Bardel, 2010), argue that order of acquisition and proficiency are important factors to understand CLI in L3 acquisition. In the current study, we cannot investigate the effect of these factors since the L3 learners acquired both Norwegian and Russian from birth and were proficient in both languages (cf. Participants). We asked the following research questions:

1. Do both previously acquired languages contribute to CLI at developmental stages of L3 acquisition, or is one language chosen as the sole/primary source of influence?
2. Is CLI always facilitative?
3. Is the pattern of CLI the same across grammar domains: morphology, syntax and syntax–semantics?

We predicted that the L3 group's scores, measured by accuracy in an AJT – at least on some of the conditions – may be in the middle of the two L2 groups' scores due to facilitative and non-facilitative influence from Russian and Norwegian. Alternatively, they would score the same as the L2 group with which it shared the relevant property (a ceiling effect), but they would not be expected to score better than this group (see Westergaard, 2021). We also expected that the L2 groups would outperform each other on the conditions in which the L1 offered facilitation. The predictions are summarised in Table 1 (see details about the conditions in the Methods section).

It should be noted that the predictions for the L3 learners are dependent on these properties being problematic for the L2 learners where the property is missing in the L1; if they are not, then all groups may have already acquired the property, and no differences will be seen. Thus, timing is crucial, and it may not be the case that all properties

Table 1. Predictions

Similarity	Condition	Module	Prediction
ENG = RUS ≠ NOR	Gen	Syntax–semantics	Rus > Rus–Nor > Nor
	Agree	Morphology	
	Topic	Syntax	
	Adv		
ENG = NOR ≠ RUS	Def	Syntax–semantics	Nor > Rus–Nor > Rus
	Cop	Morphology	
	DO-pro	Syntax	

Note: Gen = Abstract genericity; Agree = Subject–verb agreement; Topic = Subject–verb word order; Adv = Adverb–verb word order; Def = Definiteness; Co*p* = obligatory copula; DO-pro = verb–pronoun word order.

tested are problematic at the same stage of acquisition. For some of the properties we have selected, there is previous research showing that they cause problems for L2 learners; e.g. adverb–verb word order in declaratives is difficult for Norwegian learners of English at a certain stage (e.g. Westergaard, 2003), while definiteness has been found to be notoriously hard for learners with an article-less L1 such as Russian (e.g. Agebjörn., 2020; Ionin et al., 2004). For other properties, we may or may not see effects of CLI at the stage that we are testing these learners. Nevertheless, even in cases where a property of the target language is already acquired by the L2 learners, we expect the L3 learners to also have acquired it.

Method

Participants

We tested 31 Russian–Norwegian bilinguals (mean age: 11.5), 90 L1 Norwegian speakers (mean age: 12.1) and 74 L1 Russian speakers (mean age: 12.4). All participants started learning English in school around age six. The Russian–Norwegian bilinguals attended a Russian-speaking evening/Sunday school in Norway. They reported having at least one Russian-speaking parent and they had acquired both languages from birth or from early childhood (age of onset in Norwegian for children with two Russian-speaking parents was typically between 1 and 2 years). The L1 Norwegian and L1 Russian speakers were recruited in Norway and Russia, respectively. They reported no knowledge past beginner levels in other languages than their L1 and English and no other countries of residence than Russia or Norway. The participants were matched for English lexical proficiency by means of a modified British Picture Vocabulary Scale (BPVS 3; Dunn & Dunn, 2009) with 20 items. Only participants with an accuracy score of 60% or above were included in the analysis. We excluded one L1 Russian speaker based on this criterion.

Experimental conditions and test items

In the AJT, the participants assigned the values *good* or *bad* to ungrammatical and grammatical English sentences. For each grammatical sentence, there was an ungrammatical counterpart. We divided the sentences into two lists so the participants never saw both members of a sentence pair. Each list contained six sentences per condition. Because of the large number of different properties tested in this study, the conditions served as fillers for each other. All items were checked for naturalness and grammaticality by native speakers of English ($N = 6$). Examples (1–7) show some of the sentences used in the AJT (sentences used for a context in brackets). English is similar to Norwegian in (1–3) and to Russian in (4–7).

1. Definiteness
    (a) [Susan thought that her dog was lazy]. **The** dog slept a lot.
    (b) [Susan thought that her dog was lazy]. *Dog slept a lot.
2. Obligatory copula
    (a) Lisa **is** a nice person.
    (b) *Lisa a nice person.

