

L_1 vs. L_2 vs. L_3 transfer: Evidence contra wholesale transfer models and privileged languages from grammatical gender and definiteness acquisition in sequential quadrilinguals

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Abstract. The acquisition of the fourth language (L_4A) is an underinvestigated field, and this study of acquisition of grammatical gender and determiners in sequential quadrilinguals (RUS-UKR-ENG-FRA) of CEFR A0 to A2 levels of French ($n = 22$) aims at testing the hypothesis that all three languages are available as a source of transfer to L_4 . The results were found to be significant by ANOVAs and MANOVA, thus the study presents evidence supporting the hypothesis that language learning is cumulative. The study also scrutinizes the existing models of L_3A on how they could be extended to the research in L_4A and what the boundaries of “linguistic proximity” used so widely in L_3A theories are.

Keywords. fourth language acquisition; transfer; multilingualism; grammatical gender; definiteness; L_4

1. Introduction.

1.1. THE ROLE OF FOURTH LANGUAGE ACQUISITION (L_4A) IN THE LINGUISTIC STUDY. Within the last 20 years, the field of third language acquisition has enjoyed unprecedented attention and is effectively establishing itself as an independent subfield of language acquisition and, more generally, linguistics. Third language acquisition studies were infrequent up until the 2000s, with rare exceptions (among which Zobl 1992; Klein 1995).

Since then, however, it appears as though a consensus has been reached that third language acquisition (L_3A) has the potential to not only obtain data about the status of the Universal Grammar (UG) in the acquisition of languages beyond the second, but also gives us various insights about both the initial state and subsequent stages of the acquisition process of the SLA itself (Leung 2007). While there are debates on whether L_3A can provide answers for the questions asked by SLA (for a comprehensive discussion see White (2020), it remains largely uncontested that L_3A does provide very useful and important insights on, for example, the cross-linguistic influences (CLIs), as well as the development of the L_3 grammar. However, multiple L_3A theories have asserted particular, special, or in some way privileged roles of L_1 or of L_2 either at the initial stage of L_n acquisition or at the later stages.

The disputes over the roles of the previous languages, among other existing discussions in the L_3A field, lead now to reveal the practical need of the fourth language acquisition research. It appears that, compared to trilinguals, quadrilinguals effectively present much richer soil to reap from for the multiple CLIs and to attempt to understand their impact in acquisition. When the

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issue of the CLIs arises, it is a truism that to observe which of the languages, if any, is dominant is much more informative at the level of the fourth language and beyond. The reasoning here is as follows: if there is a dominant language, the grammar of which has a privileged role in the subsequent language acquisition, that language is most easily discernable amidst plenty of other influences ($L_{1,2,3}$ for L_4). The reason for this is that the dominant language should, in theory, maintain its dominant role no matter what other linguistic influences there are, per the very definition of dominance¹. Naturally, it is difficult to see which language is dominant when all the languages available are just two.

Thus, adding the L_4 to the toolkit of a learner, L_4A , in turn, can lead us to help to resolve the disputes among different L_3A theories. Research in L_4A , however, comes with a notably important caveat: one more language necessitates an additional level of scrutiny for research design and for interpretation of the results since one operates, so to speak, within a four-dimensional space. Therefore, while the field of L_3A has progressed in terms of leading to some consensus on what the underlying mechanisms of L_3 acquisition are, L_4A can offer an even more limited amount of reliable and conclusive data. The main reason for this is the complexity of quadrilingual language computation as well as the general lack of comprehensive understanding of the process of multilingual acquisition. Yet still, in our view, the benefits outweigh the research challenges, and there are many theories to be extended to L_4A from both L_2A (SLA) and L_3A since “everything that is said about bilingualism applies *mutatis mutandis* to multilingualism” (Paradis 2004:226 in Slabakova 2017:6).

2. Background and predictions. In this study, we will try to detect any transfer from L_{1-3} to L_4 within two grammatical properties: grammatical gender and definiteness. Since this study involves students whose language sequence L_1-L_4 was Russian, Ukrainian, English, and French respectively, let us first consider the linguistic properties concerned (grammatical gender and definiteness), and then move to outlining the existing models of acquisition and their predictions for this study.

