

Interlingual and Intralingual Interference during Gender Production in Czech and German

Denisa Bordag

University of Leipzig & Charles University in Prague

Abstract: The purpose of this article is to explore the psycholinguistic aspects of interlingual and intralingual interference during second language grammatical gender production. Two experiments were constructed to explore whether the difficulties in acquisition and correct production of grammatical gender in a second language are influenced by competition for selection between the gender node of a second language noun and the gender node of its first language translation equivalent. The languages tested were Czech and German, which have the same number and type of grammatical gender. The results of the experiments confirmed the initial hypothesis concerning the gender competition. Furthermore, the analysis of the gender errors subjects made in both experiments yielded evidence that phonological form, especially word termination, also has an effect on gender production in the second language. The intralingual interference manifested itself especially in gender overgeneralization or misselection in cases where second language nouns had an atypical or ambiguous termination.

1. Introduction

Interlingual and intralingual interference have been in the center of second language research for a very long time. The period when the influence of interlingual interference on SLA was overestimated (Weinerich 1953, Lado 1957) was followed by a period which was dominated by the Creative Construction Hypothesis of Dulay & Burt (1974 and later), who claimed that most errors are developmental and that interlingual interference has a minimal effect on SLA. In the late seventies and eighties the situation developed towards a more balanced approach to the interference phenomena, admitting that both interlingual and intralingual interference play an important role in SLA, though the strength of their influence may differ depending on various factors, e.g. language proficiency. Interference, or, as often preferred, transfer is also no longer seen as a mechanical transference of first language features or structures

into the second language, but rather is generally viewed as a complex cognitive mechanism underlying SLA.

The emphasis on the cognitive character of interference/transfer, has not, however, resulted in extensive psycholinguistic research of these phenomena so far. One of the possible reasons is that for a long time psycholinguistics has been concerned mainly with the processing and acquisition of the first language.

In this paper I want to investigate the influence of interlingual and intralingual interference on second language acquisition and production. The subject of my research is grammatical gender. Though a very challenging topic (as numerous studies exploring grammatical gender production and representation in first language show, see below), it has hardly been addressed by psycholinguists so far. A probable explanation might be the fact that one of the two languages used in second language psycholinguistic research is usually English, a language without grammatical gender and thus intrinsically unsuitable for research on the role of interlingual interference in second language gender acquisition and production.

Although there are no studies directly concerned with the topic of this article, a lot of psycholinguistic research has been done to explore how a second language is stored and processed and how it interacts with the first language. In the first part of this article the relevant findings of this research will be reviewed, together with findings concerning grammatical gender in the first language. In the second part, a hypothesis about interlingual interference in second language gender production will be formulated and tested in two experiments. Data from these experiments will also be used to explore intralingual interference. At the end of each section, the results of the experiments and analyses will be discussed and, where appropriate, compared with results of similar experiments in first languages.

1.1 Lexical processing by bilinguals

In the human mind, information about words is stored in a **mental lexicon**. Lexical units are retrieved on the basis of their meaning. First, a preverbal message is formulated, which involves the activation and retrieval of relevant

concepts. From these the activation spreads to so-called **lemmas**, lexical units which are already specified semantically and syntactically, but not yet phonologically. Phonological encoding takes place at the next level of speech production, where the units are called **phonological forms**. In the final stage, articulation is initiated and executed (Levelt et al. 1999).

The first attempt to answer the question of whether the words of two languages are stored in one or two lexicons was made already in 1963 by Kolers (1963). Today it is generally assumed that whereas the units at the conceptual level are shared across languages, lemmas and phonological forms (with the exception of cognates) are language-specific, but stored together in one lexicon.

The preferred hypothesis in psycholinguistic research (De Bot 1992, Poulisse 1997) about lexical storage in the bilingual mind is the **Subset Hypothesis**, first formulated by Paradis (1987). According to this hypothesis, there is only one storage system. The links between its units are strengthened by repeated usage. Consequently, the units of one language are connected with each other more strongly than they are with the units from another language, which results in emergence of subsets. Each subset contains units from one and the same language and can be accessed separately.

Most theories of bilingual and second language lexical access further assume that speakers do not initially select the language-appropriate system (subset) before making a lexical search, but that lexical access is language independent and both systems are activated and searched simultaneously (De Bot 1992, Green 1993, Poulisse & Bongaerts 1994, Hermans et al. 1998, Grosjean, 1998). Hence the lexical processes operating on a bilingual lexicon are principally the same as those operating on a monolingual one. The relationship between translation equivalents could be compared to that of near-synonyms in one language: The not-to-be-selected first language lemma is activated during the lemma selection process of its foreign language equivalent, just as semantically related first language lemmas are. Hermans and his colleagues (Hermans et al. 1998) found evidence that the competition between the to-be-selected foreign language lemma and its first language translation equivalent is as strong as the

competition between near-synonyms, because both lemmas turned out to be phonologically encoded during picture naming (with distractors) in a foreign language (similarly to the way near synonyms are: see Jescheniak & Schriefers 1998, Peterson & Savoy 1998).

The subjective frequencies of foreign language lemmas are, however, generally low, and the links between them weak in comparison with the frequencies of first language lemmas and the strength of connections between them. It is therefore difficult to overcome their activation during second language production (Hermans et al. 1998). The competition with interfering first language lemmas then could be one of the reasons why the production of a word in a foreign language requires considerably more time than in a first language (e.g. Kroll & Curley 1988, Potter et al. 1984) and why unintended code switching occurs, as well as cross-linguistic interference in general.

