

Facilitative Online Processing of Gender in Swedish as a Second Language

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Similar to other Indo-European languages, Swedish makes use of grammatical gender and distinguishes between two noun categories: common and neuter nouns. This study aimed to examine whether L1 speakers whose L2 lacks gender are capable of utilizing gender agreement markers in a timed picture naming task in Swedish. The participants consisted of 24 L1 speakers of Finnish, and they were tested in a picture naming task, a gender assignment task, and a lexical proficiency test. The study firstly focused on whether the learners can obtain a novel feature in their L2 and if the gender informative agreement markers are used to facilitate naming times. Then, it was examined if this process differs as a function of the noun's markedness status (common nouns; default, neuter nouns; marked), and the number of informative cues (one or two).

In the gender assignment task, participants showed greater assignment accuracy on common nouns. In the picture naming task, informativeness or the level of informativeness did not affect naming times. The naming accuracy for neuter nouns was lower than for common nouns and the naming times for neuter nouns were slower. These effects, however only reached significance in the comparisons between conditions providing two vs. zero gender cues. The consistency in grammatically correct gender assignment facilitated naming times significantly for all conditions. Since this study did not find any significant effect of informativeness, the facilitation effects found occurred even in the absence of a gender cue, suggesting that the connections between nouns and gender markers that the learners have created are not strong enough to become activated before the presentation of the actual noun.

Keywords:

Facilitation, Picture Naming, Gender, Markedness, Second Language Acquisition.

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1. Introduction

Gender is a grammatical feature present in many Indo-European languages like French, Spanish, German, Swedish, and Russian, just to name a few. The term gender is derived from the Latin word *genus* that roughly translates to “kind of sort” (Corbett, 1991:1). Different languages display gender differently through agreement, but agreement is, however, at the core of gender as it marks for the different noun categories (Corbett, 1991). Linguistically, gender refers to the different noun classes that require different types of agreement (Corbett, 1991:4) and it can be displayed through e.g. articles, determiners, and adjectives.

A notable amount of research on second language acquisition has been dedicated to the study of the mastery of gender. Adult native speakers rarely make errors in connection to gender (Corbett, 1991:7). Spanish-speaking children have been reported to master gender by the age of three (Lew-Williams & Fernald, 2007) and monolingual Swedish children acquire gender early and make little to no errors (Andersson, 1992; Bohnacker, 2003). Native speakers can also make use of the agreement markers both in online and offline tasks (see e.g. Guillelmon & Grossjean, 2001; Hopp 2013; Montrul, Davidson, De la Fuente & Foote, 2014; Fowler & Jackson 2017; McCarthy, 2008).

Learners, however, can struggle with gender agreement even at high levels of reported proficiency (Guillelmon & Grosjean, 2001; Hawkins & Chan, 1997). As to why this is, research on L2 gender acquisition has addressed questions such as are L2 speakers capable of acquiring novel features in their second language and if L2 speakers are capable of utilizing gender cues to facilitate processing. Some theories hypothesize that while L2 grammar is initially mediated by the L1, it is not necessarily confined by it and thus novel features can be acquired even after puberty (Schwartz & Sprouse, 1996). Additionally, it has been proposed that processing in the L2 creates a burden on the learners which weakens their ability to behave in a native-like manner (Prévost & White, 2000).

Other theories have argued that late L2 processing is directly dependent on L1 morphology and thus novel features cannot be acquired to native-like levels (Hawkins & Chan, 1997). Along these lines, more recent proposals argue that the absence of a feature in the L1 leads learners to create faulty representations in their L2, since post-pubescent learners have to rely on frequency information when learning novel features (Hawkins, 2009). This results in the more common

feature, such as the masculine nouns and their markers in Spanish to become the *unmarked* default form, and the feminine nouns to become *marked*, as they are stored in memory as exceptions to the default (López-Prego, Covey, Gabriele & Fiorentino, 2018). Markedness can be conceptualized as grammatical opposites, like masculine and feminine gender and it is closely tied to the informativeness of an element (Battistella, 1996:9). In terms of grammatical gender, the rarer feminine noun forms in Spanish carry more information and constraint, than the more frequent masculine forms. That is why feminine forms are considered to be marked while masculine forms are considered to be unmarked.

Predictive processing refers to the ability to utilize syntactic information to speed up processing of the language. Prediction has been assessed with e.g. word repetition tasks (Guillelmon & Grosjean, 2001; Montrul et al., 2014), picture naming studies (Fowler & Jackson, 2017) and picture selection tasks (Grüter et al., 2012; Hopp, 2013) in which native speakers have been reported to being able to capitalize on gender nodes when processing their L1 online. What this means is that when native speakers encounter gender-marked adjectives or articles, they are able to anticipate seeing or hearing a noun from the category which agrees with the gender marker. For example, if a Swedish speaker read a sentence like: “Jag köpte en dyr...” (I bought a.COMM. expensive.COMM.), they expect to only see nouns that agree with the indefinite article *en* and adjective *dyr* instead *ett* (a.NEUT.) or *dyr-t* (expensive-NEUT.).

Although it has been previously noted that gender agreement can pose difficulty for even advanced learners, it has also been reported that participants actually struggle more with assigning the correct gender values to nouns (Grüter et al., 2012). Evidence from previous research (Grüter et al., 2012; Hopp, 2013) also lends support to the notion that the overall mastery of noun gender is indicative of whether learners can utilize gender cues in the stimulus to predict the upcoming nouns or not. Other studies have found that especially late learners perform inherently different to native speakers when it comes to prediction (e.g. Guillelmon & Grosjean, 2001; Montrul et al., 2014).

Individual features of the participants have also been discussed in connection to whether gender can be used predictively. Like mentioned, age of acquisition (maturation effects) seems to play a part in how speakers are able to use gender cues when processing in their L2 (Guillelmon & Grosjean, 2001; Montrul et al., 2014) with early bilinguals being able to perform in a more native-like manner than late bilinguals. Additionally, proficiency has also been shown to affect the way participants perform, with more proficient learners performing more similarly to native speakers

(McCarthy, 2008, White et al., 2004). Furthermore, and quite crucially, methodology and the tasks used to measure sensitivity to gender seem to influence whether learners show sensitivity to gender agreement or not. While a participant might show sensitivity in offline tasks, the same is not necessarily true in online tasks (McDonald, 2006; Montrul et al., 2014; Grüter et al., 2012).

Much of the previous research has focused on the acquisition of gender in Spanish (e.g. Montrul et al., 2014; Dussias et al., 2013; López Prego 2015; Lew-Williams & Fernald 2007 & 2010), French (Guillelmon & Grosjean, 2001; Dahan, Swingley, Tanenhaus & Magnusson, 2000) and German (Hopp 2013, Fowler & Jackson 2017). Swedish, like many other Indo-European languages, realizes grammatical gender with two categories common and neuter. Compared to e.g. Spanish and French, Swedish is more opaque in how it categorizes nouns. Spanish and French display noun canonicity, which means that certain typological and phonetical features can be attributed to a specific noun category. In Spanish nouns ending in *-o*, are often masculine and nouns ending in *-a*, are feminine. Such strong consistencies do not exist in Swedish, meaning that learners cannot easily use such information when establishing connections between nouns and the different noun categories, thus the categorization of nouns has to be learned by heart.

In many studies on second language acquisition of gender, the learners also often consist of English speakers. Theories differ in whether the L1 is seen to be all-constraining to the L2 or not, but nonetheless, the use of mostly English speakers as learners makes the overall sample linguistically homogenous. If accounts that argue that features can be transferred from the L1 to the L2 (Schwartz & Sprouse, 1996) are considered, it could be hypothesized that learners with morphologically rich L1s, such as Finnish, could have an advantage over, e.g. English speakers in gender-related tasks since Finnish speakers are used to acquiring syntactic information from suffixes, while English is a morphologically poor language.

This current study is concerned with the acquisition of gender in L2 Swedish. The aim of the study is to examine if late L2 learners of Swedish with Finnish as their L1 can acquire gender in Swedish and then use it to facilitate processing in a timed online picture naming study. Mastering noun-phrase morphology is known to cause issues for learners of Swedish (Pienemann & Håkansson, 1999:409) and Finnish L1 speakers are not an exception to this (Nyqvist, 2015 & 2018). For Finnish L1 speakers, gender is a novel feature. Finnish, unlike Swedish, not only lacks grammatical gender on nouns but also on a pronominal level, as no gendered pronouns exist.

The ability to utilize gender cues will be examined by manipulating informativeness in grammatical sentences. In other words, the stimulus sentence either does or does not include gender cues, which could be used to facilitate access to the target nouns. In addition, this study manipulates the number of cues in the stimulus. The effect of markedness is also considered, by examining the potential differences in naming times between the two Swedish noun categories, the unmarked *common* and the marked *neuter*. All in all, this study adds to the current body of research on the facilitative use of gender in online processing by adding a new language pairing, manipulating the degree of informativeness, and using a novel, more constraining methodology to study the acquisition and processing of gender in a second language.

2. Grammatical Gender in Swedish

Standard Swedish distinguishes between *common* and *neuter* gender. The former encompasses the words that formerly used to belong to separate feminine and masculine gender categories. Around two-thirds of Swedish nouns are common while the rest are neuter (Bohnacker, 2003:199). This makes the neuter nouns the marked forms in Swedish (Battistella, 1996). Gender in Swedish is marked both on definite and indefinite articles, common nouns use the article *en*, e.g. *en hund* (a.COMM. dog.COMM.) while neuter words use *ett*, e.g. *ett glas* (a.NEUT. glass.NEUT.). Definiteness is expressed as a suffix instead of an article as shown in example (1).

Swedish also makes use of double definitiveness. In cases where nominal phrases include definite articles *den* (common) or *det* (neuter) gender information is present both at the article and definite suffix (Teleman, Hellberg & Andersson, 1999:96). In the presence of a definite article, adjectives are inflected for definitiveness, but they are not inflected for gender.

(1) *Den glad-a hund-en*

‘The.COMM.SG happy.SG-DEF. dog.COMM.SG-DEF.COMM’

Noun gender is also realized on adjectives in singular forms (Teleman, Hellberg & Andersson, 1999:144). Adjectives inflected to agree with common nouns are not marked (2) but neuter inflections on the other hand are marked with *-t* or *-tt* (3). Plural adjectives do not differ from one another regardless of whether they are complementing a common or neuter noun and are marked with *-a* (4). As can be noted from examples (1) and (4), the plural and definite forms for regular

adjectives are the same but in (1) the adjective marks for definiteness, and in (4) it complements a plural noun.

(2) *En snäll-ø hund*

‘A-COMM. kind-COMM.SG dog.COMM.’

(3) *Ett snäll-t barn*

‘A-NEUT. kind-NEUT.SG. child.NEUT.’

(4) *Många snäll-a hund-ar/barn-ø*

‘Many kind-PL dogs.COMM-PL/children.NEUT-PL’

Gender is also expressed in possessives and demonstratives in singular forms e.g. *min* (common) *mitt* (neuter). Possessives for 3rd person singular remain the same *hans* (his) and *hennes* (hers) regardless of noun gender. Possessives also do require the adjectives to be inflected to the definite form, as shown in examples (5) and (6).

(5) *Hans söt-a katt*

‘His cute-DEF. cat.COMM.’

(6) *Hennes stor-a hus*

‘Her big-DEF. house.NEUT.’

In principle, one noun only has one gender, but some exceptions such as *apelsin* (an orange) have some regional variation as to which gender is commonly used (Teleman, Hellberg & Andersson, 1999:61-62). Gender is a lexical property that is not dictated by the structure or attributes of the noun (Corbett, 1991), and in general, the way nouns are assigned gender in Swedish is considered to be quite arbitrary (Andersson, 1992:37).

Some regularities in noun categorization in Swedish do still exist. For example, a large portion of Swedish animate nouns are common, but exceptions like *ett barn* (a.NEUT child.NEUT) and *ett vittne* (a.NEUT witness.NEUT) do exist (Andersson, 1992:36). Furthermore, some other semantically coherent groups like native berries are often neuter (Teleman, Hellberg & Andersson, 1999:60). Additionally, some phonological and morphological regularities also exist but are often accompanied by an abundance of exceptions (Andersson, 1992:38).

3. Literature review

3.1 Informativeness

A few studies have shown that some second language learners are capable of utilizing syntactic information when processing their L2, even in online tasks, meaning that they are capable of excluding e.g. certain categories based on the grammatical information in the sentence (e.g. Grüter et al, 2012; Hopp, 2013; Fowler & Jackson, 2017; Covey et al., 2018; López Prego, 2015). Grüter et al. (2012) argue that the source of the discrepancies in L2 gender acquisition lies on the lexical level and is dependent on how adult learners learn and process words. 19 L1 English speakers with advanced or near-native skills in Spanish and 19 L1 speakers of Spanish completed an assortment of both online and offline tasks to determine whether problems with L2 gender are rooted in processing or production.

In first the task, participants were asked to match sentences to one of the three pictures presented to them (Grüter et al., 2012:199). Informativeness in the context of this study refers to the gender node in the stimulus sentence being applicable to only one of the images participants were presented with. Both the L1 and L2 speakers performed at ceiling with no significant difference in performance, indicating that L2 speakers are capable of making use of gender cues provided on the determiners and articles in a native-like manner (Grüter et al., 2012:200). However, native-likeness was not replicated in the online tasks. In the elicited production task, participants would hear a question prompting them to describe one of two images that differed only with regards to e.g. color. L2 speakers made significantly more errors in gender assignment than the natives, but rarely made agreement errors (Grüter et al., 2012:202) indicating that the learners are struggling with gender assignment rather than agreement.