2.1. GRAMMATICAL GENDER AND ITS MORPHOSYNTACTIC CUES. Matthews (1997:248) defines grammatical gender as “a system in which the class to which a noun is assigned is reflected in the forms that are taken by other elements syntactically related to it”. Grammatical gender, if it exists in a language, is marked via distinctive morphophonological features which are particular for any given language which has a gender system, and which will be discussed in detail below. The current study considers the grammatical gender systems (or lack thereof) in four languages: Russian, Ukrainian, English, and French. English does not have a gender system; it is thus excluded from the discussion in this subsection (save the genders of the pronouns which are not relevant to the current study). It is worth noting that the current study did not confine the discussion or experiment to gender agreement (cf. Bartning 2000) or gender concord (cf. Hawkins and Franceschina 2004).

2.1.1. GENDER systems OF RUSSIAN AND UKRAINIAN. Studies on gender and its acquisition in-Russian span back to Gvozdev (1949). Both Russian and Ukrainian are fusional in terms of morpho-logical typology (see Shalnova, Golénia, and Flach 2009, Budzhak-Jones 1998, Gilley 2004), thus Ukrainian and Russian mark gender using affixes. An important note is that the cues

¹ Even though questions like the duration of this dominance in the acquisition process, its interaction with the CLIs of other languages remain open for discussion.

for case, number, tense, and gender are almost always not morphophonologically distinctive: they all cluster into one or two morphemes.

Nouns agree in case, gender, and number with adjectives, pronouns, numerals, etc., so the respective marking will appear on those parts of speech. However, the gender systems do differ between Russian and Ukrainian. For example, Russian has feminine, masculine, and neuter; and Ukrainian has the so-called common gender in addition to feminine, masculine, and neuter (cf. Pylypenko-Fritsak 2019).

2.1.2. GENDER SYSTEM OF FRENCH. French has two genders: masculine and feminine which are marked via articles and agreement affixation (Von Wartburg and Zumthor 1958). The singular articles are *le* ‘the’ or *un* ‘a’ for the masculine nouns, and *la* ‘the’ or *une* ‘a’ for the feminine ones. The generic plural pronoun *les* ‘the’ is used for the plurals of both masculine and feminine. It is worth noting that in the plural form, the nouns bear morphological cues as to their number and gender.

2.2. DETERMINERS AND DEFINITENESS. In this study, the focus is on the acquisition of the definite article which is present as a morphological unit only in English and French. Before proceeding, it is important to consider the important distinction between definiteness and determinacy as defined by Coppock and Beaver (2015). To avoid much of the semantic discussion which is not central to this article, it suffices to say that there is an important distinction between the two; the two might be acquired in different ways which should inform the experimental design. Given that the boundaries of “property” are not clearly defined, the result of an experiment that might test two different properties in the same way, mixing them together, appears to be undesirable, yet at times unavoidable. While the investigation of how definiteness and determinacy marking differ in English and Russian is an area of future inquiry (and equally so, the patterns of their acquisition), this is beyond the scope of this study. In this case, the findings of Coppock and Beaver restrict the pool of our stimuli to inanimate objects so as to avoid determinacy and focus instead solely on definiteness.

Thus, it is important to consider the environments of definiteness similar to those denoted by definite articles in English and French in Russian and Ukrainian leaving the wider analysis of definiteness and its expression out of this paper. This section serves primarily to outline the main ways in which the languages involved handle definiteness and elucidate the potential constraints that are placed on the design of the study. Following Borik and Espinal (2019), Russian has a number of ways to express definiteness. The definiteness can be defined as something which satisfies the expression of a kind e in (1). Beyond this use, the article in English denotes specificity which we will not pursue here (Ionin 2003) as well. Following Borik and Espinal (2019)², (1a) refers to the structure for definite kind arguments in languages either with or without overt article structure, and the meaning of which is represented in (1b, P corresponds to the descriptive content of a noun N).

- (1) a. [DPD[NPN]]
b. [[DefN]]= λx .[P(x)]

We will briefly consider here how the environments and the means of indicating definiteness differ in the four languages of the participants of this study. The crucial importance of this

² Borik and Espinal’s definition was amended here to accommodate a wider scope than for kind-denoting analysis (as in Carlson 1977a and Carlson 1977b).

consideration stems from the fact that acquisition of definiteness or of any article system, since the two are inextricably linked, is not a superficial process as it was often assumed under other theories (e.g., “Contrastive Analysis”, Lado 1957). For example, if French has an overt article system, it does not necessarily mean that the students will transfer the rules from English which also has an overt article system while Russian and Ukrainian do not. The question of transfer cannot be answered by merely comparing the superficial properties which a language has or doesn’t have. Purely hypothetically, it might be, for example, that the environment and context of marking definiteness in certain contexts interlaps more between Russian and French than between English and French, despite the overt vs. covert distinction. If the latter is true, the learners will most probably choose the most facilitative and most economic transfer: that appears to be from Russian (for these hypothetical contexts). This, however, is just an eclectic example within a much more intricate and inherently complicated phenomenon. See the next subsection for the detailed discussion of the predictions which the L_3A models make with regard to the determiner acquisition processes.

