Article

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Alternation phenomena and language proficiency: the genitive alternation in the spoken language of EFL learners

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Abstract: This study investigates how foreign language proficiency, which previous corpus-based research on alternation phenomena has largely ignored, influences the choice of genitive variant (*the tail of the dog/the dog's tail*) in learners of English as a Foreign Language. The data stems from the Trinity Lancaster Corpus, a three-million-word corpus featuring spoken language from low-intermediate to advanced learners of English from several L1 backgrounds. The collected genitive observations were annotated for various constraints such as the length, animacy, definiteness and discourse status of the constituents and then analyzed via mixed-effects logistic regression. The results show that although native speakers and learners are remarkably similar, low-proficiency learners are less sensitive to possessor definiteness and possessor animacy, the latter of which is otherwise the strongest constraint of the genitive alternation.

Keywords: EFL; genitive alternation; proficiency; SLA

1 Introduction

The present study investigates how learners of English as a Foreign Language (EFL) choose between the interchangeable variants of the genitive alternation at different proficiency levels. Alternation phenomena represent "two ways of saying the same thing" (Labov 1972: 271). In the case of the genitive alternation, speakers

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can choose between the *s*-genitive and the *of*-genitive, shown in examples (1) and (2), respectively (e.g. Huddleston and Pullum 2002: 476; Rosenbach 2014). On a semantic level, the central function of the constructions is to express "the relation between the possessor and a possessed entity" (Rosenbach 2002: 27). The construction therefore consists of a possessor (*character(s)* in the examples), and a possessum (*name*), which are linked on the nominal level.

(1) The characters'$_{\text{possessor}}$ name$_{\text{possessum}}$ (TLC:2_6_IT_30)

(2) The name$_{\text{possessum}}$ of the character$_{\text{possessor}}$ (TLC:2_6_IN_62)

Although the variants are often interchangeable, speakers do not pick between them at random. Rather, the choice of variant is probabilistically determined by a wide range of formal, semantic or contextual constraints that contribute to a construction's acceptability. In the case of the genitive alternation, many of these constraints relate to the features of the possessor and the possessum, such as their length, animacy, definiteness, discourse status etc. (Rosenbach 2014). To take into account these different constraints, studies on alternation phenomena often use multifactorial statistical methods, such as logistic regression (e.g. Gries and Wulff 2013; Wulff et al. 2014) and conditional inference trees (Paquot et al. 2019). This set of constraints forms part of speakers' implicit grammatical knowledge since the predictions from such corpus-based statistical models match the intuitions from speakers regarding the acceptability of the variants (Bresnan and Ford 2010).

Previous research of this type on alternation phenomena in EFL learners concerned the dative alternation (Jäschke and Plag 2016), the genitive alternation (Gries and Wulff 2013), *that*-complementation (Wulff 2016; Wulff et al. 2014, 2018), particle placement (Kinne 2020; Paquot et al. 2019; Wulff and Gries 2019), *may* versus *can* (Deshors and Gries 2014), and the progressive versus non-progressive (Rautionaho et al. 2018). In general, they found that EFL learners' choice of variant depends on a complex, interacting set of factors much like native speakers. However, depending on the alternation phenomenon under study, learners have been found to be more sensitive to processing-related constraints (Wulff et al. 2014, 2018) and to rely on fewer constraints in general than native speakers (Jäschke and Plag 2016). Most relevant in the present context is the study by Gries and Wulff (2013) on the genitive alternation in the written language of Chinese and German EFL learners. They found that although learners differ from native speakers with respect to individual constraints like the specificity of the constituents, in general "intermediate/advanced learners' production data already reflect target-like processing preferences at an astonishing level of complexity" (Gries and Wulff 2013: 349).

These studies have in common that they focus on how the learners' mother tongue interacts with the choice of variant and their sensitivity to the different

constraints. However, they ignored the influence of another important variable in EFL research, namely proficiency level, although it is highly likely from the perspective of usage-based approaches to Second Language Acquisition (SLA) that proficiency plays a part in learners' choice of variant.[1] According to these usage-based approaches, learners adapt and refine their interlanguage to accommodate incoming input (Ellis 2006: 103). Hence, learning is driven by input in the target language, which is then fed to general cognitive mechanisms of learning (Ellis and Wulff 2019: 41). It is likely that the choice of variant of low-proficiency learners who are at the beginning of the learning process differs from that of high-proficiency learners or native speakers. On the one hand, low-proficiency learners are more likely to rely on prior experience from their L1, which can make it more complicated to learn or even notice features of the L2 (O'Shannessy and Meakins 2012: 380; Song 2018: 24; Wang and Xu 2015: 216). On the other hand, low-proficiency learners will rely more on general mechanisms of (second) language learning, which could also lead to overgeneralizations or simplifications (Bentz and Winter 2013; Biewer 2011: 14). For example, low-proficiency learners might prefer the more analytical *of*-genitive because it involves less morphosyntactic complexity than the synthetic *s*-genitive (see e.g. Heller 2018: 178; Parodi et al. 2004). Other mechanisms of language learning may indirectly influence the choice of variant by interacting with the underlying constraints themselves. Most constraints that guide the choice of genitive variant relate to the semantic and morphosyntactic features of the possessor and the possessum noun phrase. In order to learn the constraints, learners have to learn the association between these features and the choice of genitive variant, most likely via the mechanism of associative statistical learning (Gries and Ellis 2015: 229; Misyak and Christiansen 2012; Romberg and Saffran 2010: 1; Wulff and Ellis 2018: 39). The success of associative statistical learning for a given constraint depends on a number of properties, such as their frequency, ease of processing, regularity of form, etc. (Gries and Ellis 2015; Misyak and Christiansen 2012: 304; O'Shannessy and Meakins 2012: 380; Romberg and Saffran 2010: 2–3; Yoshimura and MacWhinney 2010: 552). Since the constraints may not be equally frequent, regular in form, or easy to process, some constraints may be harder to learn, causing difficulty for low-proficiency learners in particular.