In a third task, the subjects' eye movements were monitored to see whether gender cues on determiners facilitated the prediction of the upcoming noun. Participants would look at the computer screen with two images and hear a sentence auditorily. The images were either similar or dissimilar with respect to grammatical gender, thus manipulating the informativeness of the determiner. Additionally, novel nouns were included in the stimulus. The novel nouns together

with their respective articles were introduced in a teaching trial in an auditory manner to control for the level of exposure (Grüter et al., 2012:203-204). Although learners were slower than the native speakers, both groups were faster at identifying the target item when the two images did not share the same gender. The effect for the L2 speakers was however not significant with the familiar nouns, but more robust with the novel nouns (Grüter et al., 2012:206), indicating that using cues predictively is not out of the learners' capabilities.

These findings lead Grüter et al. (2012) to propose the Lexical Gender Learning Hypothesis, which states that the differences in L1 and L2 gender processing arise from the different ways infant L1 speakers and mature L2 learners learn languages. Children learn gender in a way in which articles and nouns are presented together in a sequence, whereas learners will learn readily segmented categories; articles and nouns. When the novel nouns were introduced in a way that an infant L1 speaker learns a language, it strengthened the association between the gender nodes and novel nouns for the L2 speakers (Grüter et al., 2012:211).

Hopp (2013) wanted to contrast Grüter et al.'s (2012) hypothesis with the Representational Deficit Hypothesis (Hawkins, 2009), which argues that grammatical features absent in an L1 will be learned through frequency information, creating mental representations of defaults and exceptions in contrast to how native speakers come to form a mental representation of gender. The theory is specifically focused on late L2 acquisition, as the theory hypothesizes that novel features become unattainable for learners' post-puberty (Hawkins, 2009). Hopp (2013) constitutes that consistency in gender assignment facilitates access into an adult L2 speakers' lexicon, and thus facilitates prediction, despite gender being an absent feature in the L1. 20 L1 English-L2 German speakers and a German-speaking control group participated in the study.

The participants first completed a picture-naming task, in which native speakers scored at ceiling, while the L2 speakers showed variability on the accuracy of gender assignment and were thus divided into gender consistent and gender variable groups based on the number of errors they made. In the comprehension task, participants' eye movements were monitored while they looked at images and simultaneously listened to sentences that included a gender cue (similar to Grüter et al., 2012). Participants also saw trials with a lexical cue targeting number agreement as opposed to gender. Participants' gaze was monitored by an eye-tracking device. The trials' informativeness was based on the participants' subjective gender assignment. This ensured that grammatically

informative trials do not e.g. become subjectively uninformative when participants have incorrectly assigned the same gender on all images (Hopp, 2013:45).

The native speakers and the gender-consistent group used gender cues predictively, while the gender inconsistent group did not. The results support Grüter et al.'s (2012) proposal that lexical knowledge of a noun's gender facilitates predictive processing. Hopp (2013:51) suggests the source of variability in the learners seems to rather reflect the differences in the capability of linking gender cues to nouns and being able to activate these links during processing (Grüter et al., 2012). This suggestion is further supported by the significant correlation between mean reaction times in the lexical cue condition and the size of the predictive effect (Hopp, 2013:48) meaning that the overall speed of lexical access modulated morphosyntactic processing.

Fowler and Jackson (2017) conducted an experiment examining whether semantic and morphosyntactic priming facilitates picture naming in German. L1 English-speakers who were late learners of German were tested in a Visual Priming task alongside L1 speakers of German. The participants were first presented with a target and a foil image, alongside the corresponding adjectival phrases, followed by a priming sentence and finally the target image. Participants were instructed to name the target images aloud. The target (e.g. ein roter Tisch, a.MASC. red.MASC. table.MASC.) and foil images (e.g. ein rote Kirche, a.FEM red.FEM church.FEM) either shared or differed in terms of gender and semantic properties, therefore affecting whether the information in the prime sentence, e.g. *Hier ist der rote* (Here is the.MASC. red.MASC.), could be used to predict the target image (Fowler & Jackson, 2017:888). All participants also completed a written picture naming task and a gender assignment task.

The L1 speakers were significantly more accurate in assigning gender to the nouns, while no significant difference in picture naming accuracy was found (Fowler & Jackson, 2018:890). The results from the Visual Priming Task were analyzed using mixed-effect models which permits including fixed (e.g. gender, condition) and random effects (e.g. participant, item). The L2 speakers showed sensitivity both to the gender and semantic primes but the L1 speakers demonstrated a clear advantage over them, as reflected in shorter reaction times. Participants also responded faster when the morphosyntactic or semantic primes were informative concerning the target and foil images and this effect was similar across all three genders of German (Fowler & Jackson, 2018:891). This finding is consistent with the lexical gender learning hypothesis which does not predict a difference in the way noun categories are processed (Grüter et al., 2012). For

item-specific gender accuracy, the L2 speakers did not show a significant effect on naming times, opposite to Hopp (2013). It has to be noted, however, that Fowler & Jackson (2017) did not consider subjective gender assignment the way Hopp (2013) did which could in part explain the missing effect. This is also an unexpected finding in terms of the Lexical Gender Learning Hypothesis as participants' knowledge of lexical gender should be the factor facilitating processing.

Fowler & Jackson (2017) also conducted a second experiment in which they manipulated the number of informative gender cues in the stimulus sentence to determine whether facilitation arises as a function of a gender cue or short-term memory activation (Fowler & Jackson, 2017). The same set of materials was used besides the target and foil images being non-contrastive with respect to color and trials also varied in how many gender cues were provided by including or omitting the color adjective (Fowler & Jackson 2017:893). The interaction between the prime and adjective was significant suggests that the inclusion of the adjective facilitated predictive processing, as the reaction times faster were than in cases where only the indefinite was provided (Fowler & Jackson 2017:896). Fowler & Jackson (2017:898) hypothesize, that even without noun-gender node connections, learners can potentially predict upcoming nouns if provided with sufficient morphosyntactic support.

Results from a study using L1 English – L2 Hindi learners also suggest that L2 speakers with lower levels of proficiency can use gender cues to facilitate access to target nouns (Covey et al., 2018). A speeded picture-selection task was used in which the objective was to choose one of two pictures in response to the stimulus sentence. These trials were separated based on whether the images could be differentiated by looking at the gender cue in the sentence or not. In addition, transparent lexical number agreement was tested, to measure the overall lexical access speed, which has previously correlated with how fast participants make use of morphosyntactic cues (e.g. Hopp, 2013). The accuracy scores for all participants in the lexical trials was at least 93 % and the analysis of the reaction times showed that the lexical number cues facilitated processing in both the Hindi speakers and L2 learners, providing evidence that knowledge of a lexical property does facilitate access to target nouns (Grüter et al., 2012).

In the gender trials, the learners chose between the images quicker when the images did not share the same gender, meaning that the gender cue was informative. This effect was the same regardless of whether the target noun was masculine or feminine. The same was not true for the Hindi control

group, as informativeness facilitated selection only in the feminine noun trials (Covey et al., 2018:332). A significant negative correlation between the reaction times in the lexical (number trials) and gender effect size also suggests that individual processing speed influences gender computation, but this was only found to be significant for the L2 group (Covey et al., 2018:334). This effect is similar to that of Hopp (2013) suggesting that automated lexical processing does facilitate processing.

One clear limitation to the study is the fact that the Hindi speaking control group did not consist uniformly of native speakers of Hindi, but rather of a multilingual group that had come in contact with the language before the age of five (Covey et al., 2018:331). So, in essence, this can be considered to be an early learner group. The control group also displayed facilitation on feminine nouns, which is not to be expected for native speakers under the Representational Deficit Hypothesis (Hawkins, 2009). However, native speakers have been shown to be sensitive to markedness in previous studies (Alemán Bañón & Rothman, 2016). Furthermore, the learner sample consisted only of nine people of varying levels of proficiency which makes the results ungeneralizable.

Guillelmon & Grosjean (2001) aimed to study whether early and late bilinguals would display sensitivity for gender markings in an auditory task (Guillelmon & Grosjean, 2001:504). The participants consisted of early and late English-French bilinguals and a French L1 control group. The experiment consisted of an auditory naming task that required participants to listen to phrases (determiner-adjective-noun). The objective was to repeat back the noun as quickly as possible and the reaction time was measured. The determiners were either grammatically correct, incorrect with respect to gender agreement, or neutral (no gender cues), thus manipulating informativeness. For example, the word *bateau* (boat.MASC.) could either be combined either with *le* (the.MASC.), *la* (the.FEM.), or *leur* (their). The adjective *joli-e* (beautiful.MASC/-FEM.) was used on all trials, as the pronunciation of the word remains the same despite it becoming inflected in the feminine form orthographically.

Congruency and incongruency effects arose for both the early bilinguals and the natives, while neither effect was found for the late bilinguals. What this means is that the native speakers and early bilinguals showed effects of grammaticality in both the grammatically correct (congruency) and incorrect (incongruent) trials. However, in a follow-up study, the late learners did display accurate knowledge of the noun's gender. Thus, they hypothesize that the lack of congruency and

incongruency effects in late bilinguals is not necessarily an indication of an L2 speaker's inability to make gender connections to nouns, but rather that these connections are not activated when processing auditory information (Guillelmon & Grosjean, 2001:509), favoring a computational account (Prévost & White, 2000, Grüter et al., 2012).

That said, the design of the study could potentially have affected the results. The first issue has to do with the fact that the congruent and incongruent phrases were separated into two sets of stimuli. Each participant only completed one of these two sets, in other words, they only heard grammatically correct or incorrect phrases together with the neutral ones. This between-subjects design is not necessarily the most accurate way of conducting this type of lexical task, since it is known that individual differences in e.g. lexical processing speed do matter (Hopp, 2013; Fowler & Jackson, 2017). Second, the participants only listened to one set of stimuli, and the number of nouns used is quite low which also results in fewer data points. Each participant only completed nine masculine trials and nine feminine trials, for the features that were the focal point of the study.

In a more recent study, Montrul et al. (2014) tested monolingual Spanish speakers alongside heritage speakers and late L2 learners of Spanish in three different online tasks. The study aimed to examine the role of age of acquisition on implicit and explicit knowledge of grammar for both canonical and non-canonical nouns. The study consisted of a Word Repetition Task similar to Guillelmon & Grossjean (2001) and a Gender Monitoring Task in which participants were asked to indicate the gender of the target noun by pressing a button. Participants also completed a Grammaticality Judgement Task. The stimulus was presented in a noun-phrase sequence, consisting of a determiner, an adjective, and a noun similar to Guillelmon & Grossjean (2001) and were manipulated for grammaticality and canonicity, the latter referring to the regularities in noun and noun marker endings, e.g. the ending *-a* being associated with feminine nouns in Spanish.

In the gender monitoring task, heritage speakers and late L2 learners were significantly less accurate than monolingual speakers. Furthermore, the heritage speakers and L2 learners were also more affected by the ungrammatical sentences than the monolingual native speakers reflected in the slower reaction times. All experimental groups also showed an effect of grammaticality, suggesting sensitivity to gender congruency (Montrul et al. 2014:130). The results from the grammaticality judgment task were quite similar as both the heritage speakers and L2 learners displayed an effect of grammaticality similar to the native speakers. The heritage speakers did not show any clear advantage over the learners in either of these tasks.

In the word recognition task, all groups performed at ceiling in terms of accuracy. The L2 learners did not display effects for condition, while the native and heritage speakers were slower at repeating the words in the ungrammatical condition with non-canonical nouns (Montrul et al., 2014:131). The L2 speakers displayed the opposite patterns for the effect of canonicity as the non-canonical nouns were named faster in the ungrammatical condition. Montrul et al. (2014:133) hypothesize that for the learners, some of the non-canonical nouns could have been treated as the wrong gender, thus giving rise to this opposite pattern. Montrul et al. (2014:135) conclude that L2 speakers can attain sensitivity to gender markings in more explicit tasks, while heritage speakers process Spanish in a more native-like manner also in implicit tasks. These differences are attributed to the differences in learning environments, i.e. heritage speakers are used to using Spanish orally/school Spanish. This proposal is similar to the one Grüter et al. (2012) make for the Lexical Gender Learning Hypothesis; the mode in which is learned is fundamentally different and that could affect the way connections between determiners and nouns are formed.

Montrul et al. (2014:127) note that as a word repetition task does not necessarily require the participants to pay attention to the stimulus phrase it measures implicit knowledge. It is counterintuitive to argue that this type of task is then a sufficient measure of sensitivity to a grammatical feature such as gender if participants could potentially choose to ignore the critical grammatical features. Furthermore, knowledge of L2 grammar cannot be argued to be completely intuitive (Mitchell et al., 2013:96).

In sum, learners for whom L2 gender is a novel feature, struggle with gender assignment even at high levels of reported proficiency. Some studies on informativeness show that early bilinguals tend to be more capable of making use of gender cues when processing online than late learners (Guillelmon & Grosjean, 2001; Montrul et al., 2014) while others have found that even late learners are capable of predicting upcoming nouns based on gender cues (Covey et al., 2017; Fowler & Jackson, 2018; Grüter et al., 2012). Some studies have also constricted prediction to being possible just for certain subgroups (e.g. gender consistent learners in Hopp, 2013).

3.2 Markedness

Markedness refers to the informativeness of an element and in the context of grammar, it is regarded as grammatical opposites (Battistella, 1996). In languages like Spanish and Swedish, noun categories are asymmetrical in noun gender assignment. In Spanish, masculine nouns are more frequent than feminine nouns and in Swedish, common nouns are more frequent than neuter nouns. Thus, the less frequent nouns and their agreement markers, become *marked* and the more frequent ones become the *unmarked*.