Beyond the usage of demonstratives, anaphoric pronouns, etc., the definiteness in Ukrainian is expressed in most cases by context. It can arise from particular syntactic or semantic cues within the sentence itself. Alternatively, definiteness can be expressed by a larger context which surpasses the shell of a sentence. Apart from the context, word order can denote definiteness: compare (2) vs (3), both versions of the same English sentence.

(2) До класу увійшла дівчина.
 Do klasy uvijšla divčyna.
 to the.classroom.ACC enter.FEM.PAST a.girl.NOM
 ‘The girl entered the classroom’

(3) Дівчина увійшла до класу.
 Divčyna uvijšla do klasy.
 the.girl.NOM enter.FEM.PAST to the.classroom.ACC
 ‘The girl entered the classroom’

These main principles emphasized by the context as the principal means of expressing definiteness in Russian and Ukrainian³ contrast heavily with English and French where the word order is not as flexible as in the Slavic languages. It is thus safe to assume that in that respect there is little to no overlap between expressing definiteness in the Slavic languages and in English/ French. However, these facts are crucial to the experiment design which, being informed by the context above, will not include context for any of the stimuli sentences. The native speaker judgments for all the stimuli have also been obtained.

While both French and English have overt definite and indefinite articles, the French language has separate articles for masculine and feminine entities and objects, while English does not. Other mismatches include mass nouns, abstract nouns, titles (professions), quantities, count-nouns referring to kinds, following French grammar from Wagner & Pinchon (2014). There are certain idiomatic expressions that omit articles in the environment where they would usually be used in English, but given that we will not use them as stimuli, they will not be considered here. Lastly, articles are omitted in French in the context where it would be used in English alongside some prepositions: compare, for example, *without the password* and *sans mot de passe*. It should also be noted that, among Romance languages, French definiteness marking, particularly with

³ The differences in denoting definiteness are negligible between Russian and Ukrainian (cf. Bondarevska 2019).

nouns in declarative sentences, has been noted as similar to that of English to a greater degree than, for example, Italian (see Kayne 2008).

The current study will be limited to stimuli consisting of mass nouns and abstract nouns and those count-nouns which refer to inanimate kinds (to avoid dealing with determinacy as noted above). This discussion was included in order to justify the limitations on the kinds of stimuli used in the study; in our view, the understanding of the underlying linguistic structures which are being tested is crucial for the correct interpretation of the results of the study.

2.3. THEORIES AND MODELS IN L_3 ACQUISITION AND THEIR RELEVANCE FOR THIS STUDY. While this section does not aim at being a comprehensive account or review of the existing L_3 models, its primary aim is to outline the models which are relevant to this study. After outlining the relevant models, they will be extended to L_4 , and in such a way, the predictions for this study will be formulated.

Before proceeding, however, an important distinction to be made is that between partial and “wholesale” transfer. The definition of these terms, as they relate to this paper, is as follows: “wholesale” transfer refers to assuming the whole grammar system of L_n for L_{n+z} , where z is 1, 2, 3, 4... and $n \neq 0$. In these terms, is it possible for a quadrilingual individual to transfer their second language (L_{2+2}). Conversely, partial transfer refers to property-by-property acquisition of L_{n+z} such that different properties can be assumed from different previous languages. For example, for some L_{n+3} , the properties can be transferred from all or any L_n , L_{n+1} , and L_{n+2} if $n = 0$. For $n \neq 0$, all languages before L_n can be the sources of transfer. To paraphrase, all languages previously learned are accessible and can serve as a source of transfer.

2.3.1. L1 PRIVILEGE Model. The L1 Privilege Model (L1P) asserts that L_1 , being the native (first) language, has a privileged role in the language acquisition process, and thus the “wholesale” transfer will occur exclusively from L_1 for any L_3 (Hermas 2014). This model extends well to L_4 since changing L_3 to L_4 does not impact the claim about the privileged role of L_1 per its early acquisition. For some evidence supporting L1 privilege in acquisition of gender, see Paquet (2018).