3. V-DOpro word order
    (a) [Nina was Robert's girlfriend]. Robert **met her** at work.
    (b) [Nina was Robert's girlfriend]. *Robert **her met** at work.
4. Abstract genericity
    (a) Life can be difficult.
    (b) ***The** life can be difficult.
5. Subject-verb agreement
    (a) ***Ruth walks** to church every Sunday.
    (b) ****Ruth and John walks** to church every Sunday.
    (c) ***Ruth and John walk** to church every Sunday.
    (d) ****Ruth walk** to church every Sunday.
6. Topic (XSVO word order)
    (a) *Last Monday **the teachers** walked* to school.
    (b) **Last Monday **walked** **the teachers** to school.
7. Adv-V word order
    (a) We ***usually** eat* eggs for breakfast.
    (b) ***We **eat** **usually** eggs for breakfast.

Syntactic conditions

While there were two syntax–semantic and morphological conditions, there were in practice three syntactic conditions. Two of these were sub-conditions of the lack of verb movement in English, referred to as subject–verb word order (topic) and adverb–verb word order (Adv) in previous sections. In these cases, Norwegian is different from English, as the former is an SVO language with verb-second (V2) word order (see (8) and (9)).

8. *V2 word order in Norwegian non-subject-initial declarative clauses*
    (a) Forrige   mandag   **gikk   lærerne**   til   skolen.
         Last   Monday   walked   teachers.DEF   to   school.DEF
         'Last Monday the teachers walked to school.'
    (b) *Forrige   mandag   **lærerne   gikk**   til   skolen
         Last   Monday   teachers.DEF   walked   to   school.DEF
         Intended: 'Last Monday the teachers walked to school.'
9. *V2 word order in Norwegian declarative clauses with adverbs*
    (a) Vi   **spiser   vanligvis**   egg   til   frokost.
         We   eat   usually   eggs   for   breakfast
         'We usually eat eggs for breakfast.'
    (b) *Vi   **vanligvis   spiser**   egg   til   frokost.
         We   usually   eat   eggs   for   breakfast
         Intended: 'We usually eat eggs for breakfast.'

We originally used the past tense in sentences with adverbials (example (9)) to test for knowledge of verb position without the confound of knowledge of agreement, which is tested as a morphological condition. However, past tense declaratives were problematic

for the learners, as both grammatical and ungrammatical sentences were rejected. This could be an effect of the test items, as we presented the habitual adverbs *often, always* and *sometimes* in past tense sentences without any context (e.g. *Emma always ate cake)*. We therefore suggest that the present tense sentences are a better reflection of the learners' knowledge of verb position, and we exclude the past tense sentences in further analyses.

Russian is similar to English with regard to verb placement; while verbs are unacceptable in the second position in these structures in English, they are strongly dispreferred in Russian (see (10) and (11)).

10. *Word order in Russian non-subject-initial declarative clauses*
    (a) V proshlyj ponedeljnik ***uchitelj*** **byl** v shkole
        Last Monday teacher was at school.LOC
        'Last Monday the teacher was at school.'
    (b) ?? V proshlyj ponedeljnik **byl** *uchitelj* v shkole
        Last Monday was teacher at school.LOC
        Intended: 'Last Monday the teacher was at school.'
11. *Word order in Russian present tense declarative clauses with adverbs*
    (a) My ***vsegda*** **jedim** na zavtrak jaichnicu.
        We always eat.1PL for breakfast scrambled eggs
        'We always eat scrambled eggs for breakfast.'
    (b) ?? My **jedim** *vsegda* na zavtrak jaichnicu
        We eat always for breakfast scrambled eggs
        Intended: 'We always eat scrambled eggs for breakfast.'

We also tested a property that is similar in Norwegian and English, but different from Russian: The position of the pronominal object. In Russian, pronominal objects can precede or follow the verb (example (12)), while Norwegian follows the same word order as English (example (13)).

12. *SOproV word order in Russian*
    (a) Mary zabolela. Jonny ***jejo*** **otvjoz** v boljnicu.
        Mary fell ill. Jonny her drove to hospital.DEF
        'Mary fell ill. Jonny drove her to the hospital.'
    (b) Mary zabolela. Jonny **otvjoz** *jejo* v boljnicu.
        Mary fell ill. Jonny drove her to hospital.DEF
        'Mary fell ill. Jonny drove her to the hospital.'
13. *SVOpro word order in Norwegian*
    (a) Mari ble syk. Jonny **kjørte** *henne* til sykehuset.
        Mari fell ill. Jonny drove her to hospital.DEF
        'Mari fell ill. Jonny drove her to the hospital.'
    (b) Mari ble syk. *Jonny ***henne*** **kjørte** til sykehuset.
        Mari fell ill. Jonny her drove to hospital.DEF
        Intended: 'Mari fell ill. Jonny drove her to the hospital.'