The Representational Deficit Hypothesis (Hawkins, 2009) argues that differences in L1 and L2 processing are a result of a deficient L2 grammar. The absence of a grammatical feature in the L1 predisposes learners to create faulty representations of their L2, as frequency information is used to create mental representations (Hawkins, 2009:72). In other words, a native speaker of e.g. English or Finnish will compensate for the lack of knowledge of gender in their L1 by unconsciously storing information of how often a specific form is used. By this logic, the more frequent form becomes the default and the feminine forms are stored in memory exceptions (Hawkins, 2009:72). Remember that Covey et al. (2018) found that L2 speakers reacted at similar speeds to masculine and feminine images, while the Hindi control group displayed facilitation only in the feminine noun trials (Covey et al. 2018:332). This can be interpreted as evidence that markedness impacts processing even in native speakers, as feminine nouns are considered to be the marked gender in Hindi.

Some of the previous research has displayed differences in how different noun categories are processed (e.g. White, 2004) while others have not been able to replicate this finding (e.g. Fowler & Jackson, 2017). However, much of the research has not focused explicitly on markedness, but grammaticality effects (e.g. Guillelmon & Grossjean, 2001, Montrul et al., 2014). Montrul et al. (2014) for example, did not contrast the different noun categories. If differences in word repetition times for the different noun categories were analyzed, they could have possibly found an effect of markedness. In other words, feminine and masculine canonical markers could potentially be processed differently by the learners that would be reflected in differences in the reaction times.

López-Prego (2015) constructed a study using a self-paced reading task combined with a grammaticality judgment task to examine long-distance gender agreement while also considering the effect of markedness. The participants consisted of two groups of native speakers of Spanish

and advanced learners of Spanish with English as their L1 (López-Prego, 2015:43). The first adjective used in the stimulus sentences was either ungrammatical or grammatical with respect to the target noun and the grammatical trials used either invariant (*suave*, soft.INV.) or grammatically inflected adjectives (*blanc-o/a*, white-MASC./-FEM.) (López-Prego, 2015:47). The rationale behind this design is that if markedness provides facilitation due to the activation of the marked cue, the trials using feminine gender markers should be processed faster than the ones using masculine or gender opaque ones (Hawkins, 2009).

Both the native speakers and learners were sensitive to grammatical violations, resulting in slower reading times in the ungrammatical conditions (López-Prego, 2015:61), and all participants performed at high accuracy rates in the gender assignment task. Trials that used invariant vs. gendered adjectives were compared to each other to determine the role of informativeness and both groups showed sensitivity to grammar violations, indicating that participants do make use of gender cues in the stimulus sentence. Both the learners and natives were also quicker at reading the sentences in the feminine than in the masculine trials thus displaying sensitivity to markedness. However, even if otherwise consistent with the Representational Deficit Hypothesis (Hawkins, 2009), the native speakers should not have displayed this effect as they should not have to depend on frequency and co-occurrence information and López-Prego suggests markedness rather being retained in the focus of attention longer, thus providing facilitation (López-Prego 2015:97).

A study by McCarthy (2008) found that masculine forms in Spanish were treated as defaults and this variability persists both in production and comprehension even in advanced learners. She conducted a study in which she examined the cause for morphological variability and whether this extends from production to comprehension and if it is similar in both. 24 late intermediate to advanced learners of Spanish with English as their L1 partook in the study. A group of 10 native speakers of Spanish was also included.

This study used an elicited production task targeting agreement. First, the researcher would ask questions of the images to elicit a noun phrase. Then, participants were asked questions to produce the corresponding clitics and adjectives. In the comprehension task participants would read sentences and they were instructed to choose the corresponding image from three options. In the production task, there was a significant main effect of markedness as the accuracy in the masculine context was greater than in feminine contexts. On the adjectives, the feminine context once again posed more difficulty and the interaction of group and gender indicates that accuracy in all groups

was not similarly affected by noun gender (McCarthy, 2008:475). In the comprehension task, intermediate learners performed significantly worse than the native speakers in connection to gender. Again, feminine contexts proved more challenging for the learners as masculine clitics were overgeneralized to feminine contexts.

All in all, McCarthy (2008:484) concludes that morphological variability cannot completely be attributed to challenges of production as variability was found also in the comprehension task. The results thus favor a more representational account, but the difficulty with feminine contexts is the opposite as predicted by the Representational Deficit Hypothesis (Hawkins, 2009). Rather the results suggest that participants resorted to overextending the default gender (masculine) to inappropriate contexts.

Even if Hopp (2013) found that advanced learners can make use of gender cues when processing, he did not find evidence of it being mediated by markedness. In other words, he did not find any difference in how the three different noun categories in German were processed. Neuter in German is the least common of the three noun categories which makes it the marked noun category (Hawkins, 2009). But unlike Spanish or French, German is phonologically opaque in the way nouns are categorized, therefore canonicity does not exist to the same extent as e.g. Spanish. This leads Hopp (2013:30) to argue that this weakens the learners' capability of creating regularity associations between nouns and determiners. There is however evidence of similar results have been found for Spanish (e.g. Dussias et al., 2013) which compromises Hopp's (2013) argument as Spanish does make use of canonical noun endings and – markers.

All in all, previous studies have displayed varying results in how learners process different noun categories. While some studies have found evidence to support Hawkins' (2009) Representational Deficit Hypothesis as feminine nouns and their agreement markers were processed faster (e.g. López-Prego, 2015; Covey et al., 2018) others have found the opposite pattern where the default gender nouns were processed faster (McCarthy, 2008). Sometimes no difference in how the different noun categories are processed has been found (Hopp, 2013; Fowler & Jackson, 2017), suggesting that processing is not always directly modulated by markedness.

4. The current study

The aim of the current study is to examine whether late L2 learners of Swedish are sensitive to gender in an online production task. Specifically, the aim is to examine learners whose mother tongue (Finnish) does not realize grammatical gender. The current study consists of a picture naming task in which the stimulus material is manipulated for both markedness (default gender: common, marked: neuter) and informativeness (sentences with gender cues, sentences without gender cues) and the number of informative cues (one vs. two). The central interest is to study whether learners are capable of making use of gender cues when naming pictures and whether this process differs as a function of the noun's markedness status (common vs. neuter) and the number of cues.

1. Are L2 speakers of Swedish who have Finnish as their mother tongue able to use gender as a facilitator in picture naming? In other words, is there a difference between the naming times for the gender informative and gender uninformative conditions?
2. Are L2 speakers of Swedish sensitive to markedness by naming nouns from one gender category faster than nouns from the other category?
3. Does the facilitatory use of gender cues depend on the number of gender cues in the stimulus?

4.1 Predictions

4.1.1 The Lexical Gender Learning Hypothesis

The Lexical Gender Learning Hypothesis (Grüter et al., 2012) states that the differences in L1 and L2 gender processing are a result of the different ways infant L1 learners and adult L2 speakers acquire the language (Grüter et al., 2012). Children learn gender in a way in which articles and nouns are presented together in a sequence, whereas learners will learn readily segmented categories of articles and nouns, which creates weaker connections between gender nodes and nouns. According to this theory, a learner's capability to make use of gender cues in the stimulus is directly dependent on the strength between the links for gender nodes and nouns. Thus, the naming times for nouns that the participants know the gender of, should be faster than for ones they do not know the gender of.

4.1.2 The Representational Deficit Hypothesis

According to the Representational Deficit Hypothesis (Hawkins, 2009), the deficient late L2 grammar is compensated by using frequency information to create mental representations for noun connections. In Swedish, neuter nouns are less common and therefore according to this theory, participants should name neuter nouns faster than common nouns, as neuter is considered to be the marked gender as they have been stored in memory as exceptions from the unmarked default gender (the common nouns).

5. Method

5.1 Gender facilitation study

5.1.1 Participants

24 advanced late learners of Swedish¹ (20 females) gave their consent to participate in the study. All participants grew up with Finnish as their L1 and none of the participants had grown up in bilingual homes or environments. Three participants reported that one of their parents spoke Swedish as their L1, but the language was not spoken at home.

Most participants had started acquiring Swedish between the ages of 10 and 13 (mean = 11.5), while two participants had partaken in Swedish immersion from age five. On average each participant had been formally learning Swedish for 11 years (range: 6 – 20). The participants' ages at the time of testing ranged from 22 to 51 (mean: 31.6). In the background questionnaire, participants reported their proficiency on average as a 3.9 on a scale of 1-5 (range: 2.8 – 5). Six participants also reported having lived in Sweden or Swedish parts of Finland for an extended period.

¹ 25 participants were actually tested but due to a technical malfunction on PsychoPy, no data for the picture naming task was recorded for one participant. Thus, this participant is not included in any of the analyses.

5.1.2 Materials

A timed picture naming task was chosen as the method for the main study. Before the materials could be created, a picture norming was devised. This was a necessary step in building the experimental material since there was no normed set of pictures available for Swedish that would have served the purpose of the planned picture naming task. The purpose of norming was to ensure that the target nouns would be provided consistently by Swedish speakers and that images with poor concreteness or imageability would be excluded from the experimental material.

30 Swedish speakers (22 females) of Swedish partook in the norming. At the time of testing, participants were 30.8 years old on average (range 19-50). All participants were monolingual speakers of Swedish and no one had started acquiring other languages at an early age. Participants originated from both Sweden (18) and the Swedish-speaking parts of Finland (12).

A total of 247 pictures were chosen for the norming. The pictures were acquired from several different sources. A large proportion of the images chosen were from the MultiPic database (Duñabeitia et al. 2018) and Papunet Kuvapankki (Papunet Kuvapankki, papunet.net, Elina Vanninen, Sergio Palao / ARASAAC & Sclera) and the rest from free clipart websites on the internet. All pictures were greyscale drawings and represented e.g. household items, living entities, buildings, places and were scaled to be 300x300 pixels in size.

To avoid order effects, four pseudorandomized lists of all of the pictures were created. Three of the lists were created using a random order generator. In the fourth list, the presentation order was created by inverting the order of the first list. Although the order for all lists was random, it was made sure that no more than five items of the same grammatical gender were presented consecutively.

The survey platform SoGoSurvey was used to complete the study and participants completed it without monitoring. Participants started by reading an information sheet and filling out a consent form in which they were informed of the purpose of the study and their right to withdraw their consent at any stage. This was followed by a short background questionnaire.

Participants were instructed to name each image as they best saw fitting and were instructed to provide both the indefinite article (*en* or *ett*) and the noun. This was done to make sure no nouns

with varying gender would be chosen as an experimental item for the gender facilitation study. Participants were also discouraged from providing complete sentences or including an adjective in the answer. The instructions were accompanied by three example images and example answers. All participants completed 4 practice trials before the actual experiment and received feedback on the first two. The task took around 40 minutes to complete and no response times were recorded. After completing the experiment, participants received an electronic gift card as compensation for their time.

Each target entry was rated with a 1 while other entries received a zero. All entries were checked for spelling errors. From there, a percentage of target entries was calculated for each image. The anticipated target words were provided on average 86.5 % of the time (range 3.3 % – 100 %). Based on the results, a set of 120 experimental items was selected. All of the images that were chosen, received a name agreement score of at least 76.7 % ($M = 95.1$) from the picture norming. 60 of the selected experimental items represented common nouns and the other 60 were neuter nouns. A two-tailed t-test revealed that the name agreement between common nouns ($M = 96\%$, $SD = 6.10$) and neuter nouns ($M = 94\%$, $SD = 6.53$) did not differ from each other $t(117) = 1.25$, $p = .21$.

Frequency measures for target nouns were obtained from Korp (Borin, Forsberg & Roxendal, 2012), which is the concordance search tool for Språkbanken (The Swedish Language Bank). Korp encompasses 245 different corpora and 13.46G tokens. Relative frequency (occurrence per million) measures were obtained and no differences in the frequency between common ($M = 15.38$, $SD = 30.73$) and neuter nouns ($M = 15.74$, $SD = 39.83$) was found, $t(112) = -0.07$, $p = .94$. However, within the two groups of nouns, all items were not equally frequent. Relative noun frequencies for common ranged from 0.5 to 195.2 and for neuter nouns 0.1 to 275.4.

Many word property measures were obtained from the AFC-list (Witte & Köbler, 2019) which is a database for word level data for Swedish. Two-tailed t-tests were used to determine whether the word properties for common and neuter nouns were similar. The two noun groups were matched for the number of letters (common: $M = 4.83$, $SD = 1.32$; neuter: $M = 5.00$, $SD = 1.63$), $t(113) = -0.62$, $p = .54$) number of phonemes (common: $M = 4.45$, $SD = 1.17$; neuter: $M = 4.53$, $SD = 1.65$), $t(106) = -0.32$, $p = .75$), number of syllables (common: $M = 1.67$, $SD = 0.63$; neuter: $M = 1.68$, $SD = 0.79$), $t(112) = -0.13$, $p = .90$), and the number of phonological neighbors (common: $M = 11.27$, $SD = 8.83$; neuter: $M = 10.90$, $SD = 9.96$), $t(116) = 0.21$, $p = .83$). Since the objective of the study

was to measure onset time, the number of phonemes in the onset syllable was calculated separately (common: $M = 3.02$, $SD = 0.85$; neuter: $M = 3.10$, $SD = 0.78$), $t(113) = -0.57$, $p = .57$). The number of animates was the same for both sets of nouns, four in each list (common: $M = 0.07$, $SD = 0.25$; neuter: $M = 0.07$, $SD = 0.25$), $t(118) = 0$, $p = 1$).

Based on the results of previous picture naming studies (Costa, Caramazza & Sebastián-Gallés, 2000) the materials were also controlled for cognate status. The search engine NIM (Guash, Boada, Ferré & Sánchez-Casas, 2013) was utilized to calculate the lexical similarity using Van Orden's (1987) graphemic similarity measure. Since all Finnish children also start learning English as young children, the controls were conducted to both Swedish-Finnish as well as Swedish-English word pairs. If a word received a score of 0.4 or above it was considered as a cognate (Van Assche, Dieghe, Duyck, Welvaert & Hartsuiker, 2011:93). With this classification, 14 common nouns and 13 neuter nouns were considered to be Finnish cognates, while English cognate-status was assigned for 27 and 29 nouns respectively.