Moreover, previous research has not distinguished between different stages in the learning process, so it is unclear whether some of the findings are limited to one

1 One exception is Wulff and Gries (2019), who include lexical diversity as a proxy for language proficiency in their analysis of the particle placement alternation. However, the learner corpus they used, i.e. the International Corpus of Learner English (Granger et al. 2009) consists of texts written as answers to a wide variety of different prompts. Given that measures of lexical complexity are often highly sensitive to topic, this measure is probably not a reliable proxy of proficiency (Granger et al. 2009).

or more proficiency levels. For example, it is possible that only the lower-proficiency learners are more sensitive to processing-related constraints than native speakers (see Wulff et al. 2014). Previous research may also have overlooked certain effects, since it can be hard to detect an effect pertaining to a single proficiency level when data from all levels are conflated during statistical analysis. In the present study, we aim to fill this gap by investigating EFL learners' choice of genitive variant at different proficiency levels. More specifically, we would like to know whether the choice of variant differs across proficiency levels, and if so, how. To answer this question, we collected a large number of genitive observations (N_{total} = 2,302) from low-intermediate (B1) to advanced (C2) EFL learners from the Trinity Lancaster Corpus (Gablasova et al. 2019) and annotated them for a wide range of relevant factors, as discussed in Section 2. Then, we analyzed the data via mixed-effects logistic regression, which revealed that low-proficiency learners are less sensitive to the animacy and the definiteness of the possessor than native speakers. These results are presented and visualized in Section 3 and then further discussed in Section 4. Finally, we summarize the study, mention some of its limitations and offer some directions for future research in Section 5.

2 Data and method

2.1 The corpus

The Trinity Lancaster Corpus (TLC, Gablasova et al. 2019) is a 3.4 million word corpus consisting of transcribed recordings of an official spoken language exam, namely the Graded Examinations in Spoken English (GESE). The different levels of the GESE exam map onto the scale of the Common European Framework of Reference (CEFR, Council of Europe 2001), so each candidate is assigned a CEFR proficiency level based on the GESE exam they pass. This approach provides a more reliable approximation of the learners' proficiency level than many other learner corpora where proficiency is measured by proxies such as the number of years one has been learning English (Gablasova et al. 2019).[2] The candidates in the corpus are low-intermediate (B1) to advanced (C2) learners of English engaging in an interactive discussion with an examiner, who is a native speaker of British English. The corpus features spoken data, which not only offers a better window into the underlying grammatical system of learners than written language (Myles

2 However, some candidates may want to pass a certain GESE level mostly because it fits their professional goals rather than their proficiency in English, in which case the CEFR level may underestimate their proficiency.

and Mitchell 2014); psycholinguists and neurolinguists claim speech is also more representative of processing-related effects (Kemmerer 2015). The learners in the corpus cover a wide range of L1s as the exams were taken in six different countries, namely Russia, China, India, Italy, Spain and Mexico. Most of these countries have a primarily monolingual population with the exception of India, where candidates have different L1s such as Tamil, Gujarati etc. Depending on the candidate's proficiency, the exam takes between 5 and 25 min during which participants have to complete up to 4 different tasks covering production and comprehension, namely a listening task, a conversation task, a presentation about a topic of their choice, and a discussion regarding that topic. On average, the interlocutors produce about 2,500 words during the exam, of which approximately 60% are produced by the candidate learner.

For our native speaker data, we collected the genitive observations of the examiners in the corpus. This ensures that we compare the set of constraints of learners and native speakers on the basis of similar data. Additionally, this allows us to control for the influence the native speaker may have on the learner and vice versa, specifically by virtue of our operationalization of the persistence constraint (see Section 2.3). Nonetheless, the question arises as to whether the language production of the examiners is an accurate representation of native speech. Examiners may indeed incorporate some features of Teacher Talk, a simplified register that has as a goal to provide the target language in a comprehensible way (Stanley and Stevenson 2017: 2; Ünel and Mirioğlu 2015). However, it is unlikely that the features of Teacher Talk would directly affect native speakers' sensitivity to the probabilistic constraints because this set of constraints is part of their implicit knowledge (Bresnan 2007).

2.2 Definition of the variable context and retrieval

The genitive observations were collected automatically through an R script (R Core Team 2018) designed to return as many potentially interchangeable genitives as possible. Based on a random selection of 10 exams, in which we manually identified a total of 222 interchangeable genitives, we determined that the script reached a recall rate of 93% for the *of*-genitive and 91% for the *s*-genitive. In total, the script retrieved 10,630 potential *of*-genitives and 1,826 potential *s*-genitives. From this total, we excluded the genitive observations that are not interchangeable, i.e. that allow for only one of both variants (see Heller 2018: 16; Kreyer 2003: 170; Rosenbach 2014: 223).

Specifically, we excluded double genitives as in example (3) because they incorporate structural features from both variants and the possessor (*John's*) is also

missing a following possessum. Likewise, independent *s*-genitives are characterized by a missing possessum (e.g. *his car is faster than John's*, in Kreyer 2003: 171). Since the possessum in the *s*-genitive is definite by default, we also excluded all *of*-genitives that do not feature the definite article *the* (Grafmiller 2014: 475; Hinrichs and Szmrecsanyi 2007: 446; Huddleston and Pullum 2002: 477; Rosenbach 2002: 30). To exclude cases like *her style*, which only very rarely occur as *of*-genitives (Heller 2018: 55), we also removed all cases where either constituent is pronominal except for indefinite pronouns like *everybody*. The constituents also had to feature a nominal head so as to exclude pseudo-nominal verb phrases as in (4). Finally, we excluded *s*-genitives with possessums that are premodified by *own* because *own* only occurs after *s*-genitives and possessive pronouns (Huddleston and Pullum 2002: 482).