Theories concerned with how second language speakers (and bilinguals) control their language production (Green 1998, Grosjean 1997, 1998) assume that language systems can be at different levels of activation and that in order to speak one language rather than another its activation level must exceed that of the other language (Paradis 1981, Grosjean 1988 and later). A further notion is that regulation is achieved through the modification of levels of activation of language networks, or items within these networks, rather than via a simple switch mechanism (De Bot & Schreuder 1993, Grainger & Dijkstra 1992, Grosjean 1988, Paradis 1981).

Grosjean (1997, 1998) proposes that the activation and deactivation of language systems allows bilinguals to achieve different language modes. In the monolingual mode, one language is the base language and the other is deactivated at least partially. In contrast, in the bilingual mode (the other extreme of the bilingual continuum), when individuals are speaking with somebody with whom they can code-switch or mix languages, both languages are relatively active, but the activation of the base language is greater. As for the second language speakers, it is assumed that they cannot prevent their first language from being at least partly activated and thus interfering with the production of

their speech in the foreign language (Green 1986, 1993, De Bot & Schreuder 1993).

2. Interlingual Interference

On the basis of this information it is possible to hypothesize that one of the reasons why acquisition and production of grammatical gender causes so many difficulties for second language speakers at all levels of proficiency is the interference from their first language. During second language production, both language systems are activated and searched in parallel: If a second language speaker wants to produce a nominal phrase in his or her second language, the lemmas of the corresponding first language translation equivalents and their grammatical features are also activated and may thus interfere with second language production.

The prominent models of first language production (Levelt 1989, Levelt et al. 1999, Dell 1986) assume that the information concerning grammatical gender is stored in the form of generic gender nodes at the lemma level. Lemmas of all nouns of the same gender are thus connected to one gender node common to them all. If gender information is necessary for further encoding, all activated gender nodes compete for selection and the most highly activated one (usually the one of the target lemma) is finally selected. If we expand this hypothesis to the representation of second language grammatical gender, we might assume that if two languages have the same number and type of grammatical gender, their lemmas are all mapped onto one set of gender nodes. This assumption is supported by theories stressing the fact that the incomplete second language system takes over, or inherits, all it possibly can from the first language (Competition Model by Mac Whinney 1997), i.e. possibly including the generic gender nodes as well.

The hypothesis to be tested, concerning the interlingual interference during the second language production of grammatical gender, thus reads as follows: If the gender of a first language noun differs from that of its to-be-selected second language translation equivalent, their lemmas compete for selection and with

them their corresponding gender nodes, which they automatically activate. Selection of the second language lemma should thus be delayed and subjects should produce more gender errors compared to the condition where both translation equivalents have congruent genders. We will use the term **gender interference effect** to refer to the negative effect of the first language gender on the selection of the gender of its second language translation equivalent .

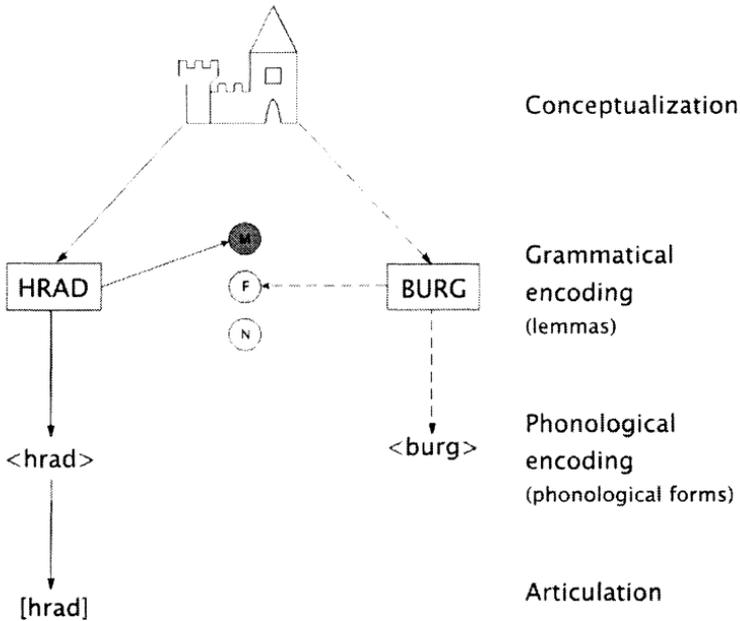


Figure 1: Gender interference effect: The gender node of the target second language word “hrad” (castle, masculine in Czech) competes for selection with the gender node of its automatically activated first language translation equivalent “burg” (feminine in German).

2.1 Experiments

Two experiments were constructed to explore whether such a gender interference effect indeed exists. Two languages, German and Czech, were chosen to be employed in these experiments. Both these languages have grammatical gender and the number and type of their genders is identical: masculine, feminine and

neuter. Despite these similarities, the languages differ in how the three genders are assigned to their nouns: Approximately half of their translation equivalents have identical genders while the other half does not. There is also no 1:1 mapping between the genders of Czech and German nouns: It is impossible to say that e.g. most German feminines correspond to Czech neuters or the other way around. German learners of Czech (and vice versa) thus have to learn the appropriate gender with every single noun they acquire. Sometimes the gender (especially of Czech nouns) can be guessed from their terminations, but this method is not very reliable as there is no ending in the Czech or German language (apart from some derivational suffixes), which would unambiguously mark e.g. only feminine nouns and not any other.