Syntax–semantics conditions

In the syntax–semantics domain, we tested the expression of definiteness in English. Since Russian does not have articles, this is an area of grammar that has often been found to be problematic for Russian learners, who typically produce and accept bare nouns in English (example (14)). Norwegian is similar to English but expresses definiteness by adding a suffix to the noun (example (15)).

14. *Definiteness in Russian*
    Sobaka spala. Dog.BARE slept
        'A dog/the dog slept.'
15. *Definiteness in Norwegian*
    (a) Hund**en** sov. Dog.DEF slept
        'The dog slept.'
    (b) *Hund sov. Dog.BARE slept
        'The dog slept.'

While nouns in English typically require an article, mass and abstract nouns can appear without the definite article. Some examples include nouns such as *life, death, love,* etc. Norwegian uses the definite suffix also in these cases, which means that with this subgroup of abstract nouns, Norwegian in fact differs from English, while Russian is similar.

16. *Genericity in Norwegian*
    (a) Liv**et** kan være vanskelig. Life.DEF can be difficult
        'Life can be difficult.'
    (b) *Liv kan være vanskelig. Life.BARE can be difficult
        Intended: 'Life can be difficult.'
17. Genericity in Russian
    Zhiznj mozhet bytj tjazholoj. Life.BARE can be difficult
        'Life can be difficult.'

Morphological conditions

In the morphological domain, the conditions were *subject–verb agreement* and *obligatory copula*. Overt subject–verb agreement is obligatory in English and Russian, but not in Norwegian; see (18) and (19). That is, Norwegian does not overtly express the feature [agree] on the verb, resulting in the same present tense morphology on the verb with third person plural and singular subjects; see (19 a, b).

18. *Subject-verb agreement in Russian*
    (a) Ole i Lisa **izuchajut** lingvistiku. Ole and Lisa study.3PL linguistics
        'Ole and Lisa study linguistics.'
    (b) Ole **izuchajet** lingvistiku. Ole study.3SG linguistics
        'Ole studies linguistics.'
19. Subject-verb agreement in Norwegian
    (a) Ole og Lisa **studerer** lingvistikk. Ole and Lisa study.PRES linguistics
        'Ole and Lisa study linguistics.'

(b) Ole **studerer** lingvistikk.Ole study.PRES linguistics
'Ole studies linguistics.'

The copula is obligatory in English and Norwegian present tense sentences, but not in Russian; see (20) and (21).

20. *Copula in Norwegian*
    (a) Lisa **er** en flink studentLisa is.COP a good student
        'Lisa is a good student.'
    (b) *Lisa en flink studentLisa a good student
        Intended: 'Lisa is a good student.'
21. No copula in Russian
    Lisa horoshij uchitelj.Lisa good teacher
        'Lisa is a good teacher.'

Research design and procedure

The testing took place during school hours for the L2 groups and during evening/ Sunday school for the Russian–Norwegian participants. The study employed three tasks for all participants: an AJT, a lexical proficiency task (BPVS 3; Dunn & Dunn, 2009) and a background questionnaire. In addition, the Russian–Norwegian participants did a Russian AJT in order to establish Russian proficiency (24 sentence pairs in two lists). The study was approved by the Norwegian Centre for Research Data. Multiple participants were tested at the same time in a classroom with the tasks presented on a big screen. All sentences in the AJTs and words in the BPVS were presented written and aurally, recorded by native speakers. Each sentence/word was kept on the screen for approximately 4 s, controlled by the experimenter. The participants marked their answers on a sheet of paper. The sentences were pseudorandomised and the participants were asked to only judge the critical sentences rather than the contextual sentences (see (1–7)). The critical and contextual sentences were marked in different colours. The questionnaire included questions about linguistic background and language habits at home.