(3) The best friend of John's (Rosenbach 2014: 222)

(4) Oh because I think that erm they want to discover again the beauty of making things by hand because it's not funny for machine do everything (TLC:2_IT_27_S)

Fixed genitives such as *within arms' reach* (Shih et al. 2015: 211) appear perfectly interchangeable structurally, but they only occur in one of both variants because they refer to names, titles or idioms. Classifying genitives such as *women's sports* or *children's books* are excluded because the possessor denotes the class to which the possessor belongs rather than referring to a specific possessor (Grafmiller 2014: 475). Appositive genitives like *the state of Wisconsin* are also categorical because the head of the possessor is coreferential with the head of the possessum (Heller 2018: 55). Partitive genitives prototypically refer to constructions like *a glass of water*, but here we use the term to refer to all categorical cases involving some sort of measurement, as in *the majority of people* or *a few years' time*. Finally, we also excluded material genitives (e.g. *a crown of gold*, in Shih et al. 2015: 211) and descriptive genitives as in (5).

(5) All persons of quality here present (Wolk et al. 2013: 388)

Following a pilot study on the precision of the R script, we decided that we would reach a sufficiently large sample of examiner observations by going over two thirds of the exams. However, some parts of the exam contain utterances that do not represent the authentic spoken language production of the examiners, as in the listening task, where the examiner reads from a text. To identify these utterances, we first checked whether there are genitive observations in the native speaker data that occur in multiple exams. For those genitive observations, we calculated the similarity between the clauses in which they occur based on the

words they contain. A test on the listening task revealed that most scripted clauses have at least 70% of their words in common with a clause in another exam containing the same genitive observation. This threshold of 70% was used to identify and then remove genitive observations in the interactive task and the conversation task as well.

Finally, for the sake of keeping the annotation effort manageable, we added a layer of (modest) random sampling. Specifically, for each L1 background including the L1 (British English) of the examiners, we retained all available observations of the less frequent s-genitive and then selected a matching random sample of *of*-genitives from the sub-corpus. The rationale was that (a) we are not interested in relative frequencies but in the probabilistic conditioning of variation, and (b) the limiting factor in regression modeling as regards the number of predictors that can be modeled is the frequency of the less frequent variant (Hosmer and Lemeshow 2000: 346–347), thus annotating more *of*-genitives than *s*-genitives would have been somewhat inefficient. To be a bit more specific, a total of 514 *of*-genitives coming from mostly the Spanish and the Italian L1 backgrounds were sampled out. No *of*-genitives by native speakers and L1 speakers of Chinese and Hindi were sampled out as these sub-corpora have a fairly balanced distribution from the get-go.

The final dataset consists of 1,216 *of*-genitives and 1,086 *s*-genitives. Out of all 2,302 observations, 529 come from the examiners of the corpus. The remaining 1,773 learner observations are distributed as shown in Table 1.

2.3 Annotation of the probabilistic constraints

The genitive observations were then annotated for the different probabilistic constraints influencing the choice of genitive variant, namely animacy, thematicity, definiteness, persistence, lexical density, possessum length, possessor length, semantic relation, final sibilancy and discourse status (see Gries and Wulff

Table 1: Distribution of the genitives across proficiency levels and mother tongue backgrounds.

	Chinese	Hindi	Spanish	Italian	Other	Row total
B1	86	60	57	47	84	334
B2	135	113	88	83	185	604
C1	147	10	241	99	110	607
C2	32	40	55	8	93	228
Column total	400	223	441	237	472	1,773

2013; Heller 2018).[3] All observations were also annotated for the proficiency level of the speaker who produced them, which is specified in the corpus metadata for each exam.

Because the constraints of possessor animacy and semantic relation had to be coded manually, we conducted an interrater reliability analysis. Hence, we trained a second coder in the annotation of both variables for approximately 6 h. The second coder then annotated more than half the dataset (N = 1,200) for both variables. The agreement between both coders regarding possessor animacy and semantic relation for those observations was estimated at respectively 0.83 and 0.85 using Cohen's kappa, which indicates almost perfect agreement (Landis and Koch 1977).

2.3.1 Constituent length

The length of the constituents influences the choice of variant (Heller 2018; Hinrichs and Szmrecsanyi 2007; Shih et al. 2015). Concretely, longer constituents tend to be postponed in accordance with the principle of end-weight (Behaghel 1909) or Easy First (MacDonald 2013; see also Heller 2018: 18). Easy First refers to the general bias in language production whereby linguistic material that is easily retrieved from memory is produced before less accessible material (MacDonald 2013; see also Bock 1982). If the possessor is longer than the possessum, speakers will first produce the possessum because it is easier to retrieve than the longer possessor, which means speakers will favor the prepositional genitive. In this way, the length of the constituents indirectly determines which genitive variant is preferred. The length of the constituents is operationalized as the number of characters it contains minus hesitations and false starts.[4] In example (6), this means that the length of the possessor *a fool* is 5 and that of the possessum *fake praise* is 10.