To articulate the predictions, the L1P model claims thus that for either L_3 or, following the trajectory of the model, L_4 , L_1 should prevail and genders for L_4 French should be assumed (that is to say, transferred) from Russian, and the article system should follow the pattern of Russian rather than English (i.e., the guiding principle should be *no overt marking whenever possible*). Per the L1P model, no prevailing (or none at all except marginal or occasional) evidence of L_2 shall be found.

2.3.2. L2 STATUS. As the name of the model indicates, the core claim here is that it is L_2 that has a privileged role, i.e., L_2 should be the exclusive source of transfer. Such role is attributed to the fact that L_2 is acquired later on in life, when the overall cognitive level of an individual is higher (Bardel and Falk 2007). In the study on acquisition of gender, Brown (2020) found some evidence supporting the L2S model.

The L2 Status model is rather difficult to extend to L_3 : while its claims are based on the fact that L_2 is the first language that is acquired in adolescence/adulthood and plays a privileged role for the next language acquired (L_3), there is no such claim made about L_4 . The question is will L_2 or L_3 , both of which were acquired later on in the life of a learner have a privileged role? However, per the very name of the model, we will assume that no L_1 transfer will occur for either L_3 or L_4 which is consistent with the L2S claims. For L_4 , L_2 's influence will also be present since that is the primary claim of the L2S model, even though L_3 might also occur. However,

lacking any trajectory for predictive power for the languages beyond the third is a challenge one might pose to this model since it is usually assumed that acquisition processes of L_2 and L_3 (which might very well be extended to L_4) are *not fundamentally different* (Slabakova 2017:8).

2.3.3. **TYPOLOGICAL PRIMACY MODEL.** The Typological Primacy Model (TPM) also claims that the transfer is “wholesale” and that one language has a privileged role; however, the TPM does not specify which language it is, the TPM only points to language typology as a source of data for adjudicating which language will transfer specifically (Rothman and Halloran 2013, Rothman 2015).

The TPM predicts that for L_3A , the learners will transfer the grammar of the language which is the closest typologically, i.e., has the greatest degree of similarity in underlying grammatical structure (sensu Rothman and Halloran 2013) or Puig-Mayenco, González Alonso, and Rothman 2020). While it is not clear what it is for L_3 English in this study: Russian or Ukrainian; for L_4 French, it is definitely L_3 English. Thus, the prediction for L_4A , following the TPM trajectory, will be that the grammar system of English should be transferred and we shall see the evidence of English article system in L_4 French. However, it is very important to note that gender systems will not transfer from Russian and Ukrainian, per the TPM, since it is L_3 English which is privileged, and thus has a monopoly over what transfers.

2.3.4. **THE PARTIAL TRANSFER MODELS.** To briefly sum up, all the models listed up to this point claim that the transfer is “wholesale”, and that one of the previous languages of a learner has a privileged role. However, the partial transfer models take a very different approach.

The partial transfer models claim that the transfer occurs property-by-property. This study will not distinguish between partial transfer models and instead focus on showing that language learning is cumulative (sensu Flynn, Foley, and Vinnitskaya 2004). It would suffice to say that there are also a range of theories within L_3A which advocate for partial transfer, among which: the Cumulative-Enhancement Model (Flynn, Foley, and Vinnitskaya 2004), the Scalpel Model (Slabakova 2017), and the Linguistic Proximity Model (Westergaard et al. 2017). While the current study aligns mostly with the CEM model, we will not report on how the results of the study fit the predictions of different partial transfer models. We aim only to affirm that all previous languages are available and accessible for subsequent language acquisition.

To sum up, the study has a very comprehensive set of predictions: the L1P model claims that L_1 is the privileged language, the L2S model claims that L_2 is the privileged language, the TPM claims that L_3 is the privileged language, and the partial transfer models claim that no language is privileged.

2.4. Research questions. The questions which the present study aims to answer are given in (4-6).

- (4) Based on acquisition of grammatical gender, is there evidence for partial transfer of L_1 or L_2 grammar at the early stages of the acquisition process of L_2 in the way stipulated by the TPM, L2S, or L1P models?
- (5) Based on acquisition of the definiteness expressed by definite articles, is there a pattern to suggest L_1 , L_2 , or L_3 influence on the construction of the L_4 grammar?
- (6) Are the findings in grammatical gender acquisition coherent with findings in acquisition of definiteness? Do both grammatical gender and definiteness transfer so as to support partial transfer?