2.1.1 Experimental design

In both experiments, subjects had to name pictures in their second language in two conditions: either with a bare noun (short condition) or with an adjective of size (*big* or *small*) and a noun (long condition). Noun phrases with adjective + noun and not solely article + noun were chosen, because Czech as contrasted to German does not have any articles. On the other hand, adjectives in both languages have to agree in gender with their head nouns. Half of the nouns chosen for the experiment had congruent gender in both languages, the other half did not. The assumption was that production of noun phrases (and nouns?) with congruent gender in both languages would be faster than production of those with different gender in German and Czech. To create optimal conditions in which the first language is most likely (and most strongly) activated, it was decided to keep subjects as close to the bilingual end of the bilingual continuum (Grosjean 1997) as possible. First language fillers were therefore included into the experiment, so that one third (22) of the pictures was to be named in the subjects' first and two thirds (44) in their second language.

2.1.2 Participants

Eighteen subjects participated in each experiment. The German subjects tested in the Czech experiment (Czech was the second language) were mostly students of West Slavic studies, started to learn Czech after their 16th year (at 20 years on

average) and had been learning Czech for 4.6 years on average. The Czech participants tested in the German experiment (German was the second language) started to learn German after their 8th year (at 14 on average) and had been learning German for 8.4 years on average. Many of them experienced long periods when they were not using German at all, so although they had been learning German almost twice as long as the German subjects, their proficiency in the foreign language was on average not exceedingly higher than that of the German subjects. The proficiency of the subjects was judged on the basis of an informal interview in subjects' second language at the beginning of the experiment, the information they provided in the questionnaire and their rating of their familiarity with the experimental items. Most German subjects have already passed or were just about to take the German equivalent of the English B.A. exams in Czech Studies (*Zwischenprüfung*). All Czech participants had sufficient knowledge of German to study at this language at the University of Leipzig. Highly advanced subjects or subjects below the level of intermediate were not tested or not included in the analysis. All subjects were paid for their participation.

2.1.3 Materials

The target stimuli were 72 line drawings in the Czech and 70 in the German experiment. Pictures of forty-four nouns were chosen as experimental items, none of them were cognates. The experimental items were partly different for each experiment to match all conditions (see below). The gender of half of the nouns was congruent with that of their translation equivalents (e.g. *strom* and *Baum*, both masculines), the gender of the other half differed from that of their translation equivalents (e.g. *obraz* (masculine) and *Bild* (neuter)). They were all easily-depictable concrete nouns with high frequency both in Czech and in German. The majority of the experimental items were monomorphemic and inanimate. Each set of 22 nouns consisted of 8 masculines, 8 feminines and 6 neuters. Their length ranged between one and three syllables and each set contained the same number of mono-, di- and trisyllabic masculine, feminine and

neuter nouns. The sets were also matched for final letter to control for the possible influence of phonological form on gender selection.

Next to 44 experimental items, there were also 22 first language filler items and 14 practice items. They were also very frequent in both languages. Some of the fillers were used as practice items as well.

2.1.4 Procedure

The experimental session had three parts and lasted approximately 40 minutes. Participants were tested individually.

The first part started with a short informal dialogue in the second language to test whether the subject is a suitable candidate for the experiment. Then, subjects were presented with instructions emphasizing both the speed and accuracy of their responses and with a booklet containing all 72 (70) pictures, which would later appear in the experiment. Under each picture, its first language name and its second language translation equivalent were printed. Subjects were asked to rate on a 7-point scale 1) how well the picture depicted the first language word, 2) how well it depicted the second language word and 3) how familiar they were with the second word. The ratings were done to ensure that participants really study the names of the pictures and to obtain data for evaluations of the stimuli materials and of subjects' familiarity with the second language words. The ratings also allowed the experimenter to control for whether the words in either the gender congruent or gender-incongruent set were not less familiar or less well-depicted than the words in the other set. Later analyses showed that all words were equally well-depicted and very well known to all participants. (Total rating in the Czech experiment was 6.48 in the congruent and 6.45 in the incongruent group; in the German experiment 6.58 and 6.55 in the congruent and incongruent group, respectively).

In the second part of the experimental session the experiment proper was run. Before the experiment started, participants were presented with a sheet containing Czech and German examples of noun phrases, which were to be used in the experiment's long condition. Attention was not explicitly drawn to grammatical gender.

The experimental session started with a block of 14 practice items, which was the same for all subjects in each experiment. Each trial started with a visual fixation point (= * =) presented on a grey background for 600 ms on the right of the screen in the middle of an imaginary square in which the target picture was displayed later. Then, either a yellow or a blue background appeared for 300 ms. The colour of the background defined the language in which the response was required. Half of the subjects in each experiment had to respond in Czech when a picture was displayed on a blue background and in German when a yellow background appeared, the other half of the subjects had the colours reversed. Following this pause, a target picture was presented in the imaginary square on the right of the computer screen and marked with a black arrow pointing at it from the upper right part of the screen. In the long condition, two pictures of the same object appeared simultaneously on the screen: The target picture marked with an arrow on its usual position on the right part of the screen and either a larger or a smaller control picture of the same object on the left. When the left control picture was larger than the target picture, the subjects had to name the target picture with the adjective “small”; if the left control picture was smaller than the target picture, subjects had to name the target picture with the adjective “big”. Naming latencies were measured from the right or both pictures onset by a voice key.

