Research Article

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Grammatical gender assignment in L3 versus L4 Swedish: a pseudo-longitudinal study

https://doi.org/10.1515/iral-2022-0207
Received October 24, 2022; accepted May 20, 2023; published online June 5, 2023

Abstract: Previous research has documented cross-linguistic influence in L2 grammatical gender acquisition and use. However, it remains unclear what role previously learned languages play in gender assignment beyond L2. To address this question, we created a timed gender decision task with which we tested two groups of L1 Polish university students of Swedish as an additional language: 65 L2 English/L3 Swedish students, and 52 L2 English/L3 German/L4 Swedish students. Adopting a pseudo-longitudinal design, we tested individuals who had completed one, two, or three to four years of studies. Accuracy and response time data were submitted to Generalised Linear Models. The results show that L4 Swedish students did not outperform L3 Swedish students in terms of accuracy. However, L4 Swedish students assigned gender to nouns faster than L3 Swedish students, but only after one year of studies. The response time advantage of L4S students was attributed to the surface transfer of the German gender values into Swedish. Apart from the specific effect of German, the results point to the robust effects of gender congruency with L1 Polish and the persistent tendency to overgeneralise uter gender.

Keywords: additional language; gender assignment; gender congruency effect; multilingual advantage; Swedish

1 Introduction

Learning a language with grammatical gender (hereafter, gender) requires that the learner assign gender to each individual lexical item in the lexicon. In Swedish, for example, the task is to learn that natt (‘night’) is uter and hus (‘house’) is neuter, whereby the choice between the two genders is arbitrary in virtually all cases

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(Andersson 1992). This renders gender an invariable lexical property of the noun, which is conceived as part of each lexical item (Carroll 1989) or as a gender node to which all nouns of a particular gender are linked (e.g., Schriefers and Jescheniak 1999). Gender assignment has frequently been reported to require considerable effort in L2 acquisition (e.g., Alarcón 2010; Andersen 1984; Carroll 1989; Dewaele and Véronique 2001; Franceschina 2005; Grüter et al. 2012; Stöhr et al. 2012). Researchers have attempted to account for L2 learners’ difficulties in this domain by attributing them to a lack of reliable semantic and formal cues to gender (e.g., Ogneva 2022; Stöhr et al. 2012), the use of a default gender (e.g., Alarcón 2010; Carroll 1989), or weaker links between nouns and gender nodes in the lexicon (e.g., Grüter et al. 2012). Another line of research has drawn attention to the role of L1 in gender assignment in L2 (e.g., Armon-Lotem and Amiram 2012; Ellis et al. 2012; Sabourin et al. 2006; Stöhr et al. 2012). Here, the relevant studies have pointed out that L2 learners typically achieve higher performance levels with nouns that share gender between L1 and L2 (e.g., Bianchi 2013; Stöhr et al. 2012). Even the mere presence of gender in L1 has been found to increase the accuracy of gender assignment in L2 (Sabourin et al. 2006).

While cross-linguistic influence is well studied in L2 gender acquisition, its role in third or additional language (L3/Ln) acquisition remains unclear. Crucially, the question of whether knowledge of two languages with gender rather than one may have consequences for L3/Ln learners has not yet been addressed. This question is not trivial because learners often speak more than one gendered language at the onset of learning a new one. This is true for a large number of university students of Swedish in Poland. Although virtually all of them begin studies with some command of English (a non-gendered language), which is taught to over 96% of children, starting from primary school (Statistics Poland 2019), many students are also exposed to German (a gendered language) prior to higher education. Could it be the case that they have an advantage in learning gender in Swedish?

To address this question, we devised a timed gender decision task with which we tested two groups of L1 Polish university students of L3/L4 Swedish: 65 L2 English/L3 Swedish students, and 52 L2 English/L3 German/L4 Swedish students. In order to track the development of gender assignment during the course of their studies, the study adopted a pseudo-longitudinal approach whereby individuals who had completed one, two, or three to four years of Swedish Philology were tested. Apart from the specific aim to explore the effect of one versus two gender systems, the objective of this study was also to add to the existing body of research on gender assignment in a non-native language from an understudied language combination, by exploring the influence of L1, the effect of length of language learning experience, and the tendency to use a default gender.
2 Cross-linguistic influence in gender acquisition

Previous research has identified two main ways by which gender assignment in L2 could be affected by L1. First, L2 learners whose L1s encode gender may outperform those with ungendered L1s (e.g., Sabourin et al. 2006). Second, lexical congruency between the L1 and L2 gender systems may benefit L2 learners in their accuracy and processing speed (e.g., Lemhöfer et al. 2008; Stöhr et al. 2012). In what follows, these two lines of research will be discussed in more detail.

The advantage of L2 learners who acquired gender in their L1 over those who did not is commonly ascribed to “deep transfer” (Sabourin et al. 2006: 3), which refers to transferring the abstract gender feature regardless of similarities and differences between the L1 and L2 gender systems. While some studies observed deep transfer in gender assignment in L2 (Sabourin et al. 2006), others failed to do so (e.g., Ellis et al. 2012).

Apart from the transfer of the abstract gender feature, the direct transfer of the L1 gender values into L2 has been found to affect the acquisition of gender assignment in L2, a finding referred to as “surface transfer” (Sabourin et al. 2006: 3). Here, the relevant studies have shown that L2 learners are more accurate at assigning gender to nouns with matching gender than to nouns with different gender in the two languages (e.g., Bianchi 2013; Sabourin et al. 2006; Stöhr et al. 2012).

Gender congruency effects have received more attention in processing research. Until now, most evidence for interactions between the two gender systems of a bilingual has been obtained in production studies. Gender congruency effects are widely documented in picture naming (e.g., Klassen 2016; Lemhöfer et al. 2008) and translation tasks (Manolescu and Jarema 2015; Paolieri et al. 2010). In turn, gender congruency effects in L2 comprehension have been addressed only in a few studies, using lexical decisions (i.e., Lemhöfer et al. 2008), translation recognition (Paolieri et al. 2020), and visual-world eye tracking (Morales et al. 2016). Their results consistently demonstrate that bilinguals process nouns in isolation and in noun phrases faster when the target nouns are congruent in gender between L1 and L2 than if they are not.