(6) […] a true friend may at times frown at you because of some reason mm but I'll better have a friend's frown than a fool's fake praise (TLC:2_7_IN_55)

3 Although branching direction, segment alternation and rhythmic alternation significantly influenced the choice of genitive variant in the study by Gries and Wulff (2013), they are difficult to operationalize and time-consuming to annotate, so we opted to include the most well-established and strong predictors following Rosenbach (2014), most of which can be annotated automatically with the exception of possessor animacy and semantic relation.

4 Other ways of operationalizing the length of constituents include counting the number of words or syllables, but previous research has shown that different operationalizations are in fact very highly correlated (see Wolk et al. 2013: 395).

Contrary to the short-before-long principle, it seems that possessors are slightly longer (M = 8) than possessums (M = 6) in the *s*-genitives of our dataset, while possessors are slightly shorter (M = 9) than possessums (M = 10) in the *of*-genitives.

2.3.2 Discourse status

Some previous studies have found that discourse-given possessors tend to occur in *s*-genitives following the given-before-new principle (Gundel 1988) or more generally Easy First (Gundel 1988; Heller 2018: 20; Hinrichs and Szmrecsanyi 2007: 451; MacDonald 2013; Rosenbach 2014: 225; Shih et al. 2015; Wolk et al. 2013). Each observation was therefore coded for whether its possessor is discourse-given or discourse-new depending on whether the head noun of the possessor NP was produced among the 100 words preceding the genitive observation. A first look at our dataset indicates that discourse status does not affect the choice of variant, since 52% of discourse-given possessors occur in *of*-genitives rather than *s*-genitives.

2.3.3 Persistence

Persistence refers to the fact that a construction that has been used previously tends to be used again as a result of its higher activation level (see also Ellis 2006: 102; Ellis and Wulff 2019: 44; Szmrecsanyi 2006). To take into account the influence the learner and the examiner may have on each other (see Section 2.1), we not only indicated for each genitive observation which variant was used last if any but also by which speaker. As expected, there is a 59% chance that speakers reuse the previous genitive variant.

2.3.4 Thematicity

The choice of variant also depends on whether the possessor represents the theme in discourse (Osselton 1988; see also Szmrecsanyi and Hinrichs 2008: 307). Following Easy First, highly thematic possessors should favor the *s*-genitive by virtue of their high resting activation level (MacDonald 2013). Similar to Heller (2018: 66), the thematicity of the possessor is operationalized as the number of times the head of the possessor occurred in the preceding context, normalized by the average word length of the exams. As expected, the possessors in the *s*-genitives of our dataset are more thematic (M = 5.15) than those in *of*-genitives (M = 4.72).

2.3.5 Lexical density

The choice of variant is also affected by the lexical density of the surrounding context, which is captured by the ratio between types and tokens (Heller 2018: 18). On the one hand, previous research has found that lexically dense contexts prefer the *s*-genitive because this variant is more concise. On the other hand, increased lexical density may also cause speakers to prefer the *of*-genitive following Rohdenburg's Complexity Principle (1996: 151; see also Szmrecsanyi 2006: 59), which states that when the linguistic environment is cognitively complex – as is the case when the surrounding context is lexically dense – speakers should prefer the more explicit *of*-genitive. The type-token ratio is operationalized as the number of different words (types) among the 50 words preceding and the 50 words following the genitive observation (tokens). If there are fewer than 50 words on either side of the construction, we included more context on the other side of the construction accordingly (see Heller 2018: 69). In our dataset, the median type-token ratio of both variants is almost identical (M = 0.6 and 0.61).

2.3.6 Possessor animacy

The animacy of the possessor is arguably the strongest constraint affecting the genitive alternation (Rosenbach 2017: 14; Shih et al. 2015). According to Branigan et al. (2008), animate entities are cognitively more accessible and therefore more easily retrieved from memory (see also Röthlisberger et al. 2017: 10), which results in animate possessors preferring the *s*-genitive following Easy First (MacDonald 2013). Depending on their use in context, we classified possessors as either animate, collective, locative, temporal or inanimate following (Zaenen et al. 2004; see also Heller 2018: 62; Szmrecsanyi and Hinrichs 2008: 298; Wolk et al. 2013: 395). Possessors that are coded as animate mostly concern humans or entities represented as humans and animals (e.g. *god*, *elephant*, *plumber*). Collective possessors refer to multiple animates who display some degree of group identity. Locative possessors refer to a location fit for humans. Finally, temporal possessors refer to a time period or a specific point in time such as *today* or *last month*. All other possessors were considered inanimate. In example (6) for instance, the possessor *a fool* refers to a single human referent, so it is considered animate. As expected, the large majority of animate possessors in our dataset occur in *s*-genitives (80%), whereas inanimate possessors take the *of*-genitive in 92% of the cases. Likewise, locative possessors prefer the *of*-genitive in 78% of the cases, while collective and temporal possessors do not clearly discriminate between both variants.

2.3.7 Semantic relation

The semantic relation that holds between the possessor and the possessum also contributes to the choice of genitive variant. Following Rosenbach (2002: 121), most studies distinguish between prototypical and non-prototypical relations. Prototypical relations prefer the *s*-genitive and include kinship relations (e.g. *the man's brother*), body part relations (e.g. *the rat's eye*), legal ownership (e.g. *the mechanic's tools*) and part-whole relations (e.g. *the bottle's cap*) (Rosenbach 2002: 121; Shih et al. 2015; Wolk et al. 2013). All other relations were considered non-prototypical. In example (6), the relation between the constituents does not fit in any of the prototypical categories so it is considered non-prototypical. In accord with previous research, most prototypical relations in the dataset are realized as *s*-genitives (61%).