Results

To analyse the results statistically,[1] we fit a generalised linear mixed effects logistic regression model where Accuracy was predicted by an interaction of Group (Russian–Norwegian vs Norwegian vs Russian) and Condition (the seven properties, see more in the Methods section). Proficiency in English was added as a separate fixed effect. Random effects included by-item random intercepts and by-participant random slopes. The model revealed a significant effect of group_Norwegian ($ß = -0.44$, $p = .015$), condition_adverb ($ß = 0.70$, $p = .03$), condition_topic ($ß = 1.03$, $p = .003$), condition_definite ($ß = 1.04$, $p = .002$), condition_DOpro ($ß = 2.39$, $p < 0.001$), condition_copula ($ß = 2.01$, $p < .001$), and proficiency ($ß = 0.11$, $p < .001$). Furthermore, four interactions were significant: group_Russian and condition_agreement ($ß = 1.19$, $p < .001$), group_Norwegian

and condition_definite ($ß = 0.62$, $p = .045$), group_Russian and condition_definiteness ($ß = -1.49$, $p < .001$), group_Russian and condition_DOpro ($ß = -0.93$, $p = .03$). No other effects were significant. The syntax and the output of the model is presented in the Appendix and an overview of the participants' demographics is shown in Table 2.

Post-hoc pairwise comparisons of groups within conditions revealed the following significant differences: On adverb placement, the Norwegians were significantly less accurate than the Russians ($p < .0001$) and the Russian–Norwegians ($p = .01$). With respect to agreement, all groups were significantly different from each other: the Russian speakers significantly outperformed the Norwegians ($p < .0001$); the Russian–Norwegian bilinguals also significantly outperformed the Norwegians ($p = .007$), but they were significantly less accurate than the Russians ($p < .0001$). On definiteness, Norwegian and Russian–Norwegian speakers performed significantly more accurately than their Russian peers ($p < .0001$ for both contrasts). The Russian–Norwegian bilinguals and the Norwegian participants performed significantly more accurately with respect to the position of direct object pronouns than the Russians ($p = .03$ and $p = .003$, respectively). The Russian–Norwegian bilinguals and the Russian speakers were significantly more accurate in their use of bare nouns in generic contexts than the Norwegian speakers ($p = .04$ and $p = .008$, respectively). Finally, no differences between the groups were found in the remaining two conditions that tested the use of overt copula and word order in non-subject-initial declaratives (topicalization). Figure 1 illustrates the participants' accuracy scores. The output of the post-hoc pairwise comparisons is presented in the Appendix.

To sum up, on two conditions (Pronoun placement and Definiteness) the Russian–Norwegians patterned with the Norwegians and performed significantly better than the Russians. On two conditions (Adverb placement and Genericity) the Russian–Norwegians and the Russians performed similarly and significantly better than the Norwegians. On subject–verb agreement, the Russian–Norwegians performed significantly better than the Norwegians, but also significantly worse than the Russians. The condition that targeted the use of overt copula in the present tense was unproblematic for all participants (above 85% accuracy). Finally, on Topicalization, we observed a numeric trend in the predicted direction (Norwegians performed slightly worse than Russians and Russian–Norwegians), but this difference did not reach significance (Figure 2).

Discussion

In this section, we discuss the research questions (see Research questions and predictions) in light of the results. To answer research questions 1 and 2, we compared the groups' accuracy scores per condition. Based on the LPM and the Scalpel Model, we expected cumulative facilitative and non-facilitative influence from both of the L3 learners' L1s. As explained in the Introduction, we considered three potential outcomes for the L3

Table 2. Participants' demographics

Group (L1s)	N	Mean age	Proficiency in English (SD)
Norwegian	90	12.1	17.4 (2.1)
Russian-Norwegian	31	11.5	16.9 (1.5)
Russian	74	12.4	16.8 (1.88)