The hypothesis of this study is that there will be no clear influence of one language over the other two or three as all of the grammars are available for transfer whether it is facilitative or not. The H_0 for this study, conversely, is any evidence for full transfer of one or more grammar, be it L_1 , or L_2 , or L_3 .

However, given the context of similarities between definiteness marking in Russian and Ukrainian, as well as the absence of gender system in English, all of which interacts and influences the overall conclusions, the predictions of this study shall be revised to the statements in (7-9).

- (7) If the TPM is correct, we will see the article system from English in L_4 (the articles inserted in contexts where they should be omitted in French, but are grammatical in English);
- (8) if the L1P model is correct, we will see the preponderance of both gender and article transfer from Russian; and lastly,
- (9) if the L2S model is correct, we shall see the prevailing transfer from Ukrainian both in terms of gender and definiteness marking (gender will be assumed from Ukrainian and definiteness will be guided by the principle of *no overt marking whenever possible*).

As noted above, the hypothesis which this paper assumes is that we will see that none of the three predictions above are satisfied. What we hypothesize is that there will be a mix of grammars influencing L_4 acquisition, all of them available for transfer. The latter aligns with the CEM, the Scalpel, and the LPM which would claim that no precise prediction as to the results can be made other than the assumption that all of the grammars of L_1 , L_2 , and L_3 can appear in L_4

3. Methods.

3.1. PARTICIPANTS AND LANGUAGE BACKGROUND. A group of 22 high-school juniors and seniors participated in the study. Their age range was 16-18, eleven of them were female and nine were male. The native language of the participants was Russian which they have been exposed to since birth. Russian was then followed by acquisition of Ukrainian, exposure to which started when the participants were about 6 years old; since that time the participants have had significant exposure to Ukrainian and completed 11 years of studying Ukrainian formally (2 hours/week). The summary of the assessment used in this study is given in Table 1⁴.

Type	L_1 RUS	L_2 UKR	L_3 ENG	L_4 FRA
International standardized CEFR assessment	No	No	Yes	Yes
National standardizes assessment	No	Yes	Yes	No
Continuous formal and informal assessment	No	Yes	Yes	Yes
Self-reported levels	Yes	Yes	Yes	Yes

Table 1. Assessments used in the study

⁴ However, there is no accepted standardized assessment of Ukrainian pinning it to CEFR A0-C2 levels up to date. They are expected to appear in 2021. We used national, and not international standardized assessment in this study (see Kovalenko and Lomakovych 2006).

After the participants completed the assessment, there were no doubts about relative fluency in Ukrainian. The majority of the participants have not, however, according to the assessment used, reached the level of native-like proficiency, and that is what led to the claim that Ukrainian is a second language as opposed to considering the participants as having two native languages, even though the margin between the two is quite vague (see Butler 2013 and Wei 2013). The bottom line for this research is that students still experienced L_1 influence, thus falling under the category for those who have not yet reached ultimate attainment, and so their Ukrainian can be characterized as a second language in the L2S's understanding without stretching or readjusting the definitions.

English was the participants' third language which they started acquiring about the age of seven over the course of formal studies at school. Between 1st and 5th grades they had 2h/w of English which was then increased to 5h/w and in the 10th grade was 6h/w. Data from the students whose level was determined to be less than B1/B1+ in English were not used in this study.

Lastly, French was their fourth language in which they had received formal instruction since the 5th grade (2h/w). Data from the students whose level was determined to be less than A2+/B1 in French were not used in this study. There were no students whose proficiency was lower in English than in French.

3.2. EXPERIMENTAL DESIGN. The experiment consisted of a survey completed by the students on their computers within 3 days from being given the link. The students were given the link by their English teachers. The software via which the survey was delivered was Qualtrics (Qualtrics XM 2020). The survey consisted of two tasks: a gender mismatch grammaticality judgment task and a definiteness grammaticality judgment task. There were 25 control stimuli⁵ sentences given in all four languages for each task. Beyond that, there were distraction stimuli. The stimuli in Ukrainian and Russian were limited to the cases which are expressible in French. i.e., no stimuli with the vocative case were used.

3.2.1. GENDER MISMATCH GJT. The 25 stimuli all consisted of six syllables and were determiner phrases (DPs) with either a definite or an indefinite article, as in (10). The correct form would have been *le soleil très brillant* 'the very bright sun' since the noun *soleil* is masculine in French. It is, however, neuter in Ukrainian and Russian.