Eight experimental conditions were created with 15 nouns in each condition. Half of the conditions contained images that depicted common nouns and the remainder depicted neuter nouns. As the aim was also to see whether the learners benefitted from multiple gender cues, the stimulus sentences were constructed such that they differed with regards to noun gender and the number of agreeing parts of speech preceding the noun.

Swedish requires congruency between determiners, adjectives, and nouns so this was utilized when creating the stimulus sentences. First, four of the conditions used the indefinite articles as the determiners. These, as discussed earlier are inflected based on the target noun. For the remaining four conditions the 3rd person singular possessive *hans* (his) was used since it does not provide a gender cue. Second, a set of regular and invariable adjectives were embedded into the sentences. The regular adjectives are inflected based on the target noun's gender while the invariable adjectives retain the same form regardless of noun gender. As discussed earlier, a possessive requires inflecting the regular adjective in the definite form ending with *-a*. The experimental conditions are listed in table 1.

Table 1: Experimental conditions for the picture naming task.

Condition	Gender	Number of cues	Example sentence
1: informative	common	two	Jag tvättade en äcklig-ø skjorta I washed a.COMM. nasty-COMM shirt.COMM.
2: informative	common	one	Jag tvättade en illaluktande-ø skjorta I washed a.COMM. smelly-INV. shirt.COMM.
3: uninformative	common	zero	Jag tvättade hans äcklig-a skjorta I washed his nasty-DEF. shirt.COMM
4: uninformative	common	zero	Jag tvättade hans illaluktande-ø skjorta I washed his smelly-INV. shirt.COMM.
5: informative	neuter	two	Jag tvättade ett äcklig-t tält I washed a.NEUT. nasty-NEUT. tent.NEUT.
6: informative	neuter	one	Jag tvättade ett illaluktande-ø tält I washed a.NEUT. smelly-INV. tent.NEUT.
7: uninformative	neuter	zero	Jag tvättade hans äcklig-a tält I washed his nasty-DEF. tent.NEUT.
8: uninformative	neuter	zero	Jag tvättade hans illaluktande tält I washed his smelly-INV. tent.NEUT.

Four different sentences for each experimental item were thus created. In conditions 1 and 5 participants would receive two gender cues, one cue in conditions 2 and 6 and zero in the rest. 15 regular and 15 invariable adjectives were used to create the gender cue manipulation. These critical adjectives were used an equal number of times (4) for both common and neuter nouns.

Since the verbs were not of central interest in this study, they were not used an equal number of times for all items like with the adjectives. However, if a verb was used 4 times in connection to a common noun, the same was true for the neuter nouns. This decision was made in order to not compromise plausibility. A total of 20 different verbs were used. The sentences were then distributed evenly across 4 lists using a Latin-Square design. This way each image would be presented once per participant and each participant would see an equal number of items in each condition.

The tasks used by Guillelmon & Grossjean (2001) and Montrul et al. (2014) do not necessarily require participants to pay attention to the phrases in the stimulus as they were always presented in similar sequences. As this also is true to the present stimulus, a selection of control questions was devised. The control questions targeted either the adjective or the determiner with a yes or no question. The aim with the inclusion of the control questions was to direct the participants' attention to the critical features, i.e. the indefinite articles, 3rd person singular possessive, and the adjectives. This way, in principle, participant could not sit idly by waiting for the picture to appear on the screen. The questions however, did not explicitly target gender as they were formatted like; "*Stod det att tältet var äckligt?*" (Did it say that the tent.NEUT. was nasty.NEUT.?) or "*Stod det att skjortan tillhörde Peter?*" (Did it say that the shirt-COMM. belonged to Peter?). Peter is the referent to *hans* (his) in the stimulus sentences and this was explained to the participants in the instructions. The rationale behind this was to make participants focus on the contents and specifically on the critical features in the sentences; the determiners and adjectives. The control questions were the same for all of the lists.

An additional 60 fillers were added to each list. The fillers were the same for each list. The images, adjectives, or verbs were not used in the experimental trials. The sentences were similar in syntactic structure to the ones in the experimental material, but the accompanying control questions were different. The control questions for the fillers were formulated in a way that the distribution of correct yes and no answers was the same across all lists. Thus, the task consisted of a total of 180 sentence-picture-control question combinations.

The experimental sentence preambles were normed to create a Cloze probability rating for each sentence to control for plausibility. 40 native-speakers of Swedish (31 females) partook in the task and the mean age of the participants was 31.9 (range: 18-49) at the time of testing. Two participants had grown up in the Swedish-speaking parts of Finland while the rest grew up in Sweden and everyone reported being brought up in monolingual homes.

The sentences were maintained in the same lists as in the picture naming task. Some lists had some double prompts, meaning that the same phrase was used for two items. These were removed. The study was conducted through LimeSurvey, an online survey platform. The participants met with the researcher in an end-to-end encrypted Zoom meeting to complete the study. As the sentences

were distributed across 4 lists, 4 versions of the same survey were used. An equal number of participants (10) was assigned to complete each version.

Participants started with reading through the information sheet and by providing their consent on the survey. This was followed by a short background questionnaire and the instructions for the study. Participants were presented with the target sentences truncated right before the critical noun, e.g. *Jag sålde en fin* (I sold a.COMM. nice.COMM.) or *Jag sålde hans imponerande* (I sold his impressive-INV.). Participants were instructed to complete the sentence with a noun that they found most fitting for the sentence. The noun was to be provided in the singular form as in the gender facilitation study the aim was to only target singular forms. The results from this norming were thus not meant to be generalizable outside of this study. Participants completed 3 practice trials with feedback and then completed the study. The experiment took on average between 30–45 minutes to complete and participants were compensated for their time in the form of an electric gift card.

Table 2. Summary of Cloze Probability ratings per condition.

Conditions:	C1	C2	C3	C4	C5	C6	C7	C8
Mean score	0.015	0.037	0.030	0.025	0.025	0.037	0.005	0.010
Max. score	0.5	0.4	0.4	0.6	0.2	0.4	0.1	0.2
Min. score	0	0	0	0	0	0	0	0
Non-target entries (n)	55	46	51	51	47	50	57	55
Target entries (n)	5	14	9	9	13	10	3	5
Target entries (%)	8.33	23.33	15.00	15.00	21.67	16.67	5.00	8.33

In general, most sentences received non-target entries. Only 44 of the 120 items received at least one target entry in one of the lists. For each list, the target noun was provided in the intended context between 13 to 25 times. The Cloze probability score was calculated as follows. After checking for spelling, each entry was provided with a score of one or zero, depending on whether the answer was on target (1) or not (0). This was done individually for each list. Then a percentage

of target answers was calculated for each item (range 0 – 0.6). The results for the cloze probability rating sorted by condition, are summarized in table 2.

5.1.3 Procedure

Participants were tested individually in a quiet environment. The experiment was run on PsychoPy (Peirce, Gray, Simpson, MacAskill, Höchenberger, Sogo, Kastman Lindeløv, 2019) version 5.2.2020 on a 13” MacBook Air (OS X El Capitan).

Participants started with reading through an information sheet and signing a consent form in Swedish. A Finnish translation of both documents was also provided, and participants were allowed to pose questions in both languages. Following giving consent, participants would fill in a background questionnaire that included a short self-assessment of their skills in Swedish.

Following the background questionnaire, participants received the instructions for the experiment in Swedish and were given the opportunity to ask questions from the researcher. The task was framed as follows. Participants were introduced to an imaginary woman called Anna who had traveled abroad for the first time and visited Sweden. The stimulus sentences were framed as activities Anna had experienced during her stay in Sweden with a man called Peter. The participants’ task was to help Anna tell about her trip by identifying the images for her.

After reading through the instructions all participants completed 16 practice trials. Participants received feedback on the first 8 practice trials. None of the images, adjectives, or verbs used in the practice trials were included in the experimental or filler material.

The sentences were presented on the screen as follows. First, a fixation cross was presented for 500ms following by a blank screen for 300ms. All words were presented on screen for 500ms with 300ms blank screens in between words. After the last word, the picture appeared on the screen and participants would name the image. Participants were instructed to pay attention to the sentence and then name the image in the indefinite singular form as fast and accurately as they could. Participants were also instructed to avoid coughing, false starts, and stuttering. The images stayed on screen for 5 seconds after which the control question was presented. After participants clicked either *ja* (yes) or *nej* (no) on the screen to answer the control question, the next trial started automatically.

The task was divided into 6 blocks, each including 30 sentence-image-control question combinations. Between each block, participants received a message on the screen encouraging them to take a one-minute break. The screen alerted participants once the one minute had elapsed. All participants completed 180 trials of which 60 were fillers. The order of the trials was randomized for each participant. The task took around 45–60 minutes.

5.2 Gender assignment task

All learners completed a Gender Assignment Task including the same 120 target nouns that were used in the picture naming task. The gender assignment task did not include any filler items. The gender assignment task was completed twice. First, after the picture naming task and then after the proficiency test (see section 5.3). The same set of words was used twice in order to establish knowledge of the participants' consistency in assigning the correct gender to each experimental item.

Instead of showing participants the images as in the picture naming, the actual words were displayed instead in order to make sure the participants know the gender of the actual target noun. This decision was reached as participants could have identified the images as non-target nouns without the researcher being aware of this. Participants were instructed to decide whether the indefinite article *en* (common) or *ett* (neuter) was the correct article for the noun. The decision was made by clicking either article on the computer screen. The task was not timed, each word was presented once, and the order was randomized for each participant. The material, task, and instructions were identical on both times apart from the randomized order of presentation. Participants completed the task in 10 minutes on average.

5.3 Proficiency test

All learners also completed a short Swedish proficiency test designed after the LexTale (Lemhöfer & Broersma, 2012).

5.3.1 Materials

There is no LexTale (Lemhöfer & Broersma, 2012) readily available for Swedish so that was constructed. Since this LexTale was not going to be standardized before this experiment, it was

not going to act like an absolute and reliable measure of proficiency. Rather the role of this short task was to establish some control over the participants' lexical knowledge.

The LexTale offered two clear advantages when considering the experiment at hand. It is significantly shorter (5 minutes) than many other proficiency measures. Additionally, it targets lexical knowledge which is relevant in the context of grammatical gender.

The test was constructed similarly as Covey et al. (2018) did for their version of a LexTale for Hindi. 10 words were chosen from a beginner textbook, 10 from an intermediate, and 10 from an advanced one. An additional 10 low-frequency words were selected from a dictionary. The selected words were of different lengths and word classes². The remaining 20 items were non-words partially generated by using a non-word generator available at Lärka (Alfter, Borin, Pilán, Lindström & Volodina, 2019).

5.3.2 Procedure

The original LexTale was mimicked as closely as possible from the presentation order of the stimulus to the instructions. The items were organized in the same word/non-word pattern as Lemhöfer & Broersma (2012) did. Moreover, 3 foil words were added to the beginning of the list, but these were not rated or included in the analysis. This list of items was presented in the same order for each participant.

Participants completed the proficiency test once. Participants were instructed to determine whether the string of letters they were presented with was a real Swedish word or not. This was done by either pressing *ja* (yes) or *nej* (no) on the computer screen. If participants felt unsure whether the string of letters they were presented with was an actual word, they were instructed to select no. Participants received the instructions in Swedish.

² See Appendix C.

6. Results

6.1 Gender assignment task

As said, the Gender Assignment Task was conducted twice by each participant. On average participants selected the correct article 80.1 % (range: 65 – 90.8 %) the first time and 82.0 % (range: 66 – 87.5 %) on the second. However, when calculating the consistency of the participants the average dropped to 74.8 % (range: 53.3 – 87.5 %). Participants showed greater accuracy when assigning gender to common nouns. On average, the correct gender was consistently assigned to common nouns 49 ($SD = 6.49$) out of the 60 items, while the respective average for neuter nouns was 40 ($SD = 9.41$). The differences in consistent gender assignment accuracy between the two noun groups was significant $t(41) = 3.90, p < .05$.

6.2 Proficiency test

Overall the participants were good at correctly identifying the words and non-words. On average participants correctly identified the letter strings as either real or non-words 49.75 of the 60 items (range 30 – 58). However, the final score was calculated as the original LexTale with the same formula as Lemhöfer & Broersma (2012):

$$\frac{((\text{number correctly identified words}/40*100) + (\text{number correctly identified nonwords}/20*100))}{2}$$

The proficiency scores ranged from 62.5 % to 97.5 %, averaging at 84 %. In the original English LexTale, the threshold for upper intermediate lies at 60 % and for advanced at 80 % (Lemhöfer & Broersma, 2012). The proficiency test scores did not significantly correlate with the participants' overall consistency in correct gender assignment, $r(46) = 0.34, p = .99$.

6.3 Picture naming task

The recordings produced in the picture naming task were first transcribed and rated dichotomously for accuracy (1 = on target, 0 = not on target). A response would receive a zero if participants did

not answer in time or did not provide the target noun. In cases where the pronunciation of the was slightly inaccurate, i.e. a dropped vowel at the end of the noun, but the target noun could be clearly distinguished, the trial would receive a rating of 1. PsychoPy had been programmed with a VoiceKey to provide the reaction times (RT) for each trial. These RTs were verified through Praat (Boersma & Weenik, 2021). Even if participants had been instructed to avoid making sounds before naming the image, some mouth-sounds or external sounds were triggered the recording onset. These trials were also counted as accurate and the actual naming time was determined in Praat instead. The picture naming task generated a total of 2008 on target responses, which corresponds to 69.72 % target answers across all trials and all participants. On average, a given participant provided the target noun 83.67 % for all trials. The low accuracy is not necessarily a reflection of poor performance, but rather that the answers were not on target; remember that even correct answers received a rating of zero if it was not the intended target noun. Participants were, however accurate when answering the control questions ($M = 86.80\%$, $SD = 5.24$)

For data trimming all items that had a reaction time of 4000ms or greater were removed. Following this, all items 2.5 SD under and over the mean across conditions were removed individually for each participant. These deletions resulted in the loss of an additional 151 data points (7.5 % of all on target-data points).