The degree of gender congruency effects in online tasks has been observed to be higher at lower L2 proficiency levels (Bordag and Pechmann 2007; Paolieri et al. 2010). This is expected since it is generally acknowledged that cross-language activation is stronger for low proficient bilinguals than for highly proficient bilinguals (e.g., Sunderman and Kroll 2006).

However, cross-linguistic influence is not the only factor playing a role in L2 gender acquisition and use. On top of gender congruency, overgeneralisation of a particular gender has been frequently observed in L2 acquisition. In French and
Spanish, for example, it involves the choice of masculine in lieu of feminine gender (Dewaele and Véronique 2001; White et al. 2004). Resorting to a default gender has been linked to performance issues. As put forward by White et al. (2004), L2 learners at times fail to retrieve the appropriate gender from the lexicon, arguably because of communication pressure. Another explanation is related to the unequal distribution of gender values. As argued by Sabourin et al. (2006), as approximately two thirds of Dutch nouns have common gender, a very simple default gender strategy can be used by learners of L2 Dutch: “if the gender of a noun is not known, then assign the noun to the common gender” (Sabourin et al. 2006: 13).

The studies reported above all explored cross-linguistic influence in L2 gender acquisition and use. More recently, some attempts have been made to investigate gender acquisition in L3/Ln. However, most of the L3/Ln studies have considered gender through the lens of agreement, and none of them has addressed the issue of a multilingual advantage. For example, Brown (2020) compared beginner L3 German learners with L1 English/L2 Spanish and L1 Spanish/L2 English in their ability to identify gender agreement errors between the article and the noun in an untimed grammaticality judgement task. L2 Spanish learners outperformed L1 Spanish learners, thereby providing evidence of the privileged role of the non-native language in the initial stages of L3 acquisition (e.g., Bardel and Falk 2007) or the effect of increased metalinguistic awareness and experience with gender in L2.

To sum up, there is ample support for links between gender congruency and higher L2 performance in different types of offline and online tasks. In turn, the evidence in favour of deep transfer in gender assignment is less clear-cut. Processing studies suggest that the degree of gender congruency effects decreases with higher L2 proficiency. Furthermore, L2 learners tend to use a default gender. Finally, there are indications that having gender in L2 rather than in L1 fosters L3 gender acquisition due to the effect of non-nativeness or increased metalinguistic awareness of gender. However, the possibility of cumulative influence from L1 and L2, either as deep or surface transfer, has not yet been taken into consideration in L3/Ln research.

3 Direct and indirect effects of multilingualism on L3/Ln acquisition

It has been frequently pointed out that the number of languages already known to learners carries weight for subsequent non-native language learning because more languages entail more knowledge that can be drawn upon in the acquisition process (Festman 2021; Sanz 2000). A larger repertoire of languages offers more opportunities for facilitative transfer, particularly when previously learned languages
are typologically related to the target language (Hammarberg 2001; Jarvis 2015; Witney and Dewaele 2018).

Indeed, it has been repeatedly demonstrated that cross-linguistic influence critically depends on the degree of similarity between languages as well as between previous learning and processing experiences and the target learning task (e.g., Hirosh and Degani 2018 for discussion). Current accounts of L3/Ln acquisition acknowledge cross-language similarity as a decisive factor in transfer selection. For example, Flynn et al. (2004) demonstrated a facilitative influence from L1 to L2 and from L2 to L3 in the case of similar structures, which laid the foundations for the Cumulative Enhancement Model (CEM). The CEM (Flynn et al. 2004) posits that all languages known to the learner can enhance subsequent language learning. Another model based on cross-language similarity is the L2 Status Factor Hypothesis (L2SFH) proposed by Bardel and Falk (2007). The L2SFH points to the differences between L1 and L2 acquisition related to such factors as age of onset, learning context, and metalinguistic knowledge. Taking them into account, L3/Ln acquisition resembles L2 rather than L1 acquisition, which renders L2 and L3/Ln cognitively more similar. The cognitive similarity between L2 and L3/Ln is assumed to explain the privileged role of L2 in L3/Ln acquisition. Furthermore, the Typological Primacy Model (TPM) proposed by Rothman (2011, 2015) claims that the background language which is most similar to L3/Ln will influence its acquisition, particularly at the beginning. More specifically, the TPM predicts that either L1 or L2 will be transferred in the initial stages of L3/Ln acquisition. Finally, the more recent Linguistic Proximity Model (LPM, Westergaard et al. 2017) posits that all previously learned languages always remain active and can have both a facilitative and non-facilitative effect on performance in L3/Ln.

Evidence for the advantages of knowing more than one language for L3/Ln acquisition and use comes mainly from studies on lexis. Here, research has shown that cognates, i.e., words that share meaning and form across languages, are processed more quickly if they belong to three languages rather than two (Lemhöfer et al. 2004; Szubko-Sitarek 2011). Furthermore, research on lexical learning in L3/Ln suggests a robust multilingual advantage (e.g., Hirosh and Degani 2018; for overview). For example, Papagno and Vallar (1995) showed that multilinguals (speakers of Italian and two or more other languages) were superior to bilinguals in learning new words in Russian. In addition, the degree of overlap between the current language task and the learner’s previous learning experience has been found to be largely responsible for the multilingual advantage in lexical learning (Kaushanskaya et al. 2014).

Previous research has pointed to the relationship between cross-linguistic influence and proficiency in the target language (e.g., Sánchez 2014). In the L3 context, two claims are generally accepted. First, since L3 is an interlanguage, and
hence still under development, it is very likely to be influenced by another non-native language, especially when learners are less proficient in L3 (e.g., Bardel and Lindqvist 2007). Second, cross-linguistic influence from L2 to L3 is predicted to be stronger in learners who are highly proficient and intensively exposed to L2 (e.g., Hammarberg 2001).

Bilingualism is also said to offer general benefits for L3/Ln acquisition regardless of the specific combination of languages the learner has in their repertoire (Cenoz 2003). Crucially, bilingual learners are credited with a greater degree of metalinguistic awareness when compared to that of monolingual learners (Jessner 2018; Witney and Dewaele 2018). Accumulating language learning experience results in increased knowledge about how language systems, structures, and rules work (Festman 2021).