(10) *la soleil très brillant

Conversely, there were DPs with nouns like 'eye' which are masculine in French and Russian but neuter in Ukrainian. The students were asked to determine whether a given stimulus is grammatical or not. If responded negatively, they were asked to justify their answers.

3.2.2. DEFINITENESS GJT. The 25 stimuli all consisted of sentences, each of 10 syllables. Each of the stimuli contained a DP missing, but requiring a definite article head, such as in (11).

(11) *Noms sont très importants dans nos vies.
'Names are very important in our lives.'

4. Results and discussion.

4.1. SCORING. The nature of both the first and the second tasks were similar, and the results were encoded as either "1" or "0" for every question. "1" was assigned if the transfer was detected (see CLI categories below for examples of transfer), and "0" was given otherwise. The score for

⁵ Those willing to replicate the study should contact to the author directly to obtain the stimuli.

every participant was then calculated for the following *CLI categories*: L_1 , L_2 , $L_{1\cup 2}$, L_3 . The category L_1 refers to the score a participant received for identifying stimuli which aimed at detecting transfer from L_1 (for example, indicating that a noun which is feminine in L_1 Russian should be feminine in L_4 French while both in L_4 French and L_2 Ukrainian it is actually masculine or neuter). Similarly, L_2 refers to the score of L_2 -transfer, and $L_{1\cup 2}$ refers to the transfer from both L_1 and L_2 (the nouns which have identical gender in L_1 and L_2). The usage for such results is primarily to verify that if a noun is feminine in L_4 and masculine in both L_1 and L_2 , the participants didn't mark it as neuter. To our surprise, they sometimes did, even though the latter phenomenon was not widespread and was statistically negligible.

4.2. RESULTS. As mentioned above, 4400 responses were recorded, and the score for each of the participants was calculated separately. The participants were also divided into groups by their level prior to the experiment. The groups, divided by the level of L_4 French were as follows: level A0 ($n = 7$), level A1 ($n = 7$), and level A2 ($n = 8$). The general scheme of analysis was as follows.

4.2.1. TRANSFER RATES. The first task is to determine whether there is evidence for transfer, i.e., determining whether it exists. To do this, the transfer rates were calculated for each group for each of the CLI categories. Transfer rate signifies a fraction of transfer which occurred, i.e., the percentage of the control stimuli in which the transfer was detected. The precise calculation consisted of summing up the scores for every participant, then averaging the sums for every group (A0, A1, A2), and then dividing this number by the number of questions asked. The results are given in Table 2.

Level	L_1	L_2	$L_{1\cup 2}$	L_3
Level A0	0.96	1	0.97	0.97
Level A1	0.89	0.68	0.73	0.90
Level A2	0.25	0.16	0.29	0.09

Table 2. Transfer rates

Given the transfer rates close to 1 at CEFR Level A0, there is evidence that transfer occurs from all the previous languages. There is a noticeable decrease at CEFR Level A1 for every category, though it is particularly prominent for L_2 , where the decrease is 0.32 and for $L_{1\cup 2}$, where the decrease is 0.24. Lastly, at the CEFR Level A1, the transfer rates are low, which is consistent with the expectations - as learners increase their mastery, the transfer rates decrease. Let me turn now to additional statistical analyses of the results.

4.2.2. ANALYSES OF VARIANCE (ANOVAS). A series of ANOVAs was performed with level as the independent variable and categories from the previous subsection as the dependent variables (sc., with the transfer scores for L_1 , L_2 , etc. as the dependent variables). If the result was significant, it would strongly suggest that there is indeed a significant correlation between the level and transfer from one of the categories. If the result was not significant, it would mean either that there was no transfer, or that the transfer cannot be accounted for by the level. In other words, the insignificant result would mean that it is not the increase in level which is responsible for the decrease in transfer rates, but rather something else.

It is important to note that none of the theories we considered predicted the absence of the transfer per se. While obtaining the results of ANOVAs, if they are significant, it is also useful to look

at the results for η_p^2 which points to the percentage of the variability which is accounted for by the independent variable (level). The results for the ANOVAs can be found in Table 3.

Dependent variable	F	Sig. (p)	Homogeneity (means, sig.)
L_1	17.453	.000	.004
L_2	56.956	.000	.001
$L_{1\cup 2}$	28.902	.000	.000
L_3	96.315	.000	.273

Table 3. First-level one-way ANOVA results for each dependent variable

As indicated in the table, all of the ANOVAs were significant, so we can be sure that it is level that accounts for the decreasing transfer rates. The large F-ratio for L_3 as well as the insignificant result of the test of homogeneity of means for L_3 can be connected to the small size of the groups.