Note: Maximum proficiency in English is 20.
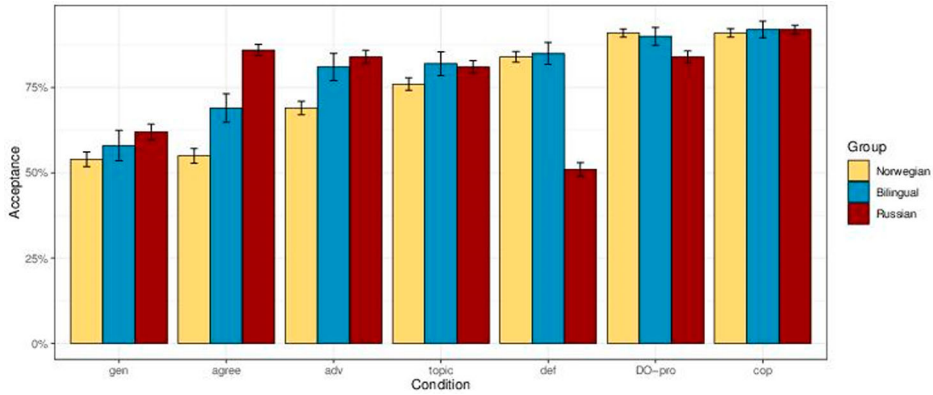
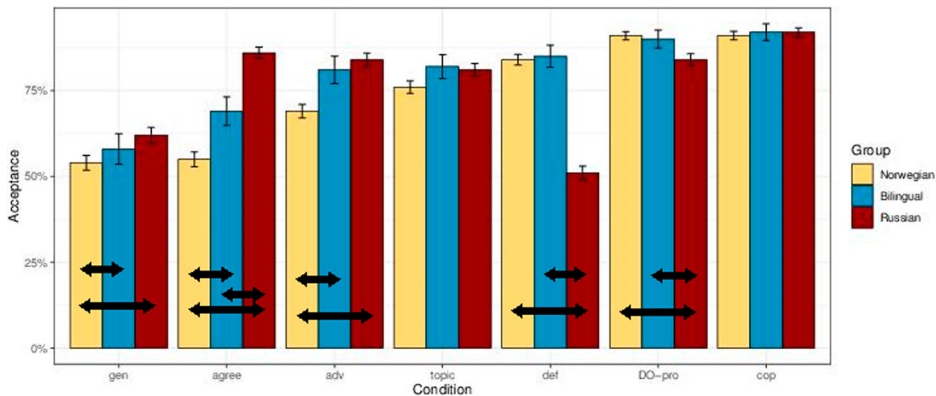**Figure 1.** Accuracy by condition and group.

learners. Outcome 1 would be compatible with the LPM, the Scalpel Model and the TPM (if the L3 group patterned with the linguistically more similar L2 group). Outcome 3 would be compatible with the LPM, the Scalpel Model and the CEM and outcome 2 would only be expected under the LPM and the Scalpel Model, but not under the CEM and the TPM. We should *not* observe that the L3 learners patterned categorically with one of the L2 groups on *all* conditions, which would indicate influence from one language only. Table 3 summarises how our predictions matched the results.

As evident from Table 3, we did not observe any differences between the groups on two out of seven conditions (Copula use and Topicalization). All groups performed accurately on these conditions. We can conclude that all groups have already acquired these properties. Furthermore, we did not observe results compatible with scenario 1 (L3 groups patterning with the lower-accuracy L2 group). Recall that according to the LPM, this outcome is only possible for stages when the L3 learners have not yet established structural correspondence between the properties in the new language and the facilitative language. Our learners are already past the beginner stages, and we can conclude

Figure 2. Accuracy by condition and group (significant differences between the groups are marked with arrows).

Table 3. Overview of predictions and results

Similarity	Condition	Module	Prediction	Result
Eng = Rus	Gen	Syntax–semantics	Rus > Rus–Nor > Nor	*Rus = Rus–Nor > Nor*
	Agree	Morphology		**Rus > Rus–Nor > Nor**
	Topic	Syntax		Rus = Rus–Nor = Nor
	Adv			*Rus = Rus–Nor > Nor*
Eng = Nor	Def	Syntax–semantics	Nor > Rus–Nor > Rus	*Nor = Rus–Nor > Rus*
	Cop	Morphology		Rus = Rus–Nor = Nor
	DO-pro	Syntax		*Nor = Rus–Nor > Rus*

Note: Italics indicates results in which the L3 group patterned with one of the L2 groups; bold font indicates results where all groups differed; the underlined text indicates no differences.

that the correspondence between similar structures has already been established. On one property (Agreement), we observed a pattern compatible with scenario 2 (L3 learners being truly in the middle and significantly different from both L2 groups). The 'in-between' behaviour is interesting and could be a result of two scenarios: (a) the L3ers were influenced by both of their previously acquired languages, which was reflected in them scoring in-between the two L2 groups; or (b) *some* of the L3ers patterned with one of the L2 control groups, while *some* patterned together with the other L2 group. Under the first scenario, we would expect the *individual* scores of the L3 learners to come from one distribution, while under the second scenario we expect that individual scores would come from a bimodal distribution, with one sub-group of the participants performing more like the L1 Russians and the other subgroup performing more like the L1 Norwegians. The distribution of individual scores in the Agreement condition is illustrated in Figure 3. As evident from the Figure, the distribution of individual L3 learner scores does not have two distinct modes (peaks), as would be predicted under the second scenario. This suggests that scenario (a), simultaneous non-facilitative and facilitative influence from Russian and Norwegian, is a more likely explanation for the L3 learners' behaviour. This scenario is only compatible with the LPM and the Scalpel Model, indicating cumulative CLI from both previously acquired languages.