4 Gender assignment in the languages under study

The grammatical gender system in modern Germanic languages is either a continuation of the inherited Proto-Indo-European threelfold system (German), reduced to two classes (Swedish), or fully reduced (English) (Skrzypek 2010: 91). Currently, Swedish nouns are either uter or neuter. The former value is a continuant of Old and Middle Swedish masculine and feminine which have coalesced into one gender value (Davidson 1990). The diachronic background makes it legitimate to treat the modern Swedish uter gender as a counterpart of German masculine and feminine.

In general, nouns are allotted to a gender according to semantic, morphological, and phonological rules, whose applicability varies across languages. Gender systems are typically classified in terms of predictability of gender by the morphological or phonological shape of nouns. Gender assignment in Swedish is claimed to be arbitrary to a large degree, with a small number of reliable gender cues (Teleman et al. 1999). In addition to the weak semantic basis for gender assignment, albeit with a strong tendency for animates to be uter, some formal cues to gender are available to Swedish learners. For example, nouns ending in “-a” and “-e” are generally uter but with common exceptions, such as öga (‘eye’) or öra (‘ear’), which are neuter. A majority of Swedish nouns deriving suffixes are uter, but they are rare in the input (Andersson 1992: 38). Between 70 and 75 % of all Swedish nouns are of uter gender, which is typically overgeneralised by child and adult L2 learners (Andersson 1992; Lahtinen 1998).
German has three genders: masculine, feminine, and neuter. Most nouns are masculine (50%), followed by feminine (30%), and less frequently, neuter (20%) (Bauch 1971). Similar to Swedish, gender assignment is claimed to be arbitrary to a large extent, with some semantic and morphological regularities that mainly apply to monosyllabic nouns and exhibit varying degrees of reliability (Köpcke 1982; Köpcke and Zubin 1996). Most of these regularities must be considered probabilistic, and only a small number of them, such as associations between suffix and gender, are deterministic in nature (Hohlfeld 2006: 129).

Polish also distinguishes between masculine, feminine, and neuter, but standard grammar forms (e.g., Grzegorczykowa et al. 1999) tend to split the masculine gender into three classes depending on animacy and virility in the accusative case (masculine virile, masculine animate/non-virile, masculine inanimate). In purely lexical terms, however, Polish has three genders. Masculine gender includes approximately 50% of all nouns, thus being the most frequent gender class, followed by feminine with a frequency of approximately 40%. Neuter is the least frequent in Polish as it only covers 10% of nouns (Stefańczyk 2007: 48). Gender assignment is highly predictable from the morphological shape of the noun in the nominative singular. Nouns ending in a consonant are masculine; nouns ending in “-a” and “-(o)ść” are feminine, and nouns ending in “-o”, “-e/-ę”, and “-um” are neuter.

To sum up, while Swedish has a two-way gender system, both Polish and German distinguish between three genders. Despite these asymmetries, the Swedish gender system maps relatively straightforwardly into that of Polish and German as most translation equivalents of uter nouns are masculine or feminine. In addition, neuter gender is the least frequent in all three languages. While the Polish gender system is highly transparent, the low degree of transparency of the German and Swedish gender systems prompt learners to resort to lexical learning.

5 The present study

In the present study, we explored gender assignment in L3/L4 Swedish using gender decisions. We focused on participants’ accuracy and response times. Bearing the previous discussion in mind, the main research questions were as follows:

RQ1. Does knowledge of non-native German in addition to native Polish facilitate gender assignment in L4 Swedish?

RQ2. Does the effect of German, if any, depend on length of experience in learning L4 Swedish?
It is conceivable that students who learned German will have an advantage in their ability to assign gender to Swedish nouns over those who did not, because previous studies have reported different types of facilitative L1 effects in L2 gender acquisition. There could be numerous reasons for this advantage. First, students with knowledge of German may experience deep transfer from German. Second, they may benefit from a larger degree of gender congruency, i.e., from Polish and German at the same time (surface transfer). Finally, students with knowledge of German are equipped with a metalinguistic awareness of gender, which can facilitate gender assignment in their L4 Swedish. Transfer from German is predicted to emerge at lower proficiency levels in Swedish as L4 learners generally experience more cross-linguistic influence when they are less proficient in a novel language (e.g., Sánchez 2014 for discussion).

Apart from focusing on the specific effect of German, this study also aimed to shed light on the development of gender assignment in Swedish as L3/L4 by considering the aspects of gender acquisition in a non-native language discussed in previous L2 studies, such as the length of language learning experience, the influence of L1, and the tendency to use a default gender. Accordingly, the present study also asked three more general research questions:

**RQ3.** Does L1 Polish affect gender assignment in L3/L4 Swedish?

**RQ4.** Does gender assignment performance improve with increasing length of experience in learning L3/L4 Swedish?

**RQ5.** Do L3/L4 Swedish learners overgeneralise utter gender in gender assignment?

In accord with previous studies, students are predicted to experience influence of their L1 Polish on gender assignment in L3/L4 Swedish (e.g., Bianchi 2013; Sabourin et al. 2006; Stöhr et al. 2012). They are also expected to improve over time and to use utter as a default gender to a large extent (Dewaele and Véronique 2001; Sabourin et al. 2006; White et al. 2004). Both the effect of L1 Polish and the tendency to overgeneralise utter gender are predicted to play a less important role with increasing length of experience in learning L3/L4 Swedish (Bordag and Pechmann 2007; Dewaele and Véronique 2001; Paolieri et al. 2010).

### 5.1 Participants

Two groups of L1 Polish university students of L3/Ln Swedish participated in this study: 65 L2 English/L3 Swedish learners (hereafter, L3S students), and 52 L2 English/
L3 German/L4 Swedish learners (hereafter, L4S students). All participants were first exposed to Swedish during higher education ($M_{AO}$ of L3/L4 Swedish = 20.8, $SD = 5.1$). All of them learned English as L2 ($M_{AO}$ of L2 English = 7.5, $SD = 3.0$). L3S students continued to learn English at university.

L4S students were recruited from a Polish university at which German (instead of English) was taught in addition to Swedish. These participants started learning German after English at school ($M_{AO}$ of L3 German = 11.2, $SD = 3.6$) and then continued at university. At the testing time, their German proficiency ranged between elementary and advanced levels (see more details below).