2.3.8 Definiteness

Previous research also found that definite possessors have a tendency to take the *s*-genitive (Heller 2018: 19; Wolk et al. 2013), which could once again be attributed to Easy First, given that a definite possessor is more easily accessible than an indefinite one. Similar to the operationalization in Heller (2018), a definite possessor must either be a proper noun, a temporal possessor or a noun phrase with a definite determiner. Hence, the possessor *a fool* in example (6) is coded as 'indefinite'. In our dataset however, the definiteness of the possessor does not seem to discriminate between the variants provided exactly 50% of all definite possessors are realized as *of*-genitives.

2.3.9 Final sibilancy

The final sibilancy constraint refers to the tendency of possessors ending in sibilants to disfavor the *s*-genitive. Previous research explains this effect as a phonological horror aequi effect that causes speakers to avoid similar adjacent sounds (Hinrichs and Szmrecsanyi 2007: 453; Shih et al. 2015). In our operationalization of the constraint, the genitive observations affected have possessors that finish in either [s], [z], [ʃ], [tʃ], [ʒ], or [dʒ] in the Carnegie Mellon University Pronouncing Dictionary (Lenzo 2014). If the final word of the possessor has no corresponding entry in the dictionary, we checked whether the word ends in the letter s, z, ce, sh, tch, dge or the digit 6 (see Grafmiller 2014: 478; Heller 2018: 71). In accord with previous research, only 40% of possessors with final sibilant in the dataset occur in *s*-genitives.

2.4 Data analysis

The annotated dataset was analyzed using multifactorial statistical methods, specifically mixed-effects logistic regression with the help of the *lme4* package (Bates et al. 2015) in *R* (R Core Team 2018).[5] The model tries to predict the choice of genitive variant based on a set of predictors, viz. the different probabilistic constraints. In doing so, it determines the influence of each predictor on the response variable while holding all other predictors in the model constant (Hinrichs and Szmrecsanyi 2007: 460). Mixed-effects models also include random effects, which increase the generalizability of the findings by controlling for dependent observations and irrelevant sources of variation (Gries 2015).

Except for the type-token ratio, all numeric predictors in the model were log-transformed. Then, all numeric predictors were standardized by dividing them by two standard deviations to make their effect on the choice of variant more comparable to that of binary categorical variables (Gelman 2008). To investigate whether proficiency influences the effect of a constraint, the model features interactions between each predictor and proficiency level. To take into account the potential effect of the learners' mother tongue background on their choice of genitive variant, the model includes intercept adjustments for L1. Intercept adjustments were also included for the speaker, the exam task, the head of the possessor and the possessum as well as the different levels of nesting in the corpus data. The model selection process followed Zuur et al. (2009) and Gries (2015), who recommend starting from a full model and then removing irrelevant predictors starting with the random effects. During this process, the five-way animacy coding was conflated to a binary variable ('animate' vs. 'inanimate') and the C1 and C2 proficiency levels were conflated to a single C level due to data sparsity issues. As for the random effects, the model retained only the most deeply nested level of the corpus (the exam task within an individual exam) and the head of the possessor and the possessum, the latter of which explains the most variance.

The fitted model is significantly better than the null model ($p < 0.001$). The $R^2_{\text{marginal}} = 0.40$ and $R^2_{\text{conditional}} = 0.74$ and its concordance index comes out at 0.96, which indicates an excellent fit (Baayen 2008). It predicts the right genitive variant with an accuracy of 88%, which is also significantly better than the baseline of 53% ($p < 0.001$).[6] There is no indication of overfitting as the standard errors are small (Levshina 2015: 263). The condition index κ of 20.30 indicates there

5 The dataset and the analysis are available at https://osf.io/k84yz/?view_only=13879789b4144e439bbad1dadf2f3995.

6 Strictly speaking, the model does not make predictions considering that the model was tested on the same dataset it was trained on.

is medium collinearity in the model, but this remains below the threshold of 30 for harmful collinearity (Baayen 2008: 182). Likewise, the VIF adjusted by degrees of freedom for each factor is below the threshold of 10 (Levshina 2015: 273).

3 Results

Table 2 presents the main effects in the model, which pertain to all speakers. The model predicts the likelihood of the *s*-genitive, so a positive coefficient indicates that when there is a change from the reference level in the corresponding predictor, learners and native speakers prefer the *s*-genitive whereas they prefer the *of*-genitive when the coefficient is negative. The table also features odds ratios, which offer a more interpretable indication of a predictor's effect size. Like coefficients, odds ratios indicate how a change in the corresponding predictor affects the odds of the *s*-genitive. Values between 0 and 1 indicate that the *s*-genitive is less likely while values above 1 imply that the *s*-genitive is more likely. To illustrate, the predictor with the largest coefficient, viz. the animacy of the possessor, has an odds ratio of 26.7, which means that the *s*-genitive is almost 27 times more likely when the possessor is animate rather than inanimate. However, the animacy constraint is part of a significant interaction term with proficiency

Table 2: Main effects of the individual predictors in the fitted model. The predicted response level is the *s*-genitive. The reference level of the predictors is given between brackets.