Finally, on four conditions we observed a pattern compatible with scenario 3 (L3 learners patterning with the higher-accuracy group). We interpret this result as indicative of a developmental stage when the L3 learners have already learned to inhibit the non-facilitative language with respect to the property in question. The L3ers patterned with the Russian group on two properties where Russian was facilitative (Genericity and Adverb placement), and with the Norwegian group on two properties where Norwegian gave them a boost (Definiteness and the position of the pronominal object). In other words, CLI from one of the previously acquired languages was powerful enough to be decisive in L3 acquisition. Note that this interlanguage state is not at all counter to our predictions: any one of the native languages suffices for a beneficial effect.

Even though we encountered this type of behaviour in most conditions, the relative acceptance of these conditions was not the same. In the Genericity condition, all groups had quite a low accuracy rate, at 54% and 62%. Importantly, however, Norwegian bilinguals were at a disadvantage. Conversely, on the DO-pro condition, all groups were highly accurate (91–92% vs. 84%), but the Russian L2 learners were at a disadvantage this time. We conclude that the predicted pattern of behaviour was visible when bilingual and trilingual speakers were confident in their evaluations, and even when they were not.
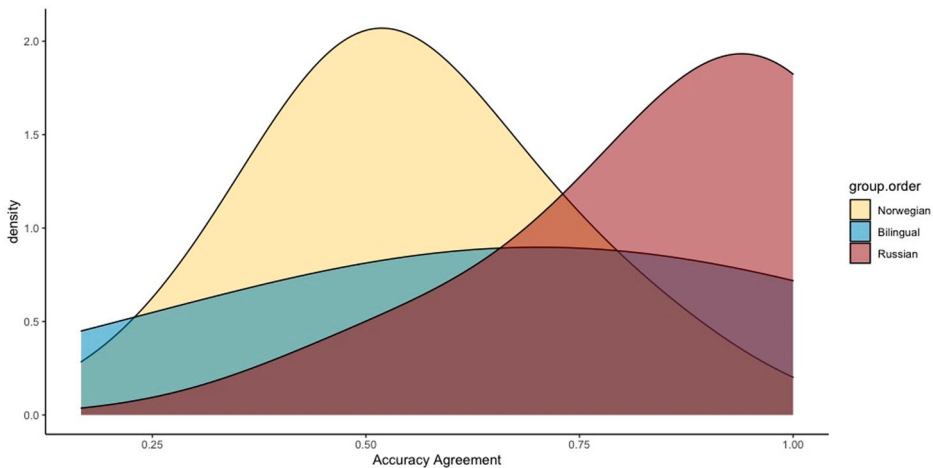
Figure 3. Distribution of individual accuracy scores in the Agreement condition by group.

Overall, the results seem to be best captured by the LPM/Scalpel Model, which both predict cumulative influence from both previously acquired languages. We argue that the results support our prediction for research question 1 and partly support our prediction for research question 2. Regarding research question 1, we observed influence from both L1s, Russian and Norwegian, for different properties. This suggests that influence, at least at developmental stages, was not limited to a single linguistic system, nor was the source of influence determined by overall linguistic similarity between the input and previously acquired languages (as suggested for the early stages of L3 acquisition by Rothman's (2011, 2015) TPM; see more in the Background section). Instead, the results suggest that the learners use both of their L1s as sources of influence. With respect to research question 2, the influence was typically facilitative, as the L3 learners patterned with the more accurate L2 group in four out of seven properties. However, we did observe the predicted 'in-between' accuracy scores by the L3 learners in one condition, *agreement,* suggesting that influence may also be non-facilitating for some properties.

In order to answer research question 3, we tested seven different linguistic properties across three linguistic domains – syntax, morphology and the syntax–semantics interface – in order to explore CLI in different parts of the grammar within the same population. The Scalpel Model (Slabakova, 2017) emphasises the need for such research designs at the developmental stages of L3 acquisition due to additional factors, beyond linguistic similarity, that can contribute to the L3 interlanguage. As mentioned in the Background section, previous studies of CLI in L3 acquisition have typically tested one or two constructions within in the same linguistic domain. As Table 3 illustrates, we found crosslinguistic influence within all linguistic domains, but the developmental slopes were not the same across all properties. We found that the saliency and complexity of the properties played an important role. For example, while the L2 groups outperformed each other on most conditions where the L1 offered facilitation, there were two properties in which there were no differences between the groups: the morphological condition Copula, where all groups were highly accurate (>85%) and Topicalization, a syntactic condition, in which also all participants performed well. In general, word order configurations are considered to be more

salient in language acquisition, and therefore they are frequently acquired very early and with less difficulty (McDonald, 2000, 2006). The copula is also relatively salient in the input and explicitly instructed in school for the Russian speakers. The high accuracy and lack of significant differences between groups suggest that these properties were already acquired by all participants at the point in which the participants were tested.