In terms of experience with Swedish, 39 students successfully completed one year of Swedish philology (A2 level), 38 students completed two years (B1), and 40 students completed three or four years (B2/C1 level). For each level, students’ proficiency was confirmed by an end-of-year exam. In each year, students received approx. 300 h of instruction in Swedish and 300 h of courses that covered topics related to Swedish linguistics, literature, and culture. Proficiency was additionally assessed using a self-report on a scale of 1–10, separately for writing, speaking, listening, reading, grammar, and vocabulary. It was then determined by calculating an average score from all six self-ratings. Table 1 gives an overview of the participants.

Table 1: Participant characteristics.

<table>
<thead>
<tr>
<th></th>
<th>First year</th>
<th>Second year</th>
<th>Third/fourth year</th>
</tr>
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<tbody>
<tr>
<td><strong>L4 Swedish group:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>17</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Age</td>
<td>21.8 (4.7)</td>
<td>22.6 (2.2)</td>
<td>24.1 (6.2)</td>
</tr>
<tr>
<td>Swedish proficiency</td>
<td>4.2 (1.5)</td>
<td>6.8 (0.3)</td>
<td>8.1 (0.6)</td>
</tr>
<tr>
<td>AOA of Swedish</td>
<td>20.5 (4.0)</td>
<td>20.0 (1.7)</td>
<td>19.3 (0.8)</td>
</tr>
<tr>
<td>English proficiency</td>
<td>7.5 (0.8)</td>
<td>7.8 (0.7)</td>
<td>6.6 (2.1)</td>
</tr>
<tr>
<td>AOA of English</td>
<td>9.8 (3.4)</td>
<td>7.4 (2.1)</td>
<td>9.0 (3.3)</td>
</tr>
<tr>
<td>German proficiency</td>
<td>6.3 (2.5)</td>
<td>3.9 (1.9)</td>
<td>5.9 (2.0)</td>
</tr>
<tr>
<td>AOA of German</td>
<td>10.8 (2.7)</td>
<td>11.8 (4.5)</td>
<td>10.9 (3.0)</td>
</tr>
<tr>
<td><strong>L3 Swedish group:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td>22</td>
<td>21</td>
<td>22</td>
</tr>
<tr>
<td>Age</td>
<td>21.3 (5.9)</td>
<td>22.8 (5.9)</td>
<td>24.3 (4.2)</td>
</tr>
<tr>
<td>Swedish proficiency</td>
<td>4.1 (1.0)</td>
<td>6.6 (0.4)</td>
<td>8.0 (0.3)</td>
</tr>
<tr>
<td>AOA of Swedish</td>
<td>20.1 (8.4)</td>
<td>20.9 (5.2)</td>
<td>19.9 (4.1)</td>
</tr>
<tr>
<td>English proficiency</td>
<td>8.3 (0.6)</td>
<td>8.1 (0.9)</td>
<td>8.4 (0.8)</td>
</tr>
<tr>
<td>AOA of English</td>
<td>7.0 (3.4)</td>
<td>6.7 (1.6)</td>
<td>5.6 (1.0)</td>
</tr>
</tbody>
</table>

Note. Standard deviations are given in parentheses.
For Swedish proficiency, two-way ANOVA provided evidence of a main effect of year of studies ($F(2, 111) = 198.56$, $p < 0.001$, $\eta^2 = 0.78$). The post hoc Bonferroni test showed significant differences between all years of studies (all $ps < 0.001$). As far as the L4S group is concerned, one-way ANOVA provided evidence of a main effect of year of studies for German proficiency ($F(2, 49) = 5.62$, $p = 0.006$, $\eta^2 = 0.19$) but not for AOA of German ($F(2, 49) = 0.44$, $p = 0.649$, $\eta^2 = 0.02$). The post hoc Bonferroni test showed that 2nd-year L4S students were less proficient in German than 1st-year ($p = 0.010$) and 3rd/4th-year L4S students ($p = 0.033$). However, as will be shown in the results section, the three groups did not differ in their lexical knowledge of gender in German.

The six student groups did not differ from one another with regard to age ($F(2, 111) = 2.52$, $p < 0.085$, $\eta^2 = 0.04$) and AOA of Swedish ($F(2, 111) = 0.17$, $p = 0.843$, $\eta^2 < 0.01$).

### 5.2 Materials

To study gender assignment in Swedish as L3 and L4, an online gender assignment task was developed. It involved 40 inanimate nouns with one exception for uter gender (i.e., *fjäril*, ‘butterfly’). Noun ending was controlled so that gender could not be predicted by the morphophonological shape of the noun. All nouns are included in the Supplementary Material.

We used 20 uter nouns (congruent-uter condition) and 10 neuter nouns (congruent-neuter condition) that were congruent in gender across Swedish, German, and Polish. Gender congruency meant a mapping of Polish and German masculine and feminine gender onto Swedish uter gender, and of Polish and German neuter gender onto Swedish neuter gender (see Lemhöfer et al. 2008; for a similar approach). To explore the influence of L1 Polish, we used 10 neuter nouns that were gender-incongruent with Polish (L1-incongruent-neuter condition). Selecting neuter nouns that do not overlap in gender with their Polish translations was the only possibility to study surface transfer from L1 Polish. Creating a gender-mismatch condition with a proper number of uter nouns was not possible as the vast majority of them share gender with their Polish translations.

A gender-mismatch with German was not included for two reasons. First, we assume that gender congruency between the target language and a non-native language needs to be approached methodologically in a different way compared to gender congruency between the target language and the native language. In L2 studies, a precondition for including gender-match and mismatch conditions is perfect mastery of gender in L1. However, mastery of gender in a non-native language cannot be assumed to be perfect, which makes manipulating gender
congruency less useful. For example, if a participant assigned an incorrect gender to a noun in L2, gender congruency in L3 would remain elusive. Second, isolating a gender-mismatch with German was hardly possible in the language combination under study (see Długosz 2022; for more details). Therefore, all nouns in this study were gender-congruent with German and surface transfer was approached by analysing students’ performance on Swedish nouns whose gender in German they were familiar with (gender congruency) or not (gender incongruency).