Predictor	Coefficient	Odds ratio	Std. error	*p*
(Intercept)	−2.406	0.09	0.52	**<0.001**
Proficiency (native):				
B1	0.927	2.528	0.595	0.119
B2	−0.359	0.698	0.516	0.486
C	−0.278	0.758	0.476	0.56
Possessor animacy (inanimate)	3.284	26.678	0.411	**<0.001**
Possessum length (logged)	−3.258	0.038	0.219	**<0.001**
Possessor length (logged)	−1.118	0.327	0.187	**<0.001**
Persistence (candidate *of*-genitive):				
Candidate *s*-genitive	−0.027	0.973	0.205	0.894
Examiner *s*-genitive	0.314	1.369	0.278	0.258
Examiner *of*-genitive	−0.623	0.536	0.223	**<0.01**
None	0.124	1.132	0.218	0.571
Final sibilancy (absent)	−0.543	0.581	0.22	**<0.05**
Type-token ratio	0.391	1.479	0.158	**<0.05**
Possessor definiteness (indefinite)	−0.235	0.79	0.375	0.531

Bold *p*-values in the last column indicate that the effect is statistically significant.

level so these odds only apply to the reference level of proficiency, namely the 'native' level (see Table 2). By extension, the main effect of proficiency, which reveals that learners better approximate the native speaker reference level as they become more proficient, also only applies when the possessor is inanimate. Next, all speakers are highly sensitive to the length of the possessum. Because the coefficient of the predictor is negative, speakers appear to prefer the *of*-genitive with long possessums, as in example (7). This result is rather surprising since it goes against the short-before-long principle.

(7) […] feminism is defined as the social political economic equality of both sexes […] (TLC:2_IN_16)

The length of the possessor is much less influential but follows the expected effect direction whereby long possessors favor the *of*-genitive. Persistence also significantly influences the speaker's choice of variant. That is, the *s*-genitive is almost 2 times less likely when the previously used variant is an *of*-genitive produced by an examiner rather than a learner. As expected, all speakers avoid the *s*-genitive when the possessor ends in a sibilant. Finally, the *s*-genitive is more likely when the type-token ratio is high, which ties in with findings from previous research on written language (e.g. Heller 2018: 18).

The statistics of the two significant interactions with proficiency are shown in Table 3. At first glance, the first interaction term reveals that learners with a B1 or B2 proficiency level are less likely to use an *s*-genitive when the possessor is animate compared to native speakers. In other words, low-proficiency learners seem to be less sensitive to the animacy constraint. The interaction is visualized in the partial effects plot in Figure 1, which summarizes the information of the model regarding the interaction effect by showing the probability of the *s*-genitive for the different values of possessor animacy in the different proficiency levels while the other predictors in the model are set to their default level.

Table 3: Interaction effects in the fitted model. The predicted response level is the *s*-genitive. The reference level for proficiency is 'native'.

Predictor	Coefficient	Odds ratio	Std. error	*p*
Possessor animacy × proficiency:				
B1 + animate	−1.213	0.297	0.553	**<0.05**
B2 + animate	−1.204	0.3	0.486	**<0.05**
C + animate	−0.738	0.478	0.469	0.116
Possessor definiteness × proficiency:				
B1 + definite	0.406	1.501	0.566	0.473
B2 + definite	1.226	3.409	0.477	**<0.05**
C + definite	0.847	2.333	0.444	0.056

Bold *p*-values in the last column indicate that the effect is statistically significant.

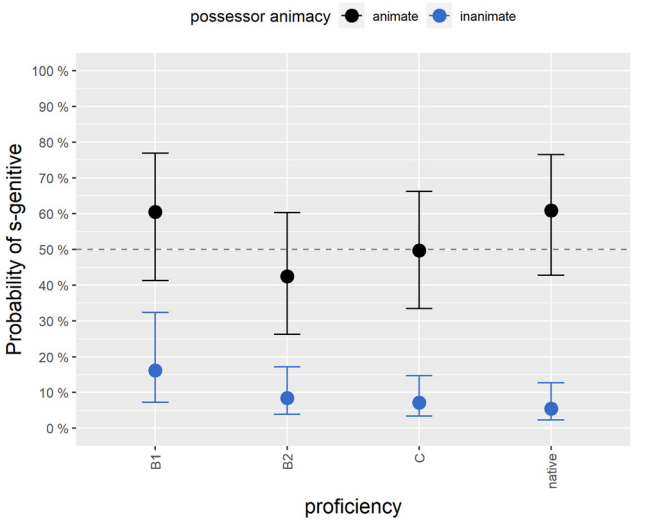

Figure 1: Partial effects plot of the interaction between possessor animacy and proficiency level.

The plot reveals that for B1 speakers, the animacy constraint may be weaker not because they do not use the *s*-genitive with animate possessors – as is the case for B2 speakers – but rather because they also use *s*-genitives with inanimate possessors, as in (8).

(8) Examiner: I'm from England I'm from London in England have you been to London?
Candidate: No but I I see the London's pictures (TLC:2_6_CH_23)

As for the interaction term with definiteness, Table 3 shows that speakers who have a proficiency level of B2 or C (marginally significant) favor the *s*-genitive when the possessor is definite, whereas the definiteness of the possessor does not affect the choice of variant for neither native speakers nor B1 speakers, as shown in Figure 2. This finding is surprising because it implies that B1 learners better approximate the target set of constraints than the more proficient B2 and C learners considering that, like the native speakers, they are not sensitive to this constraint. However, a closer look at the dataset reveals that this lack of an effect for possessor definiteness in the native speaker data may be due to the examiners' frequent use of two constructions that go against the expected tendency for definite possessors to figure in *s*-genitives. First, the examiners often place definite possessors like *the exam* or *the test* in *of*-genitives rather than *s*-genitives to refer to parts of the exam, as in (9).