4.2.3. MULTIVARIATE ANALYSIS OF VARIANCE. The next step in the analysis was to perform a MANOVA with level still as an independent variable together with all of the categories from the previous subsection included in the test as the dependent variables. The η_p^2 , similarly to the last analysis, for the MANOVA enables one to see, much like with the one-way ANOVAs⁶, how much variability is accounted for by level, but in the MANOVA's case, this is variability throughout all of the dependent variables. A MANOVA test can also be much more insightful than ANOVAs, namely because one can also get a canonical variable derived from the variation between the dependent variables through the linear regression. The standardized discriminant function coefficients of that canonical variable are then able to show whether there are particular kinds of transfer (e.g., L_2) which carry more weight than other kinds of transfer, and thus are pre-dominant. The data which the MANOVA's supervariable provides makes it possible to determine whether all previous languages have equal roles, or whether there are some which are comparatively more impactful than others. The results for the MANOVA for all the dependent variables can be found in table 4.

Effect	F	Sig. (p)	η_p^2
Pillai's Trace	7.085	.000	.625
Wilk's Lambda	18.230	.000	.820
Roy's Largest Root	88.145	.000	.954

Table 3. Multivariate tests.

Pillai's trace is the least robust test which appears significant with a solid F-ratio. A much more sensitive Roy's Largest Root has a much larger F-ratio, yet it yields all the same significant p-value of <.001. It should, however, be noted that Roy's Largest Root is so sensitive to deviation in covariance matrices that its use is at times discouraged and seems to remain an openly debated

⁶One-way ANOVAs were used since there was only one independent variable – “level”. Two-way ANOVAs would have been appropriate were it the case that there were two independent variables. Similarly, an ANCOVA would have been used if there were one dependent and multiple independent variables. However, the converse was true for this study – there were one independent and multiple dependent variables.

issue (cf. Nadler and Johnstone 2011). What the partial η^2 indicates here is that, according to all the tests, level accounts for the majority of variance, i.e., it is level that is responsible for the non-facilitative transfer. Oddly enough, Pillai's Trace determines level to be responsible for only 62.5% of variance which raises a question of what it is that is responsible for the other 37.5%. While one can ignore 4.5% of outer influence given by Roy's Largest Root, it is hardly possible to forgo the data given Pillai's Trace. The other results given by MANOVA (in table 5) are able to resolve this issue.

Root	Eigenvalue	Pct.	F	Sig. (F)
1	20.73997	98.01182	32.00	.000
2	.42071	1.98818	17.00	.105

Table 5. Eigenvalues and canonical correlations

As given in table 5⁷, there appear to be two roots, one accounting for about 98% of the variability in the supervariable, and the other one accounting for about 1.8%. However, only one of them was marked as significant with respect to F by the dimensional reduction analysis, and that is the root 1. Thus, the question about whether there is anything else to account for transfer other than level is resolved. While it is hard to explain the results given by Pillai's trace, it might have been caused by differences in the size of the groups, as well as the fact that they were very small.

4.2.4. STANDARDIZED DISCRIMINANT FUNCTION COEFFICIENTS (SDFCS). Let us now consider standardized discriminant function coefficients in table 6.⁸

Variable	Coefficient
L_1	.49156
L_2	.87486
$L_{1\cup 2}$	-.51788
L_3	.84625

Table 6. Standardized discriminant function coefficients (SDFCs)

The coefficients show us that there is no definite predominance in the kinds of transfer that are occurring. However, the SDFCs for L_1 and $L_{1\cup 2}$ seem to be a bit lower as compared to L_2 and L_3 . Nonetheless, the bottom line here is that no language is predominant when it comes to transfer and all of the languages are indeed open for transfer.

4.2.5. MULTIVARIATE ANALYSIS OF COVARIANCE (MANCOVA). Lastly, given the fact that the participants were taking the survey online and the time they took to complete their response was not limited, it appears to be necessary to confirm that the time they took to finish the survey (measured in seconds) did not have an impact on the students' results. Therefore, a MANCOVA test was run similar to that for which the results are shown above, but with time as a covariate. The results within Pillai's Trace were $F=0.046$, $p=.996$.

⁷ F-values in the table appears as given by the dimension reduction analysis with Wilks Lambda.