The display colour of the arrow was contingent on the participant’s response. It turned white as soon as a vocal response was initiated. However, if no response was registered within 5000 ms (time out) the arrow turned red. When the participant was ready for the next trial, he or she pressed the space bar on the keyboard and after a pause of 300 ms the fixation point of the new trial was displayed.

Subjects were randomly assigned to one of two main randomisation versions in each experiment. Each item was presented in a long and in a short condition. Half of the subjects in each experiment saw the items in the long condition first; the other half saw the items in the short condition first. Within each subject, half of the items were long first, the other half were short first. The

two main versions of the experiment differed with respect to which items were long first.

Individual randomisations within the two main versions were prepared for each subject with the following restrictions: No more than 3 trials of the same condition (long vs. short), the same size (big vs. small) and the same gender (masculine, feminine, neuter) were allowed to follow each other. The same language of response was allowed in maximally 4 successive trials.

In the third part of the experimental session, subjects filled in a questionnaire concerning their proficiency in the second language and their language background.

2.1.5 Results and discussion

A total of 352 (14.8%) observations in the Czech experiment and 443 (18.6%) in the German experiment were marked as incorrect. Observations were discarded mainly due to voice-key errors, gender errors and task errors (picture named in the wrong language, with the wrong adjective etc.). The cut-off was two standard deviations from a subject's mean response time in the long and short condition.

Analyses of variance (ANOVAs) were performed on the mean naming latencies per subject (F1) and per item (F2) in each experiment. Overall, naming latencies for pictures with names from the gender-incongruent set were slower than naming latencies for pictures with congruent gender in both languages. Both analysis with subjects as a random factor and with items as a random factor showed a significant effect on condition (congruent vs. incongruent) at the $p < 0.01$ level, (F1 in the German experiment was significant even at $p < 0.001$). The effect of length (short vs. long) was significant in both experiments at $p < 0.001$. There was no interaction between condition and length, which means that the gender interference effect was obtained not only when pictures were named with adjectives, but also with bare noun naming (see Table 1 and Table 2 for summary of the results).

Table 1.
Results of the Czech experiment with reaction times in ms
and % of errors in each experimental condition.

Czech exp.	Congruent		Incongruent		Interf. effect
	RT	%e	RT	%e	
Short	1202	1.4	1276	1.3	+ 74
Long	1642	3.9	1703	4.1	+ 61

Table 2.
Results of the German experiment with reaction times in ms
and % of errors in each experimental condition.

German exp.	Congruent		Incongruent		Interf. effect
	RT	%e	RT	%e	
Short	1136	1.8	1240	2.4	+104
Long	1410	3.9	1489	5.9	+79

As the Tables 1 and 2 show, reaction times in the Czech experiment were numerically slower and the interference effect smaller compared to the German experiment (though no statistic comparison can be made, because different subjects were tested in both experiments). Rather than difference in proficiency (subjects in the Czech experiment made less errors than those in the German experiment), this might suggest different experimental strategies employed by the Czech and German subjects: Whereas German subjects preferred a correct answer to speed (which might have caused that the interference effect partly “disappeared” in the long naming latencies), Czech subjects probably mostly opted for the reversed strategy.

To examine whether the gender interference effect obtained in the RT analysis also showed up in the error analysis, a Qui-square test for the given probabilities was performed on the number of gender errors in the gender-congruent and gender-incongruent conditions. The test reached significance in both experiments ($p < 0.001$). These findings are in accordance with the results of the RT analyses: Incongruent gender of the first language translation equivalent

induces more gender errors in the adjective + noun condition than when the genders of the translation equivalents are congruent in both languages.

Table 3.
Number of gender errors in both experiments in the long condition.
number of gender errors

	Czech experiment	German experiment
Congruent condition	22	48
Incongruent condition	52	90

Three important results were obtained in the experiment. First, the response latencies were longer if the gender of a second language noun differed from that of its first language translation equivalent. Second, more gender errors were produced if genders of translation equivalents were incongruent. These two results support the initial hypothesis that there is a gender interference effect from the first language during second language production of grammatical gender. Interestingly, and this is the third important result, the gender interference effect was obtained not only in the long condition, where the information about grammatical gender was necessary to encode the adjective agreement ending, but also in the short condition, when only a bare noun was named.

In this aspect the gender interference effect differs from a gender distraction effect obtained in picture-word distractor experiments in some native languages, e.g. in German and Dutch (German: Schriefers & Truel 2000, van Berkum 1997, Dutch: Schriefers 1993, La Heij et al. 1998; for overview: Schriefers & Jescheniak 1999). In these experiments subjects had to name pictures either when gender congruent or a gender incongruent word distractor was present. In these experiments, similarly to those described above, slower reaction times and more gender errors were obtained when the target picture and word distractor had different genders than when their genders agreed. This effect was, however, consistently obtained only when the gender was required by the syntactic environment, i.e. by naming with a gender-marked nominal phrase. The difference between the two effects may be due to the fact that whereas the picture

name and word distractor in the first language experiments were usually semantically unrelated words, the two translation equivalents are semantically identical (or at least very close) and share a common concept. Consequently, it might be the case that the competition between gender nodes is stronger if the two relevant lemmas share the same concept and that under this condition the not-to-be-selected gender node interferes and competes for selection even when it is not needed by the syntactic environment. More experiments are, however, necessary in order to explain the difference between the two effects satisfactorily.