Table 3. demonstrating the relevant comparisons made between conditions.

Subset	<i>Informative conditions</i>	<i>Uninformative conditions</i>
2 vs. 0 cues	Condition 1 (common)	Condition 3 (common)
2 vs. 0 cues	Condition 5 (neuter nouns)	Condition 7 (neuter nouns)
1 vs. 0 cues	Condition 2 (common nouns)	Condition 4 (common nouns)
1 vs. 0 cues	Condition 6 (neuter nouns)	Condition 8 (neuter nouns)

Adjectives were used both in informative and uninformative sentences for each noun. Thus, the relevant comparisons would be made between the conditions where the noun is found in an informative vs. uninformative context. The data was divided into two subsets, in which the comparisons were made between sentences that provided either two cues (indefinite article + gender adjective) or zero cues (possessive + definite adjective) in the stimulus sentences. The second subset contained the rest of the conditions, with the comparisons for one cue (indefinite article + invariable adjective) vs. zero cues (possessive + invariable adjective). This is summarized in table 3.

As the two subsets of data were analyzed separately, the results for the 2 vs. 0 cue subset will be presented first. The data was analyzed using mixed effect models (Baayen, Davidson & Bates, 2008) using the lme4 package in R Studio, version 1.1.463 (R Core Team, 2019). The two data sets were both subjected to analyses in which either accuracy or RT was the dependent variable.

First, accuracy was treated as the dependent variable and the results were analyzed using the glmer-function. Condition, gender, and consistency in the Gender Assignment Task (GAT) were entered as fixed effects and a three-way interaction was allowed between the three. In order to obtain main effects, the levels for the gender assignment task (consistent vs. inconsistent), condition (uninformative vs. informative), and gender (common vs. neuter) were contrast coded with values of -.5 or .5. An interaction between condition and noun gender was permitted. Frequency, the Cloze probability rating, and picture norming score were also entered as fixed effects and were centralized. Subject and noun were entered as random effects. This was the maximum effects structure that the model could converge and the R code read as follows: `glmer(Accuracy ~ Condition*Gender + GAT + Picture Norming score + Frequency + Cloze Probability rating + (1 | Subject) + (1 | Noun)`.

Table 4. Summary of the results when accuracy is treated as a dependent variable.

	Two cue conditions				One cue conditions			
	Estimate	Std. Error	<i>z</i>	<i>p</i>	Estimate	Std. Error	<i>z</i>	<i>p</i>
Intercept	0.861	0.21	4.09		1.39	0.26	5.42	
Condition	-0.10	0.14	-0.74	0.457	0.05	0.15	0.30	0.764
Gender	-0.83	0.31	-2.66	0.008	-0.43	0.35	-1.26	0.208
GAT	-0.20	0.18	-1.11	0.269	-0.47	0.20	-2.36	0.018
Picture Norming	6.14	2.47	2.49	0.013	8.95	2.70	3.31	0.001
Relative <i>f</i>	0.02	0.01	3.16	0.002	0.02	0.01	2.87	0.004
Cloze	6.50	2.49	2.61	0.009	4.03	2.00	2.01	0.044
Condition x Gender	-0.06	0.28	-0.21	0.837	-0.15	0.30	-0.50	0.615

The results for the mixed models for accuracy are summarized in table 4. For the two cue conditions, accuracy for neuter nouns was significantly lower than for common nouns. Condition, however, did not affect accuracy and the interaction between noun gender and condition also proved non-significant. More frequent nouns were also named more accurately. The items presented together with a sentence with a higher Cloze probability rating were also named more accurately than the ones presented together with lower score sentences. The picture norming score also had an effect, with a higher score increasing accuracy significantly. Knowledge of the noun's gender did not increase accuracy significantly.

For the one cue conditions, there was no significant effect of gender, but the consistency in the gender assignment task was significant, i.e. nouns that participants did not know the gender of were named significantly less accurately than ones they did know the gender of. The interaction between condition and gender did not reach significance in these conditions either. Higher Cloze probability and picture norming ratings significantly increased accuracy, as did higher noun frequency.

Visually, the reaction times between the one and two cue conditions were quite similar as can be noted from figure 1, suggesting that condition did not have a significant effect on naming times. What can be noted, however is that the distribution of reaction times in the two cue conditions is notably larger than in the one cue conditions.

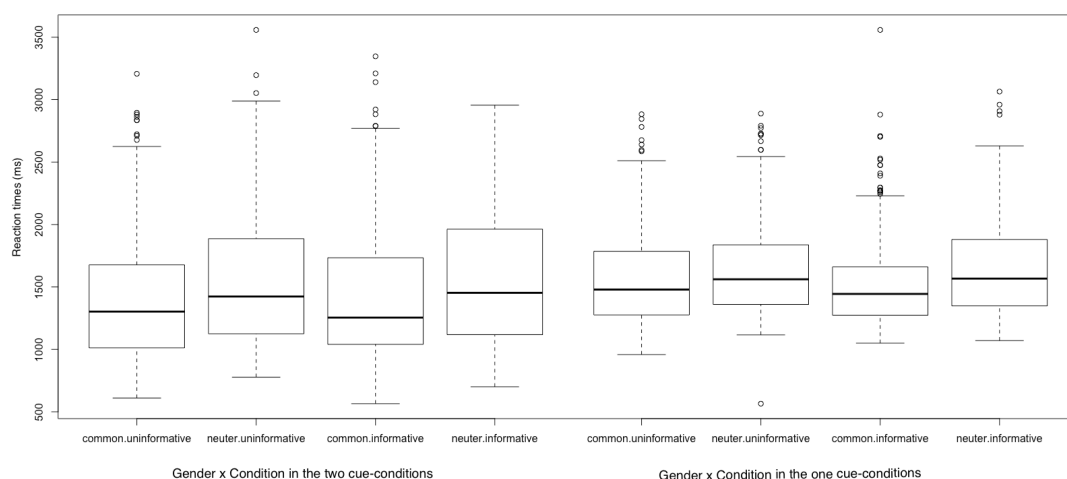


Figure 1. Box-plot over the distributions of reaction times in the 8 conditions.

Naming times were analyzed further by using the lmer-function. Here condition, noun gender, and results from the Gender Assignment Task (GAT) were placed as fixed effects, and an interaction was permitted between the three and they were contrast coded similarly as for accuracy. Furthermore, the relative frequency of the noun, the cloze probability rating, the name agreement from the picture norming, and presentation order (i.e. in which trial each participant saw a given item) were also included as fixed effects. These continuous factors were also centralized. The random effect structure in the two cue-conditions consisted of random intercepts for participant and item. This was the maximum random effects structure that could be run without the model becoming overfitted (R-code: $\text{lmer}(\text{RT} \sim \text{Condition} * \text{Gender} * \text{GAT} + \text{Relative frequency} + \text{Cloze} + \text{Norming} + \text{Presentation order} + (1 | \text{Subject}) + (1 | \text{Noun}))$). In the one cue conditions the model converged with the inclusion of a random slope for condition and noun (R-code: $\text{lmer}(\text{RT} \sim \text{Condition} * \text{Gender} * \text{GAT} + \text{Relative frequency} + \text{Cloze} + \text{Norming} + \text{Presentation order} + (1 | \text{Subject}) + (1 + \text{Condition} | \text{Noun}))$).

In the two cue conditions, a higher Cloze probability rating and picture norming score significantly reduced the reaction times. Noun frequency also affected naming times with more frequent nouns being named faster than rarer ones. This result however is only marginal. A significant main effect for accurate gender assignment in the GAT is found as can be seen from table 5, meaning that nouns that were consistently assigned the correct gender were named significantly (151.30ms) faster than nouns participants did not know the gender of. Noun gender also affected reaction times marginally with neuter nouns being named slower (108.30ms) than common nouns. Condition (uninformative vs. informative) did not affect reaction times and none of the interactions yielded any significant results.

For the one cue conditions the results were similar to the ones in the two cue conditions. The Cloze probability rating and the score from the picture norming had significant effects on naming times. Specifically, a higher score in the Cloze probability rating and Picture norming resulted in faster naming times. Likewise, knowledge of noun gender in the Gender Assignment Task affected naming times, with the familiarity of the noun's gender speeding up the naming significantly.

In the one cue conditions, frequency does not display the same marginal effect that it did in the two cue conditions. The effect of gender was still similar in direction to the two cue-condition, as neuter nouns were named slower than common nouns, but this result was not significant.

Table 5. Mixed-models analysis when reaction times are treated as the dependent variable.

	Two cue conditions				One cue conditions			
	Estimate	Std. Error	<i>t</i>	<i>p</i>	Estimate	Std. Error	<i>t</i>	<i>p</i>
Intercept	1602	54.44	29.43		1568	57.21	27.41	
Condition	27.67	36.81	0.75	0.452	-37.33	40.95	-0.91	0.363
Gender	108.30	55.07	1.97	0.051	70.58	61.75	1.14	0.255
GAT	151.30	41.69	3.63	<.001	101.20	44.06	2.30	0.022
Relative <i>f</i>	-1.10	0.66	-1.66	0.100	-0.88	0.77	-1.14	0.256
Cloze	-917.60	284.70	-3.23	0.001	-623.20	268.50	-2.32	0.022
Picture Norming	-1394.00	400.80	-3.48	<.001	-984.70	458.50	-2.15	0.034
Presentation order	-0.05	0.27	-0.19	0.853	< 0.00	0.28	-0.001	0.999
Condition x Gender	91.44	74.73	1.22	0.221	75.82	81.40	0.93	0.353
Condition x GAT	61.70	74.49	0.83	0.408	-84.05	78.08e	-1.08	0.282
Gender x GAT	22.38	81.69	0.27	0.784	-11.95	84.89	-0.14	0.888
Condition x Gender xGAT	208.90	149.40	1.40	0.162	-20.78	158.20	-0.13	0.896

The effect of condition in the one cue trials is the opposite to the two cue trials, meaning that nouns were named quicker when no gender cues were presented. This result, however is not significant either in either of the datasets. None of the interactions between the main effects reached significance in the one cue-conditions.

7. Discussion

This study set out to examine whether L2 speakers of Swedish whose mother tongue does not realize gender, are able to use gender cues to facilitate sentence processing in a picture naming task in which both accuracy and reaction times were measured. The study manipulated informativeness, meaning that gender cues in stimulus sentences were either presented or omitted. Moreover, the degree of informativeness was manipulated by including sentences with either two, one, or zero gender cues. This study also aimed at examining whether participants would display

effects of markedness, by examining differences in reaction times between the two Swedish gender categories.

Informativeness (cue vs. no cue) did not affect accuracy or reaction times significantly and the number of gender cues (1 vs. 0 or 2 vs. 0) did not show effects either, although the latter was not statistically tested. Common nouns were named more accurately and faster, but the results only reached significance in the two cue-condition. Knowledge of noun gender however resulted in significantly faster reaction times across all conditions and also increased accuracy in the one cue conditions.

The first research question targeted the overall acquisition of L2 gender; Are L2 speakers of Swedish who have Finnish as their mother tongue able to use gender as a facilitator in picture naming? In other words, is there a difference between the naming times for the gender informative and gender uninformative conditions? The results from the gender assignment tasks showed quite a bit of variability, as the range in which participants performed was quite large (53.5 % – 87.5 %). This suggests that the group of learners tested was not uniform with respect to knowledge of lexical gender. This is also further supported by the distribution range in the proficiency test, but no absolute conclusions from this can be drawn since the test was not standardized and it also did not correlate significantly with overall knowledge of noun gender (GAT).

That said, when participants had assigned the correct gender on both completions of the GAT, it had a significant effect on shortening the naming times in both the one and two cue-conditions, which is in line with Grüter et al.'s (2012) and Hopp's (2013) results and opposite to Fowler & Jackson (2017). In this study, subjective gender agreement was not considered the way Hopp did, but only grammatically correct assignment was considered. The current results thus suggest that participants have been able to make some connections between gender nodes and nouns. If participants would not be able to create any associations between indefinite articles and nouns, knowledge of the noun's gender should not have facilitated naming times. However, since there was no effect of informativeness, the knowledge of noun gender did not arise as a function of the presence of gender cues. If that would have been true, an interaction between the gender assignment task and condition should have been present. This suggests that participants might just be more familiar with the target nouns they consistently knew the gender of and thus were able to name them faster. This still suggests that there is some link between the gender nodes and the nouns since knowledge of a noun's gender did facilitate naming times in both conditions.

Participants provided the target answers fewer times for neuter than common nouns. This effect was significant only in the two cue-condition. The three-way interaction between condition, gender, and GAT accuracy was marginally significant when participants received two cues instead of zero. In the one cue condition, this interaction was significant. This means that participants were less accurate when they did not know the gender of a neuter noun and the condition was informative. This result is unexpected as informativeness has affected prediction/facilitation in previous studies (e.g. Hopp, 2013). This also suggests that participants did indeed struggle more with neuter nouns and the respective agreeing articles more than their common counterparts.