To enable comparisons between the three conditions, the nouns were selected so that they were balanced in terms of variables that influence lexical processing (see Table 2). Therefore, they were matched as closely as possible for the number of letters, frequency in Swedish using the Swedish Kelley-list (Kilgarriêt al. 2014), and cognate status with respect to Polish, English, and German. Cognate status was established using the AWSM Tool (https://awsm-tools.com), which calculates text resemblance in per cent based on the Levenshtein distance and length of source/target nouns. One-way ANOVA did not yield any significant differences between the three conditions for number of letters, \( F(2, 37) = 0.31, p = 0.737, \eta^2 = 0.13 \), cognateness with German \( F(2, 37) = 0.02, p = 0.978, \eta^2 = 0.03 \), cognateness with English \( F(2, 37) = 0.01, p = 0.988, \eta^2 = 0.02 \), cognateness with Polish \( F(2, 37) = 1.22, p = 0.305, \eta^2 = 0.26 \), and frequency in Swedish \( F(2, 37) = 0.27, p = 0.760, \eta^2 = 0.12 \).

5.3 Procedure

The procedure of the gender assignment task was as follows: participants were first presented with a fixation dot for 500 ms on a computer screen. Then, they were visually presented with a Swedish bare noun (e.g., *hus*, ‘house’) for 2,000 ms or until a key-press response was registered. The participants were asked to indicate which gender class – uter or neuter – the noun belonged to by pressing one of the response keys. The keys “1” (uter) and “0” (neuter) on a regular computer keyboard were used, in order to avoid possible confusion with letter signs. Participants used both hands to respond. The inter-trial interval was 1,000 ms. The task began with written instructions in Swedish explaining the experimental procedure and a practice block.

Table 2: Stimulus characteristics.

<table>
<thead>
<tr>
<th></th>
<th>Congruent-uter</th>
<th>Congruent-neuter</th>
<th>L1-incongruent-neuter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of letters</td>
<td>4.7 (1.7)</td>
<td>4.5 (1.7)</td>
<td>5.0 (1.5)</td>
</tr>
<tr>
<td>Cognateness with German</td>
<td>38.8 (32.2)</td>
<td>42.0 (39.0)</td>
<td>42.2 (31.5)</td>
</tr>
<tr>
<td>Cognateness with English</td>
<td>23.7 (25.0)</td>
<td>23.4 (22.0)</td>
<td>22.3 (24.5)</td>
</tr>
<tr>
<td>Cognateness with Polish</td>
<td>21.6 (26.3)</td>
<td>23.6 (31.4)</td>
<td>8.1 (11.8)</td>
</tr>
<tr>
<td>Frequency in Swedish</td>
<td>51.1 (42.1)</td>
<td>64.5 (56.3)</td>
<td>54.7 (42.6)</td>
</tr>
</tbody>
</table>
The task included a total of 40 trials. Their order was randomised by participant. The task was hosted on PsyToolkit – web-based software for programming and running reaction-time experiments (Stoet 2010, 2017).

To control for L4S students’ knowledge of gender assignment in German, an untimed gender assignment task was administered. Participants had to assign gender to translation equivalents of the nouns used in the target tasks in Swedish. They did so in Excel by providing the gender names (“masculine”, “feminine”, “neuter”), letter signs (“m”, “f”, “n”) or definite articles (“der”, “die”, “das”). Importantly, they were asked to perform a gender assignment only if they were certain that they knew the gender of the noun. The intention was to determine the gender of the German translation equivalents mastered by participants and which could be the basis for surface transfer.

Participants first performed the gender assignment task in Swedish, followed by the control gender assignment task in German (only for L4S students), and finally the language background questionnaire. Each session lasted approx. 90 min and included three other tasks used for other experiments (not reported here). Participants were tested individually and received gift cards for a bookstore for their participation.

6 Results

6.1 Control gender assignment task in German

L4S students assigned gender to 47.5% of the German translation equivalents. Accuracy was treated as a binary variable (1 – correct gender assignment/0 – incorrect gender assignment). The results are presented in Table 3.

A chi-square test of independence revealed that the association between Year of Studies and Accuracy in German was not significant, $\chi^2 (2) = 4.62; p = 0.099; V = 0.07$. This means that students performed similarly in terms of gender assignment in German regardless of length of experience in learning L4 Swedish.

<table>
<thead>
<tr>
<th>Accuracy German</th>
<th>Year of studies</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st</td>
<td>2nd</td>
<td>3rd/4th</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>0</td>
<td>96</td>
<td>25.3</td>
<td>85</td>
<td>29.7</td>
</tr>
<tr>
<td>1</td>
<td>284</td>
<td>74.7</td>
<td>201</td>
<td>70.3</td>
</tr>
</tbody>
</table>

Table 3: Accuracy in the control GAT in German.
6.2 Gender assignment task in Swedish

Out of 4,680 responses, 203 had to be ruled out because they fell outside the 2 s response window (4.33 %). Again, accuracy was treated as a binary variable (1 – correct gender assignment/0 – incorrect gender assignment). Outliers were defined as any response time ±3 SDs of the mean (0.4 %). Erroneous responses were excluded from the analysis of the response time data. In the following, the detailed results and statistical analyses are presented.

The accuracy data were analysed using a Generalised Linear Model (GLM) with binary distribution and logit link function, and the response time data were analysed using a GLM with gamma distribution and log link function. The following factors were included in the models: Group (L3S, L4S), Year of Studies (1st, 2nd, 3rd/4th), and Condition (congruent-uter, congruent-neuter, L1-incongruent-neuter). In addition, the interactions Group × Year of Studies and Condition × Year of Studies were considered in the analysis.

The Bonferroni test was used as a post hoc test. All pairwise comparisons are given in the Supplementary Material. Gender assignment accuracy in German could not be included in the models because it only concerned L4S students. Therefore, additional analyses using a Pearson’s chi-squared test and a t-test were carried out to test the possibility that knowledge of gender in German could have an effect on gender assignment in L4 Swedish.

6.2.1 Accuracy

The analysis using a GLM with binary distribution and logit link function provided evidence of significant main effects of Year of Studies and Condition as well as two significant interactions: Group × Year of Studies and Condition × Year of Studies. The effect of Group was found not to be significant. The effects in the GLM for Accuracy are presented in Table 4. In what follows, we analyse the results in light of the research questions guiding the study.