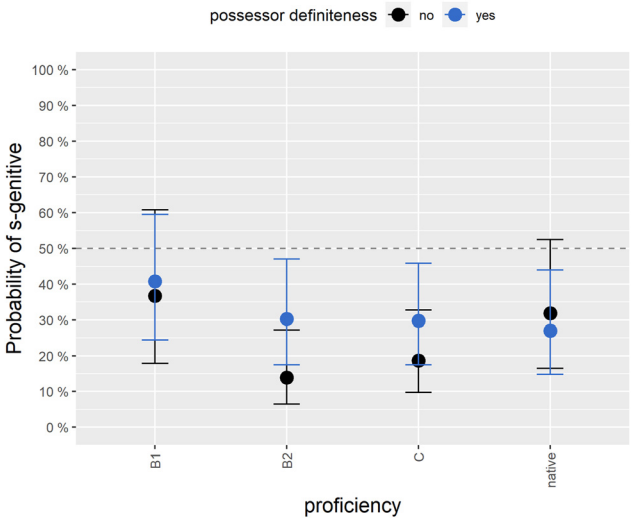

Figure 2: Partial effects plot of the interaction between possessor definiteness and proficiency level.

(9) Now we've arrived at the final part of the exam the discussion phase erm did you prepare from list A or B? (TLC:2_IN_24)

Second, the examiners almost always place the indefinite possessor *people* in *s*-genitives rather than *of*-genitives, which they often use to introduce new topics of discussion with the candidate, as shown in (10).

(10) Do you think that erm values change from generation to generation? So for example when your grandmother was very young do you think people's values were different from values today? (TLC:2_8_IN_7)

Since both of these constructions alone account for a substantial number of the native speaker observations (14%), they may have counteracted the tendency for definite possessors to figure in *s*-genitives in the remaining observations, so that possessor definiteness does not significantly affect native speakers' choice of variant according to the model. To test this possibility, we excluded both of these constructions from the dataset and fitted the model again. This model reached an accuracy of 89% with a concordance index C of 0.96, indicating an excellent fit of the data (Baayen 2008). In this new model, there is no longer a significant interaction between definiteness and proficiency level. Instead, the native speakers now also prefer the *s*-genitive when the possessor is definite, which lends support to our claim that both of these constructions may have caused the model to miss an effect of possessor definiteness in native speakers. In that case, only the B1 learners are not sensitive to the definiteness constraint.

4 Discussion

Previous research on alternation phenomena in EFL learners largely focused on how learners' mother tongue influences their choice of variant while largely ignoring a key variable in SLA, namely proficiency. Proficiency is relevant because it indirectly measures language learning, which is driven by input in the target language according to usage-based approaches to SLA (Ellis and Wulff 2019: 41). Proficiency can therefore reveal whether and how EFL learners differ from native speakers at different stages of language learning. To investigate the influence of proficiency, we collected a large number of genitive observations from the Trinity Lancaster Corpus (Gablasova et al. 2019). These observations were then annotated for most relevant constraints guiding the choice of variant in the genitive alternation as well as the CEFR proficiency level of the learners as reported in the corpus metadata. The data was analyzed via mixed-effects logistic regression, where we allowed the proficiency level to interact with the other predictors in the model, viz. the set of constraints.

In general, the similarity between the set of constraints of EFL learners and native speakers in spoken language is striking, which echoes the conclusion of Gries and Wulff regarding the genitive alternation in the written language of EFL learners (Gries and Wulff 2013: 350). All speakers prefer the *s*-genitive when both constituents are short, the possessor is animate and does not end in a sibilant, while the surrounding context is lexically dense and the examiner did not previously use an *of*-genitive. Neither learners nor native speakers take into account the semantic relation of the possessor and the possessum, the discourse status of the possessor, which is generally rather weak in the genitive alternation (Hinrichs and Szmrecsanyi 2007: 461; Kreyer 2003: 172), or the thematicity of the possessor, which mostly operates on written language (Grafmiller 2014). The effect direction of type-token ratio indicates that lexically dense linguistic material favors the *s*-genitive, which ties in with previous findings on type-token ratio in written language where the *s*-genitive is chosen to save additional space (Hinrichs and Szmrecsanyi 2007: 457; Szmrecsanyi and Hinrichs 2008: 300–301). It is somewhat unclear how this explanation pertains to spoken language where one would expect processing factors such as Rohdenburg's Complexity Principle (1996: 151, see Section 2.3) to play a role rather than editorial pressure. The effect direction of possessum length is unexpected as it runs counter to the short-before-long principle: long possessums favor the *of*-genitive in the same way as long possessors do. The same effect was found by Szmrecsanyi (2006), who also investigated the genitive alternation in spoken English. This effect can be explained by Rohdenburg's Complexity Principle (1996: 151), which predicts that learners prefer to use the more explicit and analytic *of*-genitive when the linguistic environment is

highly complex, as is the case when either the possessor or the possessum is long. It is also interesting that the persistence effect occurs only when the previous variant is an *of*-genitive produced by an examiner. This means that producing the *s*-genitive does not lead to persistence effects, although the *s*-genitive is less frequent and should therefore induce stronger persistence effects than the *of*-genitive (Jaeger and Snider 2013). Additionally, this finding suggests that learners are more sensitive to an examiner's previous *of*-genitive than their own.

In spite of these similarities, the analysis revealed that B1 and B2 learners are less sensitive to the animacy of the possessor compared to native speakers. More specifically, it seems that B1 speakers are less sensitive to the animacy constraint because they overuse the *s*-genitive when the possessor is inanimate, whereas B2 speakers tend to use the *of*-genitive with animate possessors. Additionally, B1 learners are not sensitive to the definiteness of the possessor, contrary to the other speakers in the corpus, who tend to use the *s*-genitive when the possessor is definite. The study by Gries and Wulff (2013) revealed no difference between the native speakers and the Spanish or German EFL learners with respect to either constraint.[7] Since even the native speakers in their data were not sensitive to possessor definiteness, it is no surprise that they did not find a difference between learners and native speakers. The effect of definiteness may not have been found in their analysis due to the fact that the constraint is less influential in written language compared to spoken language, or because it is rather weak in general (Heller 2018: 104). As far as animacy is concerned, which significantly affects both native speakers' and learners' choice of genitive variant in their study, it is much more likely that they did not find a similar interaction because they conflated data from low-proficiency learners with that of more advanced learners who might already master the animacy constraint. As stated above, the most likely reason why B1 and B2 learners are less sensitive to these constraints is because they have not yet received enough input in the target language to approximate the native speaker pattern (e.g. Ellis and Wulff 2019). This difference in language experience can also be seen within the B proficiency levels, since B1 learners are not sensitive to the definiteness of the possessor contrary to the more advanced B2 learners. This entails that B1 learners rely on fewer constraints to make their choice of variant compared to more proficient learners and native speakers, which echoes Jäschke and Plag's (2016) findings regarding the dative alternation.