The last point also addresses the second research question which was concerned with markedness: Are L2 speakers of Swedish sensitive to markedness, by naming nouns from one gender category faster than nouns from the other category? If participants showed sensitivity to markedness, naming times should have been shorter in the trials using neuter nouns but the opposite effect was found. This is also unexpected under the account of the Representational Deficit Hypothesis (Hawkins, 2009) which argues that novel features in the L2 acquired after puberty will inevitably lead to participants creating faulty representations in their minds as they will depend on frequency information to create mental representations of marked and unmarked features. In Swedish, neuter nouns are the rarer noun form and thus, the marked form. The fact that participants struggled more with the unmarked contexts is in line with some previous studies (e.g. McCarthy, 2008) but not in line with others that have either found effects of markedness on the less frequent noun forms (López Prego, 2015) or not found any difference between the different noun categories (Hopp, 2013).

In terms of reaction time, if markedness had facilitated accessing the nouns, neuter nouns should have been named faster than the unmarked common nouns. Marginal evidence for this was found in the two cue-condition. However, as no interaction between gender and condition was found, this difference cannot be attributed to the presence of the gender cue. This result is not in line with what López Prego (2015) found in her study on Spanish noun gender, as the L1 speakers of English indeed displayed a greater effect of facilitation in grammatical trials using feminine gender markers and nouns compared to respective masculine trials. It is also evidence against the Representational Deficit Hypothesis (Hawkins, 2009). If participants would have behaved in accordance with Hawkins' hypothesis, naming times in the neuter nouns should have been named faster than common nouns, since neuter nouns and their agreement markers are the *marked* features

in Swedish, due to them being less common. What the results from this current study indicate are more in line with what McCarthy (2008) discusses in terms of default morphology. It is possible, that since common nouns are more common in Swedish, they are also more readily available for the learners to retrieve from their lexicon.

The third research question addressed the open question that Fowler & Jackson (2017) put forth; Does the facilitatory use of gender cues depend on the number of gender cues in the stimulus? As discussed, condition (informativeness) did not affect reaction times and there was no significant interaction between condition and gender, suggesting that participants did not actually benefit from additional morphological scaffolding when processing language online, opposite to the result of Fowler & Jackson (2017). However, the two subsets (2 vs. 0 cues; 1 vs. 0 cues) were not compared statistically. Moreover, knowledge of the target noun's gender (GAT) only increased accuracy significantly in the one cue conditions. This however cannot be tied to the cue manipulations made to the sentences, since if participants were able to use the only gender cue (the indefinite article) to provide target the answers, an interaction between the GAT and condition should have been found.

The results from the accuracy and RT data do not directly support any of the theories suggesting deficiencies in grammar underlying difficulties in L2 processing. According to theories arguing for maturation effects (Hawkins & Chan, 1997) acquiring novel features in a second language will inevitably lead to difficulties for late learners. While some participants assigned correct gender in the GAT twice only slightly better than chance, some participants displayed much more consistent accuracy. In addition, knowledge of noun gender significantly reduced reaction times in both the one and two cue conditions. This indicates the late learners do have the ability to create connections between the articles and nouns and can display their knowledge both online and offline despite their L1, Finnish, lacking gender, which is more in line with the accounts that argue for the ability to create gender connections even post-puberty (Schwartz & Sprouse, 1996).

There are also some other possible points worth discussing with regards to the lack of effects for condition and noun gender on reaction times. If we consider a computational account (Prévost & White, 2004) for example, the picture naming task itself could be too constraining for the second language speakers. Contrary to previous production studies (Hopp, 2013; Montrul et al., 2014; Guillelmon & Grosjean, 2001) the participants did not see the images, read, hear or see the word prior to naming them. Forcing participants to retrieve the word from their lexicon, could have

created a processing burden that inhibits real-time access to gender cues. Grüter et al. (2012) also suggest that even if learners have been able to establish connections between nouns and their agreement markers, the activation of these markers could be too effortful in online processing. As the learners showed evidence of prediction with the novel nouns, Grüter et al. (2012:211) suggest that they relied more on distributional cues due to the nature that the novel nouns were presented in, thus overcoming the struggle the participants' displayed with the familiar nouns, that they hypothesize had been learned with the use of non-distributional cues.

The control questions were included to direct the participants' attention to the critical features in the stimulus sentences. Even if accuracy on the control questions was high ($M = 86.8\%$ of experimental trials), participants did not show significant differences in reaction times between the informative and uninformative conditions indicating that even if the control questions were successful at directing the participants' attention to the critical features and they were retained in focus, that information did not facilitate naming. In other words, despite the features remaining in focus, they could not be utilized when naming the images. The data loss from non-target answers or missed trials was also substantial which can also be interpreted as an indication of the task being demanding. This open question could be explored further by including groups of native speakers and creating a processing burden for them.

Previous picture naming studies on predictive or facilitative processing (Montrul et al., 2014; Guillelmon & Grosjean, 2001; Covey et al., 2018; Fowler & Jackson, 2017; Hopp, 2013) have not required participants to retrieve and produce the actual noun from the lexicon completely by themselves. Montrul et al. and Guillelmon & Grosjean used a word repetition task, Covey et al. used a picture selection task, Fowler & Jackson provided participants with the actual nouns before the stimulus sentence. This makes the results from the current study more difficult to compare to previous research as the current task can be regarded as more demanding. The methodology in the current experiment however provides more compelling evidence for the lexical gender learning hypothesis (Grüter et al., 2012) as the task is explicitly lexical in nature and a significant effect of knowledge of noun gender and reaction times were found in both the one and two cue conditions.

Although the pictures were normed, imageability still had a significant effect on naming times, as is to be expected. It also has to be noted that when norming the pictures, the L1 speakers of Swedish were untimed. While an image might become recognizable after looking at it for some time, the learners in the picture naming task only had five seconds to provide their responses. The Cloze

probability rating also had a significant effect by boosting reaction times. However, as most stimulus sentences received a rating of zero, this effect is most likely driven by a number of items. Plausibility is known to affect how sentences are processed (e.g. Peelle, Milner, Rogers, Spehar, Sommers & Van Engen, 2020) and imageability has been shown to affect naming times in picture naming studies (e.g. Bates et al., 2003), and the fact that the same effects arose in the current study can be regarded as evidence that the method in the current experiment successfully captured subtle latency differences in picture naming.

Noun frequency had a marginal effect on naming times in the two cue conditions. As the results of the Gender Assignment Task only had a significant effect on accuracy when participants were presented one cue, it could also be that in the two cue-condition participants relied more heavily on information in the sentence and the image itself for naming.

8. Conclusions

The results from this study suggest that consistent knowledge of noun gender has a significant effect on naming times. However, as this study did not find any effect of informativeness, this facilitation did not arise in the presence of gender cues. Rather, it suggests that the connections that learners have made between nouns and gender markers are not strong enough to become activated before the noun, which is consistent with Grüter et al.'s (2012) Lexical Gender Learning Hypothesis.

With respect to naming times markedness, the naming times for common nouns (the default gender) were marginally faster in the two cue conditions, while no differences were found in the one cue conditions. Noun gender had a significant effect on naming accuracy in the two cue conditions, suggesting that participants actually struggled more with neuter nouns (the marked gender), a finding that is not in line with the predictions made by the Representational Deficit Hypothesis (Hawkins, 2009).

The Lexical Gender Learning Hypothesis (Grüter et al., 2012) on the other hand, does not predict that different noun categories would be processed differently as the learner's capability of using gender cues in online tasks is seen to be dependent on the overall attainment of gender and the strength of the connections made between gender markers and nouns. Again, these results did not

arise in the presence of a gender marker which indicates that common nouns were not named more accurately and faster because they made use of the gender cues in the stimulus sentence but rather that common nouns might just be more readily available for retrieval in the learners' lexicon. The results from this study thus lend more support to a lexical account for L2 gender processing.

The current study has not argued to examine native-likeness as no control group was tested. However, in the future, a control group should be included in order to see whether native speakers of Swedish would show effects informativeness that is mediated by markedness. If the computational account (Prévost & White, 2000) would to be explored further potential stressors would also have to be added. As the results from this study seem to show alignment with Grüter et al.'s (2012) Lexical Gender Learning Hypothesis, a future study could also potentially add novel nouns to the stimulus to further examine the role of lexical knowledge on naming times.

In addition, a larger group of learners would need to be tested. The sample in this current study consisted of 24 learners, but as shown in the distribution of the proficiency test scores and performance in the gender assignment task, the group did not display similar lexical proficiency across the board. One potential extension of this current study would be to include participants from different proficiency levels which would permit exploring the effects of proficiency.

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Appendix A.

List over items and lexical controls for common nouns.

Item number	Word	Translation	Absolute frequency	Relative frequency	Letters	Phonemes	Syllables	Phonemes 1st syllable	Phonological neighbors	Cognate status FIN	FIN > 0.4	Cognate status ENG	ENG > 0.4	Initial frication	Name agreement	Animate
1	kopp	a cup	176 301	13,20	4	3	1	3	28	0,523	1	0,264	1	0	0,9	0
2	stol	a chair	163 587	12,20	4	4	1	2	15	0,218	0	0,04	0	1	1	0
3	dörr	a door	154 930	11,60	4	3	1	3	5	0,04	0	0,524	1	0	1	0
4	bil	a car	1 479 579	110,50	3	3	1	3	22	0,038	0	0,054	0	0	1	0
6	flaska	a bottle	345 509	25,80	5	6	2	4	10	0,056	0	0,063	0	1	0,867	0
8	dator	a computer	638 052	47,60	5	5	2	2	9	0,115	0	0,248	0	0	1	0
9	hatt	a hat	64 573	4,80	4	3	1	3	31	0,754	1	0,92	1	1	0,967	0
10	boll	a ball	142 284	10,60	4	3	1	3	28	0,331	0	0,738	1	0	0,867	0
11	tomat	a tomato	67 563	5,00	5	5	2	2	9	0,617	1	0,754	1	0	1	0
12	tv	a tv	658 726	49,20	2	4	2	1	12	1	1	1	1	0	0,933	0
13	pyramid	a pyramid	10 998	0,80	7	7	3	2	1	0,761	1	1	1	0	0,767	0
14	soffa	a sofa	102 060	7,60	5	4	2	3	9	0,66	1	0,936	1	1	1	0
15	kniv	a knife	147 426	11,00	4	4	1	4	3	0,072	0	0,599	1	0	0,967	0
16	gaffel	a fork	25 653	1,90	6	5	2	3	3	0,047	0	0,055	0	0	1	0
17	sked	a spoon	68 684	5,10	4	3	1	3	18	0,061	0	0,313	0	1	1	0
18	klocka	a clock	124 623	9,30	6	5	2	3	17	0,078	0	0,387	0	0	0,967	0
19	penna	a pen	53 170	4,00	5	4	2	3	14	0,064	0	0,67	1	0	0,767	0
20	brunn	a well	23 524	1,80	5	4	1	5	8	0,05	0	0,038	0	0	0,967	0
21	bro	a bridge	75 733	5,70	3	3	1	3	16	0,03	0	0,443	1	0	0,933	0
22	fiol	a violin	12 668	0,90	4	4	2	2	1	0,075	0	0,289	0	1	0,9	0
23	gunga	a swing	14 341	1,10	5	4	2	3	20	0,07	0	0,19	0	0	0,867	0
24	lök	an onion	137 202	10,20	3	3	1	3	22	0,046	0	0,03	0	0	1	0
25	kruka	a pot	20 740	1,50	5	5	2	3	10	0,288	0	0,032	0	0	0,833	0
26	gitarr	a guitar	76 374	5,70	6	5	2	2	1	0,373	0	0,82	1	0	1	0
27	jacka	a jacket	164 659	12,30	4	4	2	2	22	0,142	0	0,646	1	0	1	0
28	tand	a tooth	86 254	6,40	4	4	1	4	10	0,046	0	0,282	0	0	1	0
29	slips	a tie	34 368	2,60	5	5	1	5	4	0,036	0	0,059	0	1	1	0
30	ballong	a balloon	28 785	2,10	7	5	2	3	4	0,274	0	0,723	1	0	1	0
31	kyrka	a church	175 850	13,10	5	5	2	3	5	0,429	1	0,059	0	0	1	0
32	hjälm	a helmet	55 130	4,10	5	4	1	5	11	0,054	0	0,45	1	0	1	0
33	cykel	a bike	330 885	24,70	5	5	2	3	2	0,07	0	0,201	0	1	0,967	0
34	banan	a banana	60 079	4,50	5	5	2	2	12	0,711	1	0,764	1	0	1	0
35	staty	a statue	19 334	1,40	5	5	2	3	2	0,265	0	0,686	1	1	1	0
38	skjorta	a shirt	90 770	6,80	7	4	2	2	6	0,332	0	0,439	1	1	0,933	0
40	nyckel	a key	66 627	5,00	6	5	2	2	2	0,053	0	0,217	0	0	1	0
42	fläkt	a fan	42 622	3,20	5	5	1	5	3	0,058	0	0,348	0	1	0,933	0
43	spegel	a mirror	55 523	4,10	6	6	2	3	4	0,17	0	0,04	0	1	1	0
49	pumpa	a pumpkin	10 151	0,80	5	5	2	3	14	0,248	0	0,605	1	0	1	0
52	skorsten	a chimney	6 919	0,50	8	7	2	4	1	0,261	0	0,107	0	1	0,967	0
54	tändare	a lighter	15 514	1,20	7	7	3	3	5	0,09	0	0,132	0	0	0,967	0
56	balkong	a balcony	64 763	4,80	7	6	2	3	2	0,071	0	0,589	1	0	1	0
57	tidning	a newspaper	271 946	20,30	7	6	2	3	5	0,114	0	0,046	0	0	0,967	0
62	hand	a hand	2 615 327	195,20	4	4	1	4	13	0,051	0	1	1	0	0,967	0
63	korg	a basket	41 215	3,10	4	4	1	4	9	0,662	1	0,052	0	0	1	0
68	säng	a bed	741 635	55,40	4	3	1	3	28	0,599	1	0,04	0	1	0,833	0
69	bok	a book	882 344	65,90	3	3	1	3	27	0,055	0	0,818	1	0	0,967	0
71	hund	dog	789 078	58,90	4	4	1	4	13	0,04	0	0,071	0	1	0,967	1
72	ko	a cow	71 570	5,30	2	2	1	2	30	0,02	0	0,079	0	0	1	1
76	diamant	a diamond	16 564	1,20	7	7	3	2	1	0,326	0	0,631	1	0	1	0
80	hammare	a hammer	24 068	1,80	7	6	3	3	5	0,174	0	0,726	1	1	0,933	0
84	bänk	a bench	80 565	6,00	4	4	1	4	12	0,16	0	0,35	0	0	0,8	0
86	bästu	a sauna	42 151	3,10	5	5	2	3	1	0,17	0	0,17	0	0	0,933	0
88	fyr	a lighthouse	16 139	1,20	3	3	1	3	18	0,02	0	0,01	0	1	0,933	0
89	kamera	a camera	177 437	13,20	6	6	3	2	2	1	1	0,636	1	0	1	0
92	äсна	a donkey	17 625	1,30	4	4	2	2	3	0,1	0	0,05	0	0	0,933	1
187	karta	a map	89 194	6,70	5	4	2	3	15	0,89	1	0,06	0	0	1	0
188	pipa	a pipe	48 461	3,60	4	4	2	3	19	0,56	1	0,71	1	0	1	0
193	tavla	a painting	53 812	4,00	5	5	2	3	7	0,44	1	0,06	0	0	1	0
199	häst	a horse	246 452	18,40	4	4	1	4	20	0,28	0	0,35	0	1	0,967	1
228	ring	a ring	47 841	3,60	4	3	1	4	27	0,05	0	1	1	0	1	0

List over items and lexical controls for neuter nouns.