Table 4: Effects in the GLM for Accuracy.

<table>
<thead>
<tr>
<th></th>
<th>Wald $\chi^2$</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>0.02</td>
<td>1</td>
<td>0.879</td>
</tr>
<tr>
<td>Year of studies$^a$</td>
<td>186.70</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Condition$^a$</td>
<td>201.09</td>
<td>2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Group × year of studies$^a$</td>
<td>9.87</td>
<td>2</td>
<td>0.007</td>
</tr>
<tr>
<td>Condition × year of studies$^a$</td>
<td>18.94</td>
<td>4</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note. $^a$Significant effects.
Addressing the first research question about the effect of German, L4S students had no accuracy advantage in their ability to assign gender to Swedish nouns over L3S students. As for the second research question about the relationship between the potential effect of German and length of experience in learning L4 Swedish, the analysis of interaction between Group and Year of Studies did not show any differences between the L3S and L4S groups studying in the same year. L3S students did not differ from L4S students in the 1st (OR = 1.30; p = 0.382), 2nd (OR = 0.76; p = 0.422), or 3rd/4th year (OR = 0.98; p = 1.000). Thus, knowledge of German was not beneficial for L4S students, regardless of their length of experience in learning L4 Swedish. The interaction between Group and Year of Studies is illustrated in Figure 1.

When it comes to the third research question about the effect of L1 Polish on gender assignment in L3/L4 Swedish, Accuracy in the congruent-uter condition was higher than in the L1-incongruent-neuter condition (83.3 vs. 60.5 %; OR = 0.30; p < 0.001). Also, Accuracy in the congruent-neuter condition was higher than in the L1-incongruent-neuter condition (72.0 vs. 60.5 %; OR = 1.73; p < 0.001). Addressing the prediction that the effect of L1 Polish would play a less important role with increasing length of experience in learning L3/L4 Swedish, the analysis of interaction between Condition and Year of Studies revealed similar differences among 1st-year students (congruent-uter vs. L1-incongruent-neuter: OR = 0.19, p < 0.001; congruent-neuter vs. L1-incongruent-neuter: OR = 2.06, p < 0.001) and 2nd-year students (congruent-uter vs. L1-incongruent-neuter: OR = 0.39; p < 0.001; congruent-neuter vs. L1-incongruent-neuter: OR = 1.88; p = 0.005). Third/fourth-year students responded more accurately in the congruent-uter condition than in the L1-incongruent-neuter condition (OR = 0.35; p < 0.001). Altogether, 1st and 2nd-year, but not 3rd/4th-year students, were affected by their L1 Polish.

![Figure 1](image-url)
Addressing the fourth research question about the relationship between gender assignment performance and length of experience in learning L3/L4 Swedish, Accuracy for 3rd/4th-year students was higher than for 2nd-year (84.7 vs. 75.0 %; OR = 0.57; p < 0.001) and 1st-year students (84.7 vs. 64.1 %; OR = 0.30; p < 0.001). Also, 2nd-year students performed higher than 1st-year students (75.0 vs. 64.1 %; OR = 0.53; p < 0.001). Thus, students’ performance improved with increasing length of experience in learning L3/L4 Swedish.

The fifth research question concerned the tendency to overgeneralise gender. Accuracy in the congruent-uter condition was higher than in the congruent-neuter condition (83.3 vs. 72.0 %; OR = 0.52; p < 0.001). According to the analysis of interaction between Condition and Year of Studies, the difference between these two conditions was significant in the 1st (OR = 0.40; p < 0.001) and 3rd/4th year (OR = 0.46; p < 0.001). Thus, Accuracy for uter nouns was higher than for neuter nouns, even among the most proficient students.

The interaction between Condition and Year of Studies is illustrated in Figure 2.

Although L4S students were not more accurate than L3S students, we addressed the possibility that they could perform better depending on their knowledge of gender in German, by analysing their Accuracy in Swedish in relation to their Accuracy in German. The responses of L4S students were therefore split into two subsets: one paired with correct gender assignments in German (n = 670) and the other paired with incorrect gender assignments in German (n = 230). A Pearson’s chi-squared test did not provide evidence of an association between Accuracy in German and Accuracy in Swedish in either year: 1st (60.4 vs. 64.0 %), χ² (1) = 0.36, p = 0.547, φ = 0.03, 2nd (78.6 vs. 81.4 %), χ² (1) = 0.28, p = 0.596, φ = 0.03, and 3rd/4th (87.4 vs. 83.3 %), χ² (1) = 0.68, p = 0.409, φ = 0.06. This means that L4S students were not more accurate at assigning gender to Swedish nouns when they provided the correct gender of the German translation equivalents.

Figure 2: The interaction between condition and year of studies for accuracy.
6.2.2 Response times (RTs)

The analysis using a GLM with gamma distribution and log link function provided evidence of significant main effects of Year of Studies and Condition as well as one significant interaction: Group $\times$ Year of Studies. The effect of Group and the interaction Condition $\times$ Year of Studies were found not to be significant. The effects in the GLM for RTs are presented in Table 5. In what follows, we analyse the results with respect to the research questions.

Starting with the first research question about the effect of German, L4S students did not respond faster than L3S students. Regarding the second research question about the relationship between the potential effect of German and length of experience in learning L4 Swedish, the analysis of interaction between Group and Year of Studies did not yield any differences between L3S and L4S students in the 2nd and 3rd/4th year ($p_{s} = 1.000$). However, in the 1st year, L4S students responded faster than L3S students ($p < 0.001$). Thus, the effect of German on RTs was only observed among 1st-year students. The interaction between Group and Year of Studies is illustrated in Figure 3.

### Table 5: Effects in the GLM for RTs.

<table>
<thead>
<tr>
<th></th>
<th>Wald $\chi^2$</th>
<th>df</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1.14</td>
<td>1</td>
<td>0.287</td>
</tr>
<tr>
<td>Year of studies$^a$</td>
<td>16.41</td>
<td>2</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Condition$^a$</td>
<td>273.28</td>
<td>2</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Group $\times$ year of studies$^a$</td>
<td>17.85</td>
<td>2</td>
<td>$&lt;0.001$</td>
</tr>
<tr>
<td>Condition $\times$ year of studies</td>
<td>6.68</td>
<td>4</td>
<td>0.154</td>
</tr>
</tbody>
</table>

*Note. $^a$Effects.