Finally, the question remains as to why EFL learners have difficulty learning the animacy and the definiteness constraint in particular. Since both of these constraints are most likely learned via associative statistical learning, the difficulty

7 Strictly speaking, Gries and Wulff (2013) did not annotate their observations for possessor definiteness, but their operationalization of possessor specificity is similar.

must lie in learning the association between the constraint and the choice of variant (e.g. Gries and Ellis 2015; Wulff and Ellis 2018). The main issue for possessor definiteness is probably that the constraint is rather weak: whether the possessor is definite or not does not give a strong indication as to which variant is preferred. This makes it more difficult for low-proficiency learners to notice the association between definite possessors and either variant (Ellis and Wulff 2019: 44; Gries and Ellis 2015; O'Shannessy and Meakins 2012: 380). What is more surprising, however, is that learners are less sensitive to the animacy constraint compared to native speakers, since the animacy constraint has many features that facilitate associative statistical learning: it is very reliable, highly available, etc. (Gries and Ellis 2015). Therefore, one would rather expect learners to use this constraint as a categorical rule in determining the choice of variant. The most likely reason why the animacy constraint could be more difficult to learn than other constraints is because the cognitive cost associated with processing the animacy of the possessor is comparatively high (see Kail 1989; Yoshimura and MacWhinney 2010: 552). At the highest level, the constraint requires learners to know that the different levels of possessor animacy help determine the choice of genitive variant, so they should know for example that inanimate possessors prefer the *of*-genitive. The same applies to constraints such as possessor definiteness or final sibilancy: one has to learn that definite possessors prefer the *s*-genitive and that possessors with a final sibilant disfavor the *s*-genitive. For the constraints to apply however, it is first necessary to determine whether the possessor is animate, definite or has a final sibilant. This is where the animacy constraint proves more challenging than the other constraints. Whereas the determiner can often help determine the definiteness of the possessor, the animacy of the possessor cannot be derived from any structural pattern, so learners have to proceed on a case-by-case basis for each noun phrase. Additionally, the animacy of the noun phrase differs according to its use in context. This can be tricky for the so-called "borderline cases" (Yamamoto 1999: 139–146), i.e. locatives and collectives, which can sometimes be hard to distinguish. In example (11) for instance, it is unclear whether *South Africa* is used as a locative or as a collective.

(11) and er in May nineteen ninety four for the first time in South Africa's history all the races voted in democratic election (TLC:2_6_IT_100)

Accordingly, collectives and locatives are the two categories where learners and native speakers are most likely to vary in their use of genitive variant. This is especially true in the B1 sample, where these two categories account for most of the cases where the animacy of the possessor does not match with the chosen genitive variant. Specifically, the difference between B1 speakers and native speakers regarding the animacy constraint can be attributed to B1 speakers using the *s*-genitive with

locative possessors, which were conflated as inanimate possessors in the model, as shown in example (8), where *pictures of London* is clearly the more acceptable variant. By the time learners reach a C-level proficiency, they seem to have made some adjustments so there is no longer a significant difference with native speakers regarding the animacy constraint. Interestingly, Heller (2018) found that speakers of English as a Second Language (ESL) are also less sensitive to the animacy constraint, which raises the question as to whether ESL speakers face similar difficulties when learning the animacy constraint (see Biewer 2011; Deshors 2014).

5 Conclusion

Through the course of language learning, second language learners adapt their interlanguage grammar to accommodate the language input they receive (Ellis 2006). As a result of this process, learners better approximate the target grammar, which can be captured indirectly via language proficiency tests. Although the language use of low-proficiency learners is probably different from that of native speakers and more proficient learners because they are more sensitive to general mechanisms of language learning and language transfer from their L1 (Bentz and Winter 2013; Wang and Xu 2015: 216), previous alternation studies on EFL have not distinguished between learners at different proficiency levels. Including proficiency level in our analysis of the genitive alternation revealed that low-proficiency learners differ from native speakers with regard to possessor animacy and definiteness, probably because they are difficult to acquire via associative statistical learning. If proficiency had not been taken into account, these effects might have been missed completely, or they would have been generalized to all learners regardless of their proficiency level. Therefore, an accurate and comprehensive account of learners' choice between alternating variants has to control for the influence of proficiency level.

In general, the similarity between native speakers and even low-intermediate learners is striking. This highlights one of the limitations of the study, namely that our dataset does not feature speakers from the A proficiency levels. Another shortcoming is that our dataset and model design did not allow us to analyze the effect of mother tongue in addition to proficiency level as a fixed effect. In future studies, this would allow us to also take into account transfer from the L1, which is probably more prominent in the lower proficiency levels (Morett and MacWhinney 2013: 134). Finally, corpus-based models show what speakers say, but one needs experiments to investigate what they know about the variants in different contexts (Ellis 2017: 46), so we are planning to conduct a rating task experiment on the genitive alternation in a next study (see Bresnan and Ford 2010).

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