3. Intralingual interference

In the next step, the role of intralingual interference during second language production of grammatical gender shall be explored. According to Richards (1971) intralingual interference “reflects the general characteristics of rule learning such as a faulty generalisation, incomplete application of rules and failure to learn conditions under which rules apply”. A typical manifestation of an intralingual interference is thus overgeneralization.

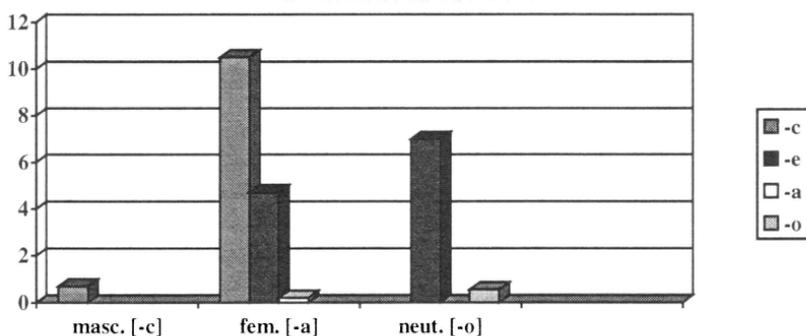
As already mentioned above, the gender of German and especially Czech nouns can be partly derived from a word’s termination. In Czech, there is a typical termination for each gender (monomorphemic words): -a for feminines, -o for neutrals and a consonant for masculines, in German this is only partly true (see below). In both languages it is, however, possible to formulate rules on the basis of which a large number of nouns can be assigned a particular gender according to their termination. One way in which intralingual interference during second language production can be manifested is hence overgeneralization of these regularities between a noun’s grammatical gender and its termination. To find out whether this kind of intralingual interference appears in the data, the gender errors made in the long conditions in both experiments were analyzed.

4.1 Gender errors analysis

A detailed analysis of gender errors made by subjects in both experiments in the long condition revealed a consistent pattern: Subjects made most gender errors in agreement with nouns which had either an ambiguous or an atypical termination

for their gender. In these cases, subjects mostly assigned to these nouns a gender which they „should have had“ according to their termination. Figure 1 presents an overview of average number of agreement errors for items with particular termination in the first experiment (Czech).

Figure 1.
Average number of errors for particular terminations within each gender in the Czech experiment.



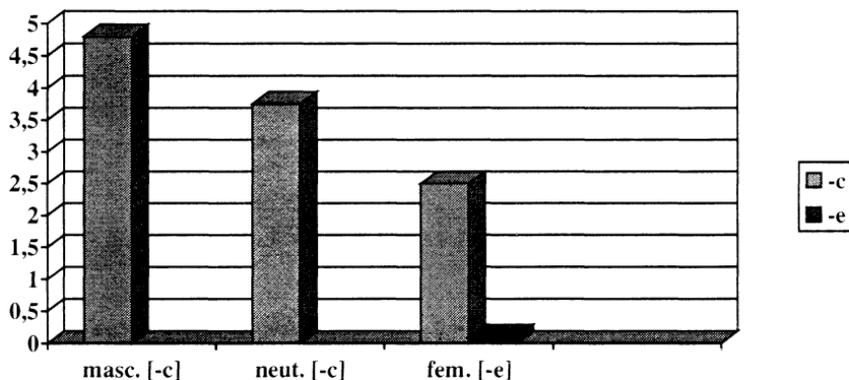
A typical termination for masculine nouns in Czech is a consonant (e.g. *strom* (M) – *tree*), for feminine –a (e.g. *kniha* (F) – *book*) and for neutral –o (e.g. *m sto* (N) – *town*). Figure 1 shows that if the experimental nouns had a gender predictable from their terminations, subjects made almost no agreement errors. The vowel –e is from this aspect an ambiguous termination in Czech, because nouns ending with –e are usually either feminine or neuter (e.g. *židle* (F) – *chair* and *slunce* (N) – *sun*). As obvious from the table, the number of agreement errors with these nouns was higher. Typically, if the participants made a gender error in agreement with a feminine noun ending with –e, it was because they took it for a neuter (e.g. **malé*(N) *židle* – *small chair*), and vice versa (e.g. **malá*(F) *slunce* – *small sun*). Most errors were made in agreement with feminine nouns ending with a consonant (*myš*(F) – *mouse*). As mentioned above, a final consonant is a termination typical for masculine nouns (there are only a few derived Czech masculine nouns which end with a vowel) and though the number of Czech feminine nouns ending with a consonant is quite large, it is still

considered an atypical feminine ending. Characteristically, almost all feminine nouns ending with a consonant were considered masculine by the subjects (*malý(M) myš – small mouse).

The situation was similar in the second experiment (German) as summarized in Figure 2.

Figure 2.

Average number of errors for particular terminations within each gender in the German experiment.