Abstract genericity, on the other hand, turned out to be relatively difficult for all groups (although significantly more difficult for L1 Norwegian speakers, as we discussed above). A possible reason for this high level of difficulty could be the somewhat exceptional status of this subgroup of nouns in English, which learners in our participants' age group had limited exposure to. Put together, the accuracy on copulas/topicalization and on genericity demonstrates that although CLI is selective and, in the Scalpel Model's terms, 'acts with a scalpel-like precision' from both the L1 and the L2, additional factors can 'blunt the scalpel' (Slabakova, 2017, p. 655). In the most recent version of the LPM (Westergaard, 2021), where CLI is seen as co-activation of structures from the previously acquired languages, other factors are considered to affect the strength of the activation.

Conclusion

In this paper, we posed three questions about the role of previously acquired linguistic knowledge at developmental stages of L3 acquisition. We based our predictions on the LPM and the Scalpel Model and predicted non-facilitative and facilitative CLI from both previously acquired languages across morphological, syntactic and syntax–semantic properties. Our predictions, and by extension the LPM and the Scalpel Model's predictions, were partly supported. First, we showed that the L3ers were influenced by both previously acquired languages, Russian and Norwegian. Importantly, we did not observe that the L3ers selected one primary source of influence, as has been suggested for earlier stages of the acquisition process by the TPM (Rothman, 2011, 2015). Furthermore, the L3 learners patterned with the more accurate L2 group on four out of seven conditions. We interpret this as facilitative influence triggered by a structural similarity between the L3 and a previously acquired language. These results support models that argue for similarity-driven property-by-property CLI and access to both previously acquired languages throughout the acquisition process. Such models are the LPM, the Scalpel Model and the CEM. The latter model argues that CLI cannot be non-facilitative (see the Background section). However, we observed simultaneous facilitative and non-facilitative influence in the Agreement condition. Finally, we found CLI across linguistic domains, but also observed that complexity and saliency affected the participants' accuracy scores, as the properties had different developmental slopes. This suggests, as both the LPM and the Scalpel Model allow for, that linguistic similarity is not the only factor that affects CLI. Factors such as saliency in the input and linguistic complexity of properties are also important and need to be taken into account in future experimental designs that aim to investigate CLI.

Note

1. All generalized linear mixed effects models in this paper were fit using the lme4 package (Bates et al., 2015) of the software R version 4.0.3 (10 October 2020). Post-hoc pairwise comparisons were run using the R package emmeans (Lenth et al., 2019).

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Appendix

Statistical analysis
Model 1: Accuracy predicted by Group and Condition.
Generalised linear mixed model fit by maximum likelihood (Laplace Approximation) ['glmerMod']
Family: binomial (logit)

Formula: acc ~ group*cond1 + prof + (1 + cond1|ID) + (1|item1)

Predictors	Odds Ratios	acc CI	p
(Intercept)	0.28	0.14–0.57	**<0.001**
group[Norwegian]	0.64	0.45–0.92	**0.015**
group[Russian]	0.97	0.67–1.40	0.850
cond.order[agree]	1.18	0.66–2.12	0.581
cond.order[adv]	2.02	1.05–3.87	**0.035**
cond.order[topic]	2.81	1.42–5.56	**0.003**
cond.order[def]	2.83	1.47–5.44	**0.002**
cond.order[DO-pro]	10.97	4.66–25.86	**<0.001**
cond.order[cop]	7.46	3.25–17.17	**<0.001**
Prof	1.11	1.08–1.15	**<0.001**
group[Norwegian]*cond.order[agree]	0.88	0.53–1.45	0.611
group[Russian]*cond.order[agree]	3.31	1.90–5.76	**<0.001**
group[Norwegian]*cond.order[adv]	0.80	0.44–1.44	0.453
group[Russian]*cond.order[adv]	1.69	0.90–3.19	0.105
group[Norwegian]*cond.order[topic]	1.10	0.58–2.08	0.776
group[Russian]*cond.order[topic]	0.99	0.51–1.92	0.976
group[Norwegian]*cond.order[def]	1.86	1.01–3.43	**0.045**
group[Russian]*cond.order[def]	0.22	0.12–0.41	**<0.001**

(Continued)

Continued.