![Figure 3](image.png)

Figure 3: The interaction between group and year of studies for RTs.
When it comes to the third research question about the effect of L1 Polish on gender assignment in L3/L4 Swedish, RTs in the congruent-uter condition ($M = 958.23; SE = 6.72$) were shorter than in the L1-incongruent-neuter condition ($M = 1,015.04; SE = 12.37; p < 0.001$). RTs in the other conditions were comparable ($p > 0.05$). The non-existent difference between the congruent-neuter and L1-incongruent-neuter conditions suggests that L1 Polish did not affect students’ RTs.

Addressing the fourth research question about the relationship between gender assignment performance and length of experience in learning L3/L3 Swedish, 3rd/4th-year students ($M = 869.19; SE = 7.61$) responded faster than 1st ($M = 1,105.29; SE = 13.01; p < 0.001$) and 2nd-year students ($M = 997.99; SE = 10.04; p < 0.001$). Also, 3rd/4th-year students took less time to respond than 2nd-year students ($p < 0.001$). This means that RTs decreased with increasing length of experience in learning L3/L3 Swedish.

The fifth research question considered the tendency to overgeneralise uter gender. RTs in the congruent-uter and congruent-neuter conditions were comparable ($p > 0.05$), showing that the tendency to overgeneralise uter gender was not reflected in RTs.

As in the case of Accuracy, we investigated whether participants’ knowledge of gender in German had an effect on their RTs in L4 Swedish. Again, RTs were split into two subsets: one paired with correct gender assignments in German ($n = 498$) and the other paired with incorrect gender assignments in German ($n = 173$). An independent t-test showed that 1st-year L4S students responded faster when they knew the correct gender in German than when they did not (968.47 vs. 1,173.40 ms), $t(214) = -4.06; p < 0.001; d = 0.63$. However, the effect of knowledge of gender in German was not significant in the 2nd (1,032.10 vs. 992.96 ms), $t(212) = 0.84; p = 0.401; d = 0.12$, and 3rd/4th-year (803.56 vs. 880.24 ms), $t(236) = -1.77; p = 0.076; d = 0.28$. The relationship between Accuracy in German and RTs could not be analysed separately for each condition due to the limited number of responses.

7 Discussion

The present investigation was designed to explore cross-linguistic influence in gender assignment in L3 versus L4 Swedish. Starting with the first research question concerning the effect of knowledge of German, the analysis showed that L4S students did not achieve higher gender assignment accuracy levels than L3S students. The lack of an advantage of L4S students was additionally confirmed by the analysis of interaction between Group and Year of Studies, which revealed no differences between L3S and L4S students being in the same year of studies. This means that experience in learning gender in a previous non-native language does not
necessarily translate into a better mastery of gender in a novel language. However, 1st-year L4S students were found to assign gender to nouns significantly faster than 1st-year L3S students, which provides an affirmative answer to the second research question concerning the relationship between the effect of German and length of experience in learning L4 Swedish. Thus, experience with gender in a previous non-native language seems to accelerate access to the gender information in a novel language.

The most likely explanation of the response time advantage of 1st-year L4S students is the positive effect of gender congruency with German. According to the additional analysis, when 1st-year L4S students provided the correct gender of the German translation equivalents, they responded faster in L4 Swedish. Remember that the response time among 1st-year L4S students was the only measure that was found to be affected by gender assignment accuracy in German. The effect of gender congruency disappeared among 2nd and 3rd/4th-year L4S students, which accords with the results of the main GLM analysis. Therefore, we assume that when 1st-year L4S students had to assign gender to Swedish nouns, the gender representations established in German were activated and influenced their responses, as suggested by previous studies on gender congruency effects in bilinguals (e.g., Klassen 2016; Lemhöfer et al. 2008; Paolieri et al. 2010). After the first year of studies, L4S students were more proficient in German than in Swedish. Therefore, we argue that they initially transferred the gender values from German into Swedish (surface transfer). Since L4S students had metalinguistic awareness of gender before they were confronted with the task of learning gender in their L4 Swedish, they could have transferred the gender values from German into Swedish consciously to some extent. In other words, they could have used transfer as a strategy that enabled them to capitalise on their previous linguistic knowledge and facilitate the learning process. The transfer could have been facilitated by the similarity between the German and Swedish gender systems or, more generally, topological similarity between these languages (Hirosh and Degani 2018; Westergaard et al. 2017). This explanation is reinforced by the fact that the response time advantage of L4S students disappeared in the 2nd and 3rd/4th year of studies, thus corroborating the results of previous studies and demonstrating that the degree of gender congruency effects decreases with advancing L2 proficiency (Bordag and Pechmann 2007; Paolieri et al. 2010).

However, in some tasks, gender congruency effects are associated with both shorter response times and higher accuracy. To explain why no accuracy advantage emerged in this study, we need to consider the tendency to use utter as a default, discussed in more detail below. We assume that utter as a default was the dominant gender use strategy among students, and that this strategy superseded gender congruency effects in the accuracy. Students did not take longer to respond to congruent-neuter than to congruent-uter nouns, which means that using utter as a
default was not associated with any time cost. Therefore, gender congruency effects could manifest in the response time. In addition, it should be noted that gender congruency effects in online tasks are typically measured as a difference of RTs, not of error rates, as incorrect gender retrieval may suggest an instability of the gender representation (Sá-Leite et al. 2019: 1153).

The advantage of L4S students is less likely due to deep transfer from German. Sabourin et al. (2006) observed that the mere presence of gender in L1 positively correlated with gender assignment accuracy in L2. Therefore, it is possible that the presence of gender in two languages could have a cumulative positive effect on gender assignment in L3/Ln. In this study, however, students who learned German showed faster but not more accurate responses. Thus, deep transfer somewhat lacks explanatory force as a mechanism driving the advantage of L4S students. In addition, the present study controlled for cognate status with respect to all previously learned languages. Therefore, the advantage of 1st-year L4S students could not be caused by lexical similarity with German.