In this experiment, the variety of the noun terminations was not so large as in the Czech experiment: The experimental nouns ended either with a consonant or with –e. This reflects the situation in German inflectional morphology, which is less rich than in Czech. The only typical termination in this experiment was –e, marking predictably German feminine nouns (e.g. *Brücke*(F) – *bridge*). As clearly seen from the table, almost no gender errors were made with these nouns (one error on each such item on average in both conditions in the whole experiment). A consonant must be considered an ambiguous termination in German, because it is a usual ending for both masculine and neuter nouns (e.g. *Kopf*(M) – *head* and *Herz*(N) – *heart*). It is thus not surprising that subjects often confused German masculine nouns with neuter ones (e.g. **kleines*(N) *Kopf* – *small head*) and vice versa (**kleiner*(M) *Herz* – *small heart*). (The average

Interlingual and Intralingual Interference

number of gender errors for neuter nouns in both conditions was 3.75, for masculine nouns 4.8.). A possible interpretation of the fact that subjects made more gender errors in this experiment (138 compared to 74 in the Czech experiment), thus might be that in German participants could rely less on a word termination as a source of information about grammatical gender. If they did, it often resulted in agreement errors, because the correlation between word termination and grammatical gender is generally lower in German than in Czech.

The results of the gender errors analysis clearly shows that intralingual interference affected the gender production in both experiments as well: Subjects clearly overgeneralized the phonological rules for gender assignment in both languages and applied them to nouns with different gender as well. This effect was stronger in Czech than in German, because the correlation between grammatical gender and word termination is more straightforward in this language. The analysis further showed that phonological form of a word plays an important role in second language grammatical gender production and that subjects take word termination into account during gender selection.

It is noteworthy that the way the phonological form of a noun affects the gender assignment in a second language is similar to the way a noun termination influences gender assignment in the child language. Overgeneralizations of typical terminations and difficulties with gender of nouns with ambiguous or atypical terminations have been observed in the language of both Czech and German children. Henzel (1975), who published probably the only article on this topic concerning acquisition of the first language Czech reports error free gender production with nouns with a “clear-cut phonological form” and states that:

„the child learning to speak Czech gives preference to those gender categories which are least ambiguous rather than to those that are most frequent; he attends to the consonant ending with masculine, to the a-ending with feminine, and to the o-ending with neuter” (Henzel 1975, 189)

More evidence about first language gender acquisition has been collected about German. In her monography on gender acquisition by German and English

children, Mills (1986) observes that similarly to the second language learners, also German children have least problems with acquisition of feminine gender of nouns ending with –e and show difficulties with acquisition of gender of nouns with consonantal termination.

4. Conclusion

According to the results of this study there seem to be at least three factors affecting gender production in a second language:

- (1) The gender of the corresponding first language translation equivalent (interlingual interference/transfer).
- (2) The phonological form of the to-be-selected second language noun (intralingual interference/transfer).
- (3) Gender information saved on the second language lemma (otherwise subjects would not be able to produce the correct gender of nouns whose gender differs from that of their first language translation equivalent and/or has an atypical termination).

The gender errors reported in the language of Czech and German children are also in accordance with the hypothesis that at least in the early stages of language acquisition children assign gender on the basis of phonological form of a noun. As native speakers later achieve full competence in gender production and can retrieve grammatical gender very fast without making errors, it is assumed by the models of adult language speech production that the information about grammatical gender is stored.

In light of the findings reported in this paper it however does not seem to be necessarily the case that grammatical gender of second language nouns is stored as their inherent property in the same way as it is assumed for native languages. It is more likely that the grammatical gender of second language nouns is computed each time it is needed anew on the basis of stored information, information coming from the first language lemmas and information coming from the phonological form. In this aspect the second language gender production seems to be closer to the child than to the adult language processing.

Interestingly, effects similar to those in the child language were observed with quite proficient second language learners and with nouns belonging to the core of basic vocabulary in our experiments. It would be interesting to see whether the same interference effects could be obtained with second language speakers of near-native proficiency, or whether it is possible for the second language learners to reach a processing stage equivalent to that of adult native language speakers. The critical period is likely to play a role here.

The influence of phonological form is of crucial importance for the models of speech production, because it would assume a feedback activation between the level of phonological forms and the lemma level, where gender selection takes place. Whereas this idea is compatible with models permitting bottom-up processes like the Interactive Activation Model of Dell (1986), it is incompatible with strictly serial models without feedback like the one of Levelt (1989, Levelt et al. 1999). However, it is not possible to decide on the basis of our data, whether the effect of phonological form could not be also a post-lexical strategy which the subjects use to solve the problem of gender assignment in cases where the usual mechanisms fail. If the feedback from the phonological form is however an automatic process, speech production models which aspire to explain both the first and second language production and which do not permit bottom-up processes would have to reconsider their claims. Further experiments are clearly necessary to answer this question and many others concerning gender production and representation in second languages.

References

- Bordag, D. (2003) Gramatický rod a eová produkce v mateřském a cizím jazyce. *asopis eskoslovenské psychologie* 2:105-122.
- De Bot, K. (1992) A bilingual production model: Levelt's speaking model adapted. *Applied Linguistics* 13:1-24.
- Dell, G. S. (1986) A spreading-activation model of retrieval in sentence production. *Psychological Review* 93:231-241.
- Dulay, H.C. and M.K. Burt (1974a) Errors and strategies in child second language acquisition. *TESOL Quarterly* 8:129-136.
- Dulay, H.C. and M.K. Burt (1974b) Natural sequences in child second language acquisition. *Language learning* 24:37-53.