Predictors	Odds Ratios	acc CI	p
group[Norwegian]*cond.order[DO-pro]	1.44	0.61–3.38	0.404
group[Russian]*cond.order[DO-pro]	0.39	0.17–0.92	**0.031**
group[Norwegian]*cond.order[cop]	2.12	0.92–4.90	0.078
group[Russian]*cond.order[cop]	1.41	0.59–3.33	0.439

Post-hoc pairwise comparisons of groups within conditions (with adjusted alpha levels).

$emmeans Group	emmean	SE	df	asymp.LCL	asymp.UCL
cond.order = gen:					
Bilingual	0.5713	0.212	Inf	0.157	0.986
Norwegian	0.1279	0.166	Inf	−0.197	0.453
Russian	0.5357	0.173	Inf	0.197	0.874
cond.order = agree					
Bilingual	0.7367	0.217	Inf	0.310	1.163
Norwegian	0.1625	0.167	Inf	−0.165	0.490
Russian	1.8976	0.201	Inf	1.504	2.291
cond.order = adv					
Bilingual	1.2734	0.253	Inf	0.777	1.769
Norwegian	0. 6048	0.174	Inf	0.264	0.946
Russian	1.7631	0.210	Inf	1.352	2.174
cond.order = topic					
Bilingual	1.6053	0.269	Inf	1.079	2.132
Norwegian	1.2546	0.192	Inf	0.878	1.631
Russian	1.5595	0.202	Inf	1.164	1.955
cond.order = def					
Bilingual	1.6120	0.254	Inf	1.115	2.109
Norwegian	1.7915	0.194	Inf	1.411	2.172
Russian	0.0784	0.169	Inf	−0.252	0.409
cond.order = DO-pro					
Bilingual	2.9667	0.380	Inf	2.223	3.711
Norwegian	2.8869	0.269	Inf	2.360	3.414
Russian	9.9991	0.233	Inf	1.543	2.455
cond.order = cop					
Bilingual	2.5814	0.365	Inf	1.867	3.296
Norwegian	2.8907	0.276	Inf	2.350	3.431
Russian	2.8860	0.282	Inf	2.333	3.439

Results are given on the logit (not the response) scale.
Confidence level used: 0.95.

$Contrasts Contrasts	estimate	SE	df	z_ratio	p.value
cond.order = gen:					
Bilingual − Norwegian	0.44334	0.183	Inf	2.424	0.0407
Bilingual − Russian	0.03554	0.188	Inf	0.189	0.9805
Norwegian − Russian	−0.40779	0.136	Inf	−3.003	0.0075
cond.order = agree					
Bilingual − Norwegian	0.57416	0.191	Inf	3.011	0.0073
Bilingual − Russian	−1.16090	0.218	Inf	−5.333	<.0001
Norwegian − Russian	−1.73506	0.171	Inf	−10.155	<.0001
cond.order = adv					
Bilingual − Norwegian	0.66854	0.233	Inf	2.864	0.0117
Bilingual − Russian	−0.48975	0.258	Inf	−2.896	0.1399
Norwegian − Russian	−1.15829	0.185	Inf	−6.250	<.0001
cond.order = topic					
Bilingual − Norwegian	0.35074	0.259	Inf	1.352	0.3663
Bilingual − Russian	0.04580	0.268	Inf	0.171	0.9840

Continued.

$Contrasts

Contrasts	estimate	SE	df	z_ratio	p.value
Norwegian – Russian	−0.30493	0.192	Inf	−1.589	0.2504
cond.order = def					
Bilingual – Norwegian	−0.17954	0.247	Inf	−0.728	0.7469
Bilingual – Russian	1.53359	0.232	Inf	6.622	<.0001
Norwegian – Russian	1.71313	0.165	Inf	10.373	<.0001
cond.order = DO-pro					
Bilingual – Norwegian	0.07984	0.392	Inf	0.204	0.9774
Bilingual – Russian	0.96762	0.385	Inf	2.514	0.0320
Norwegian – Russian	0.88778	0.272	Inf	3.262	0.0032
cond.order = cop					
Bilingual – Norwegian	−0.30931	0.381	Inf	−0.812	0.6956
Bilingual – Russian	−0.30457	0.392	Inf	−0.777	0.7173
Norwegian – Russian	0.00474	0.304	Inf	0.016	0.9999

Results are given on the log odds ratio (not the response) scale.
P value adjustment: tukey method for comparing a family of 3 estimates.