⁸ The signs of the coefficients are random: one can without affecting the results change negatives to positives and vice versa.

These analyses appear to be particularly insightful given that the MANOVA takes into account intercorrelation between all of the dependent variables which the ANOVA or any one-variable tests do not. Thus, since the hypothesis of this paper was that all grammars are available for transfer, all transfer processes are indeed intercorrelated. The only test appropriate for this study, or one of the very few, which can give an insight into those processes is the MANOVA. For example, regular logistic regression has been shown to be biased for small sample size groups, which is why it is not appropriate for this study (see Moineddin, Matheson, and Glazier 2007 or Carroll and Pederson 1993).

Lastly, it is important to acknowledge, to some degree undermining the results and the analyses outlined above, the results obtained on such a small group and with just two grammatical “properties” should be subject to caution. This approach concerns all of the conclusions drawn, but we want to stress that the assertions made above about higher/lower coefficients and some hints at quantification of the transfer which is in place must be viewed with caution as they are because, based merely on the acquisition of two properties: grammatical gender and definite article in some environments, any attempts at quantification do border, if not overlap, with the conjecture of most unreliable kind. Thus, in the discussion section, we shall not draw on the aforementioned quantification and instead operate in much more general terms of the transfer being present or not present. That being stated, we still believe that the standard discriminant function coefficients (SDFCs) do contain some insight, even though those should be considered with utmost caution - and it is precisely for that reason that the SDFCs are present in the current study. They are also consistent with the results of the other analyses performed.

5. Results and discussion. Referring back to the research questions, let us now consider the answers to them.

In terms of the first question, there is no evidence for partial for either L_1 or L_2 at early (A0-A2) stages of acquisition process. In terms of the second question, the only discernible evidence there is that all the grammars known (of L_1 , L_2 , and L_3) do influence the L_4 grammar. Lastly, the findings in acquisition of grammatical gender do fully correlate with findings in acquisition of definiteness as shown by the significance of MANOVA. Let me move now to answering the more precise predictions which were made within models of L_3 acquisition.

The TPM’s claim that the learners will transfer the grammar of the language which is most typologically close was rejected for both L_3 and for L_4 . The claim about L_3 was rejected on the theoretical ground that Ukrainian and Russian are typologically close enough to be more or less “equidistant” from L_3 English, so the model lacks predictive power to distinguish between them. The first ground is, however, theoretical, and did not receive much attention in the study. We have, nonetheless, found evidence of L_3 transfer to L_4 as predicted by the TPM. The problem is, however, that the wider prediction of the TPM for L_4 is that whole grammar of L_3 will transfer for L_4 , and contrary to that claim we found evidence for both L_1 and L_2 in L_4 . Thus, even though there is evidence for transfer from L_3 to L_4 per se if we take out of the account language background as well as ignore the transfer from L_1 and L_2 to L_4 , the TPM’s claim about the partial transfer did not succeed according to the results of the experiment.

The LIP model’s first claim that the grammatical gender system should be assumed from L_1 was rejected on the grounds of strong evidence of transfer present from the L_2 . The LIP’s second claim that the article system should also be assumed from L_1 Russian was also refuted since the evidence for the influence of the L_3 was found. The principle predicted by the LIP (*no overt whenever possible*) was not supported by the results. Thus, the LIP model was not supported by

the results of the experiments. The L2S model was not supported on similar grounds: evidence of the influence of L_1 as opposed to exclusive transfer of L_2 .

6. Conclusions. This paper aimed to explore the nature of influence of previous languages on L_n (L_4) acquisition. The results found that, contrary to the models which suggested that one language plays a predominant role in subsequent language acquisition, all languages influence L_4 , and more generally, L_n acquisition. It was found that in the acquisition of grammatical gender, both L_1 Russian and L_2 Ukrainian influence L_4 French, and L_3 English demonstrates a similar influence. Thus, the study necessitates the further scrutiny of L_n acquisition process and the elucidation of the issues of not *whether* $L_{1...n}$ influences L_{n+1} , but rather *how* the previous languages are used in the acquisition of a novel one. Thus, the results of the study seem to advise that future research focus on the *development of a principled theory of L_n acquisition* in terms of UG as opposed to attempts at discerning the outer, extralinguistic influences on the acquisition process, be it language of community, input any given learner receives, etc. The acquisition process at the level of genetic endowment is, no doubt, uniform and the unwieldy question at hand is to ascertain what that process is.

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