- Grainger, J. and T. Dijkstra (1992) On the representation and use of language information in bilinguals. In: R. J. Harris (ed), *Cognitive Processing in Bilinguals*. Amsterdam: Elsevier, 207-220.
- Green, D. W. (1993) Towards a model of second language comprehension and production. In: R. Schreuder and B. Weltens (eds), *The Bilingual Lexicon*. Amsterdam: John Benjamins, 249-277.
- Green, D. W. (1998) Mental control of the bilingual-semantic system. *Bilingualism: Language and Cognition* 1:67-81.
- Grosjean, F. (1988) Exploring the recognition of guest words in bilingual speech. *Language and Cognitive Processes* 3:233-274.
- Grosjean, F. (1997) Processing mixed language: Issues, findings and models. In: A. De Groot and J. Kroll (eds), *Tutorials in Bilingualism: Psycholinguistic Perspectives*. Mahwah, NJ: Lawrence Erlbaum Associates, 225-254.
- Grosjean, F. (1998) Studying bilinguals: Methodological and conceptual issues. *Bilingualism: Language and Cognition* 1:131-149.
- Henzel, V. M. (1975) Acquisition of grammatical gender in Czech. *Reports on Child Language Development* 10:188-200.
- Hermans, D., Bongaerts, T., De Bot, K. and R. Schreuder (1998). Producing words in a foreign language: Can speakers prevent interference from their first language? *Bilingualism: Language and Cognition* 1:213-229.
- Jescheniak, J. D. and H. Schiefers (1998) Discrete serial versus cascaded processing in lexical access in speech production: Further evidence from the coactivation of near synonyms. *Journal of Experimental Psychology: Learning, Memory and Cognition* 24:1256-1274.
- Kolers, P.A. (1963) Interlingual word associations. *Journal of Verbal Learning and Verbal Behavior* 2: 291-300.
- Kroll, J. F. and J. Curley (1988) Lexical memory in novice bilinguals: The role of concepts in retrieving second language words. In: M. Gruneberg, P. Morris & R. Sykes (eds), *Practical Aspects of Memory: Vol.2*. New York: Wiley, 389-395.
- Lado, R. (1957) *Linguistics across cultures*. Applied linguistics for language teachers. Ann Arbor: University of Michigan.
- La Heij, W., Mak, P., Sander, J. and E. Willeboordse (1998) The gender congruency effect in picture-word tasks. *Psychological Research* 61:209-219.
- Levelt, W. J. M. (1989) *Speaking: From intention to articulation*. Cambridge, MA: MIT Press.
- Levelt, W. J. M., Roelofs, A. and A.S. Meyer, A. S. (1999) A theory of lexical access in speech production. *Behavioral and Brain Sciences* 22:1-75.
- MacWhinney, B. (1997) Second language acquisition and the competition model. In: De Groot, A. M. B., Kroll J. F. (eds), *Tutorials in Bilingualism: Psycholinguistic Perspective*. Mahwah, NJ: Lawrence Erlbaum, 1997, 113-142.
- Mills, A. (1986) *The Acquisition of Gender. A Study of English and German*. Berlin Heidelberg: Springer Verlag

- Paradis, M. (1981) Neurolinguistic organisation of bilinguals' two languages. In: J. E. Copeland and P. W. Davis (eds), *The Seventh LACUS Forum*. Columbia, SC: Hornbeam Press, 486-494.
- Paradis, M. (1987) *The Assessment of Bilingual Aphasia*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Peterson, R. R. and P. Savoy (1998) Lexical selection and phonological encoding during language production: Evidence for cascaded processing. *Journal of Experimental Psychology: Learning, Memory and Cognition* 24:539-557.
- Potter, M. C., So, K.-F., von Eckhardt, B. and L.B. Feldman (1984) Lexical and conceptual representations in beginning and more proficient bilinguals. *Journal of Verbal Learning and Verbal Behaviour* 23:23-38.
- Poulisse, N. (1997) Language production in bilinguals. In: De Groot, A. M. B., Kroll J. F. (eds), *Tutorials in Bilingualism: Psycholinguistic Perspective*. Mahwah, NJ: Lawrence Erlbaum, 201-224.
- Poulisse, N. and T. Bongaerts (1994) First language use in second language production. *Applied Linguistics* 15:36-57.
- Richards, J. (1971) Error analysis and second language strategies. *English Language Teaching* 25:115-135.
- Schriefers, H. (1993) Syntactic processes in the production of noun phrases. *Journal of Experimental Psychology: Learning, Memory and Cognition* 19: 841-850.
- Schriefers, H. and J. D. Jescheniak (1999) Representation and Processing of Grammatical Gender in Language Production: A Review. *Journal of Psycholinguistic Research* 28:575-600.
- Schriefers, H. and E. Teruel (2000) Grammatical gender in noun phrase production: The gender interference effect in German. *Journal of Experimental Psychology: Learning, Memory and Cognition* 26:1368-1377.
- Van Berkum, J. J. A. (1997) Syntactic processes in speech production: The retrieval of grammatical gender. *Cognition* 64:115-152.
- Weinreich, U. (1974) *Languages in contact. Findings and Problems*. The Hague, Paris: Mouton.

Appendix

Items used in Experiments 1 and 2 in both conditions. The lists contain the target L2 words, their L1 translation equivalents (with their corresponding genders) and the English translation.