Item number	Word	Translation	Absolute frequency	Relative frequency	Letters	Phonemes	Syllables	Phonemes 1st syllable	Phonological neighbors	Cognate status FIN	FIN > 0.4	Cognate status ENG	ENG > 0.4	Initial frication	Name agreement	Animate
93	glas	a glass	388 085	29,00	4	4	1	4	12	0,385	0	0,861	1	0	0,967	0
94	brev	a letter	276 204	20,60	4	4	1	4	10	0,084	0	0,114	0	0	0,867	0
95	bord	a table	174 191	13,00	4	3	1	4	30	0,04	0	0,062	0	0	1	0
96	hus	a house	1 009 461	75,40	3	3	1	3	26	0,038	0	0,5	1	1	1	0
97	ljus	a candle	367 334	27,40	4	3	1	4	33	0,039	0	0,052	0	0	0,833	0
98	staket	a (picket) fence	24 964	1,90	6	6	2	3	0	0,178	0	0,06	0	1	0,933	0
99	tåg	a train	273 153	20,40	3	3	1	3	25	0,038	0	0,325	0	0	1	0
100	äpple	an apple	83 402	6,20	5	4	2	2	2	0,07	0	0,632	1	0	1	0
101	påron	a pear	32 247	2,40	5	5	2	2	1	0,503	1	0,364	0	0	1	0
102	ben	a bone	98 038	7,30	3	3	1	3	31	0,048	0	0,491	1	0	1	0
105	träd	a tree	81 150	6,10	4	4	1	4	10	0,036	0	0,471	1	0	1	0
106	piano	a piano	47 690	3,60	5	5	2	3	3	1	1	1	1	0	0,9	0
108	pussel	a puzzle	39 681	3,00	6	5	2	3	5	0,355	0	0,488	1	0	1	0
109	mynt	a coin	16 894	1,30	4	4	1	4	6	0,027	0	0,077	0	0	0,833	0
110	kuvert	an envelope	32 617	2,40	6	5	2	2	1	0,372	0	0,133	0	0	0,933	0
111	berg	a mountain	285 619	21,30	4	4	1	4	7	0,062	0	0,024	0	0	0,867	0
112	skägg	a beard	70 521	5,30	5	3	1	3	14	0,05	0	0,05	0	1	1	0
114	skelett	a skeleton	14 368	1,10	7	6	2	3	0	0,066	0	0,725	1	1	1	0
115	kors	a cross	70 040	5,20	4	3	1	4	19	0,084	0	0,333	0	0	1	0
116	tält	a tent	44 641	3,30	4	4	1	4	18	0,434	1	0,564	1	0	1	0
117	koppel	a leash	37 305	2,80	6	5	2	3	4	0,037	0	0,133	0	0	0,967	0
120	lejon	a lion	33 182	2,50	5	5	2	2	1	0,621	1	0,685	1	0	0,967	1
122	hallon	a raspberry	5 563	0,40	6	5	2	3	0	0,072	0	0,043	0	1	0,8	0
126	ankare	an anchor	8 513	0,60	6	6	3	3	3	0,493	1	0,446	1	0	0,933	0
127	hjul	a wheel	31 017	2,30	4	3	1	4	20	0,04	0	0,249	0	0	1	0
130	element	a radiator	25 539	1,90	7	7	3	1	1	0,073	0	0,055	0	0	0,867	0
131	öga	an eye	149 153	11,10	3	3	1	3	15	0,03	0	0,044	0	0	1	0
132	rör	a pipe	19 784	1,50	3	3	1	3	28	0,03	0	0,033	0	0	0,8	0
133	svärd	a sword	33 800	2,50	5	4	1	5	4	0,039	0	0,66	1	1	1	0
134	öra	an ear	60 178	4,50	3	3	1	3	26	0,26	0	0,232	0	0	1	0
135	täcke	a blanket	85 450	6,40	5	4	2	2	11	0,073	0	0,164	0	0	0,9	0
136	huvud	a head	621 328	46,40	5	5	2		2	0,029	0	0,548	1	1	0,8	0
138	får	a sheep	16 198	1,20	3	3	1	3	25	0,021	0	0,028	0	1	0,967	1
139	altare	an altar	7 088	0,50	6	6	3	3	5	0,651	1	0,766	1	0	0,967	0
140	pass	a passport	880 397	65,70	4	3	1	3	23	0,754	1	0,616	1	0	0,9	0
142	ansikte	a face	253 439	18,90	7	7	3	2	4	0,086	0	0,251	0	0	0,967	0
143	akvarium	an aquarium	15 349	1,10	8	8	4	2	0	0,658	1	0,795	1	0	0,967	0
144	nät	a net	86 556	6,50	3	3	1	3	19	0,023	0	0,607	1	0	0,867	0
145	fönster	a window	123 464	9,20	7	7	2	3	2	0,055	0	0,057	0	1	1	0
147	rep	a rope	42 408	3,20	3	3	2	3	11	0,03	0	0,491	1	0	0,967	0
148	hjärta	a heart	613 082	45,80	6	4	2	2	16	0,06	0	0,475	1	1	1	0
150	horn	a horn	7 948	0,60	4	3	1	4	17	0,069	0	1	1	1	1	0
151	lamm	a lamb	21 606	1,60	4	3	1	4	24	0,045	0	0,662	1	0	0,933	1
154	mikroskop	a microscope	4 041	0,30	9	9	3	3	0	0,698	1	0,571	1	0	0,867	0
161	plåster	a bandaid	26 147	2,00	7	7	2	4	3	0,152	0	0,049	0	0	1	0
162	batteri	a battery	67 533	5,00	7	6	3	3	1	0,174	0	0,752	1	0	1	0
163	ägg	an egg	159 700	11,90	3	2	1	2	21	0,038	0	0,545	1	0	1	0
165	slott	a castle	73 000	5,40	5	4	1	4	13	0,066	0	0,095	0	1	0,933	0
168	mål	a goal	1 318 210	98,40	3	3	1	3	24	0,33	0	0,252	0	0	0,9	0
170	barn	a child	3 688 709	275,40	4	3	1	3	14	0,062	0	0,04	0	0	1	1
172	kvitto	a receipt	66 902	5,00	6	5	2	4	3	0,56	1	0,066	0	0	0,967	0
174	stetoskop	a stethoscope	3 472	0,30	9	9	3	3	0	0,718	1	0,701	1	1	0,9	0
176	tak	a roof	176 266	13,20	3	3	1	3	16	0,24	0	0,04	0	0	1	0
179	kex	a craker	2 582	0,20	3	4	1	4	19	0,491	1	0,548	1	1	0,8	0
183	garage	a garage	3 222	0,20	6	5	2	2	1	0,05	0	1	1	0	1	0
235	skepp	a ship	32 790	2,40	5	3	1	3	17	0,05	0	0,55	1	1	0,933	0
241	staffli	an easel	989	0,10	7	6	2	4	1	0,16	0	0,09	0	1	0,867	0
242	tempel	a temple	19 834	1,90	6	6	2	3	3	0,7	1	1	1	0	0,867	0
243	fängelse	a prison	461 488	34,4	8	7	3	3	3	0,07	0	0,06	0	1	1	0
244	diadem	a hairband	4510	0,30	6	6	3	2	1	0,06	0	0,15	0	0	0,867	0

Appendix B.

The four lists of experimental sentences with their matching nouns.