The third research question asked about the effect of Polish, which was the native language of all participants in the study. Here, the analysis revealed a robust gender congruency effect in the accuracy, which only partly decreased over time. It was present among 1st and 2nd-year students who were more accurate at responding to congruent-neuter than to L1-incongruent-neuter nouns, but disappeared among 3rd/4th-year students who did not provide more accurate responses to congruent-neuter than to L1-incongruent-neuter nouns. The effect of gender congruency with Polish was also detectable in response times to some extent. Although the interaction between Condition and Year of Studies was not significant in this case, we found a significant effect of Condition, with shorter response times to congruent-uter than to L1-incongruent-uter nouns. This difference could not solely be due to difficulties with neuter gender, because students performed similarly on congruent-uter and congruent-neuter nouns. Instead, gender incongruency with Polish must have been at play here. Therefore, the present study accords with previous findings showing L1 effects in gender assignment in L2 (e.g., Lemhöfer et al. 2008; Sabourin et al. 2006; Stöhr et al. 2012) and extends them to include L3 and L4 contexts.

A comparison of the extent of gender congruency effects between L1 Polish and L3 German leads us to the conclusion that gender congruency with the native language rather than with a non-native language plays a more important role in gender assignment in a novel language (while the effect of L3 German on L4 Swedish was limited to 1st-year students, the effect of L1 Polish manifested in all years of studies). This can be explained by the different stability of gender representations in the native versus non-native language. Unlike L1 gender representations, “L2 gender representations might be unstable or even incorrect, due to an incomplete of faulty acquisition process” (Lemhöfer et al. 2008: 313). A similar approach is adopted in the
Lexical Gender Learning Hypothesis (Grüter et al. 2012; Hopp 2013), which posits that L2 learners develop weaker links between nouns and gender nodes and hence less stable gender representations. As a consequence, they retrieve gender information from the lexicon more slowly. Therefore, gender representations in a non-native language may be too unstable or weak to exert an influence on gender processing in a novel language, especially after a language dominance shift in favour of the novel language.

Showing cross-linguistic influence from both L1 and L3 in gender assignment in L4, the study supports models of L3/Ln acquisition that allow for facilitative influence from more than one previously learned language beyond the initial stages of L3/Ln learning. These include the Cumulative Enhancement Model (Flynn et al. 2004) and the Linguistic Proximity Model (Westergaard et al. 2017). The study also shows that global cross-language similarity is not a precondition for cross-linguistic influence in gender assignment to occur. The influence of L1 Polish on L3/L4 Swedish was very strong, despite the typological dissimilarity between the two languages and the asymmetry between their gender assignment systems. However, both Polish and Swedish have neuter gender, which is the least frequent value in both languages. Therefore, cross-language similarity at the micro- rather than macro-level appears to determine cross-linguistic influence in L3/Ln gender acquisition and use.

Finally, let us address the fourth and fifth research questions that considered students’ performance more generally from a developmental perspective. Using a pseudo-longitudinal design, we were able to gain insights into the development of gender assignment in L3/L4 Swedish. The analysis showed a gradual improvement of students’ gender assignment performance during the course of their studies. With increasing length of experience in learning L3/L4 Swedish, accuracy increased and response times became faster, thereby indicating a gain of gender knowledge and an increase in the automaticity of gender assignment. After three to four years of studies, students achieved an overall accuracy of 84.7%, which demonstrates that gender is acquirable in a non-native language. Previous research on gender acquisition in L2 Swedish has consistently shown that learners tend use utter gender as a default (Andersson 1992; Lahtinen 1998), most likely because it is way more frequent. In this study, even the most proficient students were less accurate at assigning gender to neuter nouns compared to utter nouns. This result points to a persistent tendency to overgeneralise utter gender, which does not decrease with increasing proficiency.

Given that the participants in this study were university students, the question arises as to what conclusions can be drawn from the results in terms of their pedagogical implications. First, teachers should presume that students of Swedish will overgeneralise utter gender even at very high proficiency levels. In order to
reduce the number of errors with neuter gender, teachers could pay more attention to neuter nouns during lessons, for example by showing which nouns in a previously learned language are also neuter, so as to promote surface transfer. This study also showed that students who previously learned gender in a non-native language where not more accurate at assigning gender to nouns in a novel language than those who did not. However, after one year of studies, students who had experience with gender performed the task of gender assignment faster than those who did not. The difference of 67.51 ms between 1st-year L3S and L4S students is rather unlikely to have direct consequences for them. The difference could have been larger earlier, for example after a few months of instruction, which may have resulted in noticeably slower gender processing and hence to possible communication breakdowns in L3S students, compared to L4S students. Therefore, it is important for the teacher to take into account the linguistic background of their students.

This study has potential limitations. First of all, we could not manipulate gender congruency between all languages. Future studies on gender assignment in L3/Ln should regard language combinations in which gender congruency can be controlled for. This study would also have benefited from including a group of students with ungendered L1s. This would enable comparisons to be made between students who learned none, one, and two gender systems to tease apart the effects of bi- versus trilingualism. Such a group should involve university students of Swedish with no knowledge of additional languages. Unfortunately, this is hardly possible because students often already have some knowledge of other languages at the onset of higher education, and study programmes usually offer other languages in addition to Swedish. Furthermore, the present study used a gender assignment task that requires explicit access to the gender information. Future studies should adopt other methods to find out whether students with experience in learning gender would also process gender in L3/Ln faster in other types of tasks. Finally, the results should be interpreted with consideration of the limited number of trials per condition.

To conclude, the investigation into gender assignment in L3 versus L4 indicated that students with experience in learning gender in a non-native language are not more accurate at assigning gender to nouns in a novel language compared to students without such experience. However, experience in learning a gendered language may lead to more automatic gender assignment at lower proficiency levels. The present study showed a multilingual advantage in gender processing speed, but not in gender accuracy. Thus, the positive effect of multilingualism on L3/Ln learning is selective, and so future research should aim to test the limits of the multilingual advantage.
Acknowledgments: I am grateful to two anonymous reviewers and the editor for their thoughtful and constructive comments on an earlier version of this manuscript. Research funding: This work was supported by the National Science Centre, Poland (grant number 2019/33/N/HS2/00349).

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**Supplementary Material:** This article contains supplementary material (https://doi.org/10.1515/iral-2022-0207).