Experiment 1

Gender congruent group					Gender incongruent group				
Czech (L2)		German (L1)		English	Czech (L2)		German (L1)		English
Mí	m	Ball	m	<i>ball</i>	Nos	m	Nase	f	<i>nose</i>
Pes	m	Hund	m	<i>dog</i>	Byt	m	Wohnung	f	<i>flat</i>
Vlak	m	Zug	m	<i>train</i>	hrad	m	Burg	f	<i>castle</i>

Denisa Bordag

Strom	m	Baum	m	<i>tree</i>	most	m	Brücke	f	<i>bridge</i>
Dopis	m	Brief	m	<i>letter</i>	obraz	m	Bild	n	<i>picture</i>
Kabát	m	Mantel	m	<i>coat</i>	kostel	m	Kirche	f	<i>church</i>
M síc	m	Mond	m	<i>moon</i>	dárek	m	Geschenk	n	<i>present</i>
Koberec	m	Teppich	m	<i>carpet</i>	pomeran	m	Orange	f	<i>orange</i>
Myš	F	Maus	f	<i>mouse</i>	Lo	f	Schiff	n	<i>ship</i>
Ruka	F	Hand	f	<i>hand</i>	noha	f	Fuß	m	<i>foot</i>
Sví ka	F	Kerze	f	<i>candle</i>	kniha	f	Buch	n	<i>book</i>
Mapa	F	Karte	f	<i>map</i>	hlava	f	Kopf	m	<i>head</i>
Sprcha	F	Dusche	f	<i>shower</i>	ryba	f	Fisch	m	<i>fish</i>
Ko ka	F	Katze	f	<i>cat</i>	židle	f	Stuhl	m	<i>chair</i>
Tabule	F	Tafel	f	<i>blackboard</i>	vesnice	f	Dorf	n	<i>village</i>
Koruna	F	Krone	f	<i>crown</i>	zmrzlina	f	Eis	n	<i>ice-cream</i>
Srdce	n	Herz	n	<i>heart</i>	raj e	n	Tomate	f	<i>tomato</i>
Pole	n	Feld	n	<i>field</i>	slunce	n	Sonne	f	<i>sun</i>
Oko	n	Auge	n	<i>eye</i>	m sto	n	Stadt	f	<i>city</i>
Ucho	n	Ohr	n	<i>ear</i>	víno	n	Wein	m	<i>wine</i>
Okno	n	Fenster	n	<i>window</i>	k eslo	n	Sessel	m	<i>arm-chair</i>
Letadlo	n	Flugzeug	n	<i>plane</i>	zrcadlo	n	Spiegel	m	<i>mirror</i>

Experiment 2

Gender congruent group				Gender incongruent group					
German (L2)	Czech (L1)	English		German (L2)	Czech (L1)	English			
Ball	m	Mí	m	<i>ball</i>	Fuss	m	noha	f	<i>foot</i>
Hund	m	Pes	m	<i>dog</i>	Stuhl	m	židle	f	<i>chair</i>
Zug	m	Vlak	m	<i>train</i>	Kopf	m	hlava	f	<i>head</i>
Baum	m	Strom	m	<i>tree</i>	Wein	m	víno	n	<i>wine</i>
Brief	m	Dopis	m	<i>letter</i>	Fisch	m	ryba	f	<i>fish</i>
Zahn	m	Zub	m	<i>tooth</i>	Schrank	m	sk í	f	<i>wardrobe</i>

Interlingual and Intralingual Interference

Teller	m	Talí	m	<i>plate</i>	Sessel	m	k eslo	n	<i>arm-chair</i>
Teppich	m	Koberec	m	<i>carpet</i>	Spiegel	m	zrcadlo	n	<i>mirror</i>
Maus	f	Myš	f	<i>mouse</i>	Burg	f	hrad	m	<i>castle</i>
Hand	f	Ruka	f	<i>hand</i>	Stadt	f	m sto	n	<i>city</i>
Kerze	f	Sví ka	f	<i>candle</i>	Nase	f	nos	m	<i>nose</i>
Rose	f	R že	f	<i>map</i>	Sonne	f	slunce	n	<i>son</i>
Dusche	f	Sprcha	f	<i>shower</i>	Brücke	f	most	m	<i>bridge</i>
Katze	f	Ko ka	f	<i>cat</i>	Kirche	f	kostel	m	<i>church</i>
Tafel	f	Tabule	f	<i>blackboard</i>	Butter	f	máslo	n	<i>butter</i>
Krone	f	Koruna	f	<i>crown</i>	Tomate	f	raj e	n	<i>tomato</i>
Herz	n	Srdce	n	<i>heart</i>	Schiff	n	lo	f	<i>ship</i>
Feld	n	Pole	n	<i>field</i>	Bett	n	postel	f	<i>bed</i>
Ei	n	Vejce	n	<i>egg</i>	Pferd	n	k	m	<i>horse</i>
Ohr	n	Ucho	n	<i>ear</i>	Dorf	n	vesnice	f	<i>village</i>
Fenster	n	Okno	n	<i>window</i>	Eis	n	zmrzlina	f	<i>ice-cream</i>
Flugzeug	n	Letadlo	n	<i>plane</i>	Geschenk	n	dárek	m	<i>present</i>

Denisa Bordag

Institut für Linguistik

Universität Leipzig

Beethovenstraße 15

04107 Leipzig

Germany

e-mail: denisav@gmx.net