Item_number	TargetName	List1	List2	List3	List4
1	kopp	Jag tvättade en vacker	Jag tvättade hans gyllene	Jag tvättade hans vackra	Jag tvättade hans gyllene
4	bil	Jag körde en fascinerande	Jag körde en fascinerande	Jag körde hans dyra	Jag körde hans fascinerande
15	kniv	Jag hittade en slitén	Jag hittade hans medeltida	Jag hittade hans slitna	Jag hittade hans medeltida
19	penna	Jag lånade en värdelös	Jag lånade en extra	Jag lånade hans värdelösa	Jag lånade hans extra
21	bro	Jag beundrade en spektakulär	Jag beundrade en imponerande	Jag beundrade hans spektakulära	Jag beundrade hans imponerande
22	fiol	Jag reparerade en trasig	Jag reparerade en gammaldags	Jag reparerade hans trasiga	Jag reparerade hans gammaldags
23	gunga	Jag sålde en annorlunda	Jag sålde hans tjugiga	Jag sålde hans tjugiga	Jag sålde hans annorlunda
24	iök	Jag slängde en äcklig	Jag slängde en illaluktande	Jag slängde hans äckliga	Jag slängde hans illaluktande
28	tand	Jag hittade en riktig	Jag hittade en äkta	Jag hittade hans riktiga	Jag hittade hans äkta
30	ballong	Jag fick en stor	Jag fick en enda	Jag fick hans stora	Jag fick hans enda
33	cykel	Jag stal en ovanlig	Jag stal en intressant	Jag stal hans ovanliga	Jag stal hans intressanta
54	ländare	Jag lånade en snygg	Jag lånade en bra	Jag lånade hans snygga	Jag lånade hans bra
56	ballkong	Jag byggde en fin	Jag byggde en elegant	Jag byggde hans fina	Jag byggde hans eleganta
69	bok	Jag hittade en konstig	Jag hittade en spännande	Jag hittade hans konstiga	Jag hittade hans spännande
72	ko	Jag fotograferade en söt	Jag fotograferade en förtjusande	Jag fotograferade hans söta	Jag fotograferade hans förtjusande
2	stol	Jag målade en bra	Jag målade hans ovanliga	Jag målade hans bra	Jag målade en ovanlig
6	flaska	Jag målade en elegant	Jag målade hans vackra	Jag målade hans eleganta	Jag målade en vacker
9	hatt	Jag stal hans tjugiga	Jag stal hans tjugiga	Jag stal hans förtjusande	Jag stal en tjugig
10	boll	Jag teknade en annorlunda	Jag teknade hans söta	Jag teknade hans annorlunda	Jag teknade en söt
12	tv	Jag reparerade en gammaldags	Jag reparerade hans trasiga	Jag reparerade hans gammaldags	Jag reparerade en trasig
16	gaffel	Jag sålde en gyllene	Jag sålde hans fina	Jag sålde hans gyllene	Jag sålde en fin
18	klocka	Jag sålde en intressant	Jag sålde hans dyra	Jag sålde hans intressanta	Jag sålde en dyr
25	kruka	Jag slängde en enda	Jag slängde hans värdelösa	Jag slängde hans enda	Jag slängde en värdelös
26	gitarr	Jag spelade en imponerande	Jag spelade hans snygga	Jag spelade hans imponerande	Jag spelade en snygg
35	staty	Jag restaurerade en medeltida	Jag restaurerade hans slitna	Jag restaurerade hans medeltida	Jag restaurerade en slitén
42	fläkt	Jag fick en extra	Jag fick hans konstiga	Jag fick hans extra	Jag fick en konstig
49	pumpa	Jag åt en illaluktande	Jag åt hans äckliga	Jag åt hans illaluktande	Jag åt en äcklig
62	hand	Jag teknade en fascinerande	Jag teknade hans stora	Jag teknade hans fascinerande	Jag teknade en stor
88	fyr	Jag besökte en spännande	Jag besökte hans spektakulära	Jag besökte hans spännande	Jag besökte en spektakulär
188	pipa	Jag köpte en äkta	Jag köpte hans riktiga	Jag köpte hans äkta	Jag köpte en riktig
3	dörr	Jag restaurerade hans slitna	Jag restaurerade hans gammaldags	Jag restaurerade en slitén	Jag restaurerade en gammaldags
8	dörr	Jag beundrade hans dyra	Jag beundrade hans intressanta	Jag beundrade en dyr	Jag beundrade en intressant
11	tomat	Jag åt hans söta	Jag åt hans enda	Jag åt en söt	Jag åt en enda
17	sked	Jag köpte hans vackra	Jag köpte hans gyllene	Jag köpte en vacker	Jag köpte en gyllene
27	jacka	Jag tvättade hans snygga	Jag tvättade hans eleganta	Jag tvättade en snygg	Jag tvättade en elegant
29	slips	Jag lånade hans konstiga	Jag lånade hans extra	Jag lånade en konstig	Jag lånade en extra
31	kyrka	Jag besökte hans spektakulära	Jag besökte hans medeltida	Jag besökte en spektakulär	Jag besökte en medeltida
38	skjorta	Jag tvättade hans äckliga	Jag tvättade hans illaluktande	Jag tvättade en äcklig	Jag tvättade en illaluktande
40	nyckel	Jag fick hans värdelösa	Jag fick hans annorlunda	Jag fick en värdelös	Jag fick en annorlunda
57	tidning	Jag köpte hans ovanliga	Jag köpte hans spännande	Jag köpte en ovanlig	Jag köpte en spännande
63	korg	Jag teknade hans tjugiga	Jag teknade hans förtjusande	Jag teknade en tjugig	Jag teknade en förtjusande
80	hammare	Jag hittade hans fina	Jag hittade hans bra	Jag hittade en fin	Jag hittade en bra
89	kamera	Jag köpte hans riktiga	Jag köpte hans äkta	Jag köpte en riktig	Jag köpte en äkta
193	tavla	Jag restaurerade hans trasiga	Jag restaurerade hans fascinerande	Jag restaurerade en trasig	Jag restaurerade en fascinerande
199	häst	Jag fotograferade hans stora	Jag fotograferade hans imponerande	Jag fotograferade en stor	Jag fotograferade en imponerande
13	pyramid	Jag besökte hans spännande	Jag besökte en spektakulär	Jag besökte en spännande	Jag besökte hans spektakulära
14	soffa	Jag reparerade hans eleganta	Jag reparerade en slitén	Jag reparerade en elegant	Jag reparerade hans slitna
20	brunn	Jag byggde hans imponerande	Jag byggde en vacker	Jag byggde en imponerande	Jag byggde hans vackra
32	hjälm	Jag lånade hans extra	Jag lånade en värdelös	Jag lånade en extra	Jag lånade hans värdelösa
34	banan	Jag åt hans enda	Jag åt en söt	Jag åt en enda	Jag åt hans söta
43	spegel	Jag beundrade hans fascinerande	Jag beundrade en fin	Jag beundrade en fascinerande	Jag beundrade hans fina
52	skorsten	Jag byggde hans bra	Jag byggde en stor	Jag byggde en stor	Jag byggde hans stora
68	säng	Jag reparerade hans annorlunda	Jag reparerade en trasig	Jag reparerade en annorlunda	Jag reparerade hans trasiga
71	hund	Jag fotograferade hans illaluktande	Jag fotograferade en äcklig	Jag fotograferade en illaluktande	Jag fotograferade hans äckliga
76	diamant	Jag fick hans äkta	Jag fick en riktig	Jag fick en äkta	Jag fick hans riktiga
84	bänk	Jag teknade hans intressanta	Jag teknade en ovanlig	Jag teknade en intressant	Jag teknade hans ovanliga
86	bastu	Jag målade hans gammaldags	Jag målade en snygg	Jag målade en gammaldags	Jag målade hans snygga
92	äсна	Jag matade hans förtjusande	Jag matade en tjugig	Jag matade en förtjusande	Jag matade hans tjugiga
187	karta	Jag hittade hans medeltida	Jag hittade en konstig	Jag hittade en medeltida	Jag hittade hans konstiga
228	ring	Jag stal hans gyllene	Jag stal en dyr	Jag stal en gyllene	Jag stal hans dyra
93	glas	Jag lånade ett stort	Jag lånade ett förtjusande	Jag lånade hans stora	Jag lånade hans förtjusande
96	hus	Jag sålde ett tjeusigt	Jag sålde ett imponerande	Jag sålde hans tjugiga	Jag sålde hans imponerande
110	kuvert	Jag slängde ett trasigt	Jag slängde ett extra	Jag slängde hans trasiga	Jag slängde hans extra
112	skåp	Jag teknade ett snygt	Jag teknade ett elegant	Jag teknade hans snygga	Jag teknade hans eleganta
114	skelett	Jag hittade ett riktigt	Jag hittade ett äkta	Jag hittade hans riktiga	Jag hittade hans äkta
116	tält	Jag tvättade ett äckligt	Jag tvättade ett illaluktande	Jag tvättade hans äckliga	Jag tvättade hans illaluktande
122	hallon	Jag åt ett sött	Jag åt ett enda	Jag åt hans söta	Jag åt hans enda
126	ankare	Jag restaurerade ett dyrt	Jag restaurerade ett medeltida	Jag restaurerade hans dyra	Jag restaurerade hans medeltida
127	hjul	Jag köpte ett fint	Jag köpte ett bra	Jag köpte hans fina	Jag köpte hans bra
131	öga	Jag teknade ett konstigt	Jag teknade ett fascinerande	Jag teknade hans konstiga	Jag teknade hans fascinerande
143	alvarium	Jag sålde ett vackert	Jag sålde ett intressant	Jag sålde hans vackra	Jag sålde hans intressanta
145	fönster	Jag reparerade ett värdelöst	Jag reparerade ett gammaldags	Jag reparerade hans värdelösa	Jag reparerade hans gammaldags
147	rep	Jag hittade ett slitet	Jag hittade ett annorlunda	Jag hittade hans slitna	Jag hittade hans annorlunda
165	slott	Jag besökte ett spektakulärt	Jag besökte ett gyllene	Jag besökte hans spektakulära	Jag besökte hans gyllene
243	fängelse	Jag besökte ett ovanligt	Jag besökte ett spännande	Jag besökte hans ovanliga	Jag besökte hans spännande
97	ljus	Jag hittade ett äkta	Jag hittade hans riktiga	Jag hittade hans äkta	Jag hittade ett riktigt
98	staket	Jag målade ett förtjusande	Jag målade hans tjugiga	Jag målade hans förtjusande	Jag målade ett tjugigt
105	träd	Jag beundrade ett intressant	Jag beundrade hans fina	Jag beundrade hans intressanta	Jag beundrade ett fint
108	pussel	Jag fick ett spännande	Jag fick hans slitna	Jag fick hans spännande	Jag fick ett slitet
115	kors	Jag restaurerade ett medeltida	Jag restaurerade hans ovanliga	Jag restaurerade hans medeltida	Jag restaurerade ett ovanligt
117	koppel	Jag lånade ett bra	Jag lånade hans snygga	Jag lånade hans bra	Jag lånade ett snygt
120	lejon	Jag matade ett elegant	Jag matade hans vackra	Jag matade hans eleganta	Jag matade ett vackert
132	rör	Jag reparerade ett gammaldags	Jag reparerade hans trasiga	Jag reparerade hans gammaldags	Jag reparerade ett trasigt
136	huvud	Jag teknade ett annorlunda	Jag teknade hans konstiga	Jag teknade hans annorlunda	Jag teknade ett konstigt
138	får	Jag tvättade ett illaluktande	Jag tvättade hans äckliga	Jag tvättade hans illaluktande	Jag tvättade ett äckligt
139	altare	Jag byggde ett gyllene	Jag byggde hans spektakulära	Jag byggde hans gyllene	Jag byggde ett spektakulärt
154	mikroskop	Jag beundrade ett fascinerande	Jag beundrade hans dyra	Jag beundrade hans fascinerande	Jag beundrade ett dyrt
161	plåster	Jag fick ett extra	Jag fick hans värdelösa	Jag fick hans extra	Jag fick ett värdelöst
179	kex	Jag åt ett enda	Jag åt hans söta	Jag åt hans enda	Jag åt ett sött
183	garage	Jag byggde ett imponerande	Jag byggde hans stora	Jag byggde hans imponerande	Jag byggde ett stort
101	påron	Jag stal hans stora	Jag åt hans enda	Jag åt ett stort	Jag åt ett enda
102	ben	Jag fotograferade hans fina	Jag fotograferade hans fasinerande	Jag fotograferade ett fint	Jag fotograferade ett fascinerande
109	mynt	Jag fick hans ovanliga	Jag fick hans intressanta	Jag fick ett ovanligt	Jag fick ett intressant
111	berg	Jag besökte hans vackra	Jag besökte hans spännande	Jag besökte ett vackert	Jag besökte ett spännande
133	svärd	Jag restaurerade hans slitna	Jag restaurerade hans medeltida	Jag restaurerade ett slitet	Jag restaurerade ett medeltida
134	öra	Jag teknade hans konstiga	Jag teknade hans annorlunda	Jag teknade ett konstigt	Jag teknade ett annorlunda
142	ansikte	Jag målade hans tjugiga	Jag målade hans förtjusande	Jag målade ett tjugigt	Jag målade ett förtjusande
148	hjärta	Jag målade hans söta	Jag målade hans gyllene	Jag målade ett sött	Jag målade ett gyllene
150	horn	Jag sålde hans riktiga	Jag sålde hans äkta	Jag sålde ett riktigt	Jag sålde ett äkta
151	lamm	Jag tvättade hans äckliga	Jag tvättade hans illaluktande	Jag tvättade ett äckligt	Jag tvättade ett illaluktande
162	batteri	Jag köpte hans värdelösa	Jag köpte hans extra	Jag köpte ett värdelöst	Jag köpte ett extra
168	mål	Jag reparerade hans trasiga	Jag reparerade hans gammaldags	Jag reparerade ett trasigt	Jag reparerade ett gammaldags
176	tak	Jag byggde hans snygga	Jag byggde hans imponerande	Jag byggde ett snygt	Jag byggde ett imponerande
235	skepp	Jag fotograferade hans spektakulära	Jag fotograferade hans eleganta	Jag fotograferade ett spektakulärt	Jag fotograferade ett elegant
241	staffli	Jag lånade hans dyra	Jag lånade hans bra	Jag lånade ett dyrt	Jag lånade ett bra
94	brev	Jag fick hans spännande	Jag fick ett konstigt	Jag fick ett spännande	Jag fick hans konstiga
95	bord	Jag köpte hans intressanta	Jag köpte ett dyrt	Jag köpte ett intressant	Jag köpte hans dyra
99	tåg	Jag körde hans imponerande	Jag körde ett stort	Jag körde ett imponerande	Jag körde hans stora
100	äpple	Jag stal hans gyllene	Jag stal ett sött	Jag stal ett gyllene	Jag stal hans söta
106	piano	Jag spelade hans gammaldags	Jag spelade ett slitet	Jag spelade ett gammaldags	Jag spelade hans slitna
130	element	Jag hittade hans bra	Jag hittade ett trasigt	Jag hittade ett bra	Jag hittade hans trasiga
135	lücke	Jag lånade hans extra	Jag lånade ett vackert	Jag lånade ett extra	Jag lånade hans vackra
140	pass	Jag stal hans enda	Jag stal ett fint	Jag stal ett enda	Jag stal hans fina
144	nät	Jag reparerade hans annorlunda	Jag reparerade ett värdelöst	Jag reparerade ett annorlunda	Jag reparerade hans värdelösa
163	ägg	Jag slängde hans illaluktande	Jag slängde ett äckligt	Jag slängde ett illaluktande	Jag slängde hans äckliga
170	barn	Jag fotograferade hans förtjusande	Jag fotograferade ett tjugigt	Jag fotograferade ett förtjusande	Jag fotograferade hans tjugiga
172	kvitto	Jag hittade hans fascinerande	Jag hittade ett ovanligt	Jag hittade ett fascinerande	Jag hittade hans ovanliga
174	stetoskop	Jag köpte hans äkta	Jag köpte ett riktigt	Jag köpte ett äkta	Jag köpte hans riktiga
242	tempel	Jag beundrade hans medeltida	Jag beundrade ett spektakulärt	Jag beundrade ett medeltida	Jag beundrade hans spektakulära
244	diadem	Jag stal hans eleganta	Jag stal ett snygt	Jag stal ett elegant	Jag stal hans snygga

Appendix C.

The adaptation of LexTale for Swedish.

Prompt	Word/non-word	Correct Answer
Orott	test item, not scored	no
Anmäla	test item, not scored	yes
Fruntimmer	test item, not scored	yes
Genhålla	non-word	no
Hyvens	word	yes
Aktie	word	yes
Åtminstone	word	yes
Ikligt	non-word	no
Anordna	word	yes
Timme	word	yes
Hamna	word	yes
Lynnig	word	yes
Hyrelserna	non-word	no
Svansa	word	yes
Gammal	word	yes
Förräderi	word	yes
Smink	word	yes
Aktning	word	yes
Höklare	non-word	no
Lunka	word	yes
Käpp	word	yes
Nareri	non-word	no
Abonnemang	word	yes
Intryck	word	yes
Attrapp	word	yes
Krina	non-word	no
Självständig	word	yes
Jobba	word	yes
Missbruk	word	yes
Affäll	non-word	no
Samvete	word	yes
Ofta	word	yes
Dyknistera	non-word	no
Tecken	word	yes

Alordnad	non-word	no
Polentesi	non-word	no
Fundera	word	yes
Konkurrens	word	yes
Land	word	yes
Ounderlig	non-word	no
Vanlig	word	yes
Redigera	word	yes
Vinnige	non-word	no
Löjlig	word	yes
Ydlementer	non-word	no
Detrollera	non-word	no
Tänka	word	yes
Anledning	word	yes
Ådra	word	yes
Bekant	word	yes
Drena	non-word	no
Omtjusta	non-word	no
Läsa	word	yes
Djur	word	yes
Övertygad	word	yes
Girig	word	yes
Ämtliga	non-word	no
Tidsel	non-word	no
Njure	word	yes
Imitta	non-word	no
Gryven	non-word	no
Liten	word	yes
Aning	word	yes

Appendix D.

List over the glosses used in this paper

COMM. – Common gender

DEF. – Definite

FEM. – Feminine gender

INV. - Invariable

MASC. – Masculine gender

NEUT. – Neuter gender

PL. – Plural

SG. – Singular

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