Plural Gender: Behavioral evidence for plural as a value of Cushitic gender with reference to Konso

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For Abeba, Fasika and Haniel

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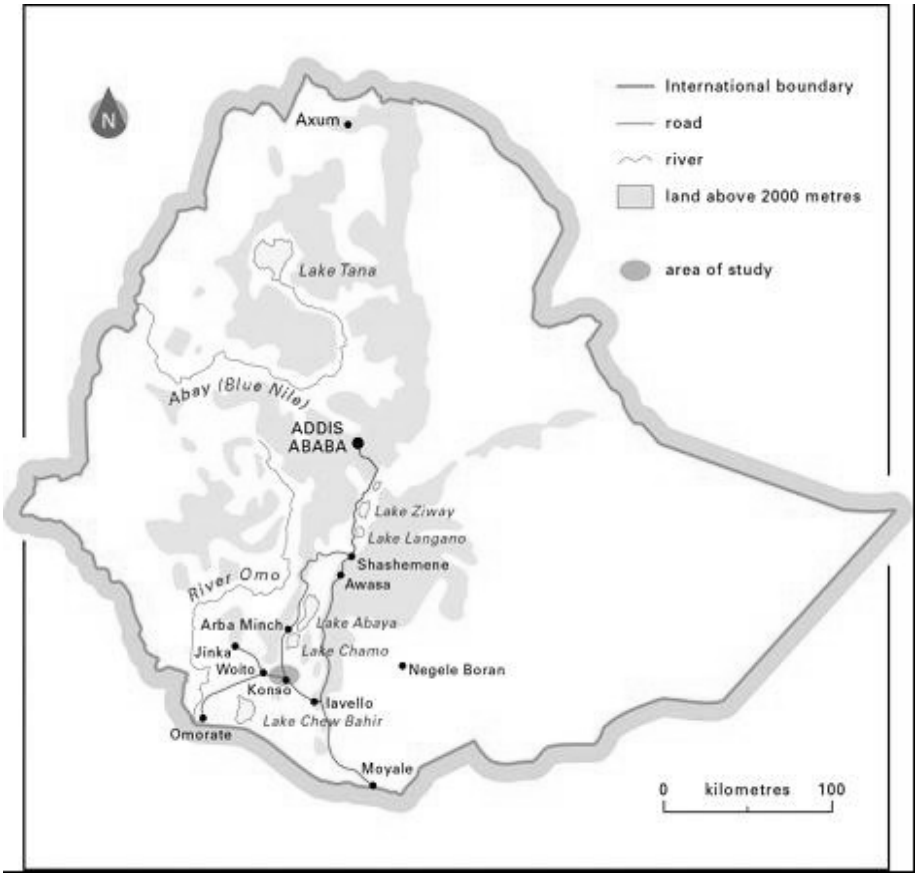
List of symbols and abbreviations

1	first person
3	third person
.	separates more than one gloss elements that correspond to one object-language element
=	marks subject clitic boundaries
~	connects the reduplicated element to its stem
%e	error rate in percentage
ADJ	adjective
ANOVA	analysis of variances
C	consonant
COM	common gender
CSA	central statistics agency (of Ethiopia)
DEF	definite
DET	determiner
DSIH	Determiner Selection Interference Hypothesis
DUR	durative
F	feminine gender
GSIH	Gender Selection Interference Hypothesis
IN	Independent Network model
IPF.FUT	imperfective future
M	masculine gender
MULT	multiple-reference number (plural number)
N	neuter gender
NP	noun phrase
P	plural gender
PAS	passive
POS	possessive
PF	perfective

PRT	particle
RDP	reduplication
RTs	reaction times
PWI	picture-word interference
SG	single-reference number (singular)
SOA	Stimulus onset asynchrony
SPN	simple picture naming
WEAVER + +	Word Encoding by Activation and VERification model
V	vowel

Map



The location of Konso in Ethiopia (map by Ian Agnew: taken, with permission, from http://www.geog.cam.ac.uk/research/projects/konsoethnography/

CHAPTER 1

1. General introduction

1.1. Background

This dissertation is concerned with the psycholinguistic investigation of grammatical gender and number in Cushitic languages. Gender and number are interrelated in a complex way in Cushitic languages. Masculine and feminine are the accepted gender values across all Cushitic languages. However, there is evidence suggesting the presence of a third gender value in some Cushitic languages. This third gender value is called plural gender since it requires the same agreement form as third person plural number (hereafter: multiple-reference, to avoid confusion with the use of plural as a value of gender). Plural gender represents a class of nouns that require plural agreement form even when they refer to single entities. In other words, by triggering plural agreement form, nouns with plural gender behave as though they were plural while in singular. This third value of gender, i.e. "plural", raises the question whether nouns with this value are processed as part of the number system or whether plural is a gender value on its own right.

Corbett analyzed the gender system of Cushitic languages, specifically Bayso, as having only two values and the third value as part of the number category, see Corbett and Hayward (1987), Corbett (1991, 2005, 2012). Mous (2008) argued that Corbett's analysis does not work for other Cushitic languages because gender and number are two independent agreement systems and adjectives show agreement for both categories independently (for specific languages see also Hayward, 1979 for Bayso; Mous, 1993, 2008 for Iraqw; Pillinger and Galboran, 1999 for Rendille; Savà, 2005 for Ts'amakko; Orkaydo, 2013 for Konso). This dissertation investigates the psycholinguistic status of the so-called plural gender in Cushitic by means of speech production experiments, and with particular

reference to Konso, a Lowland East Cushitic language of Ethiopia (see § 2.2. Gender system of Konso, pp. 35-36).

Speech production is one of the three main areas in psycholinguistics (the psychology of language), beside language acquisition and language comprehension. Speech production studies have been a less studied area compared to language comprehension since monitoring our thoughts may be challenging. Producing an utterance requires determining what to produce (conceptualization), deciding how to produce it (formulation), and producing it (articulation; Levelt, 1989). As Levelt states, during conceptualization, the speaker conceives an intention to convey a message and selects information for assembling anticipated speech, which produce a preverbal message. During formulation, the conceptual representation is transformed into a linguistic form. This contains processes of putting words together to form a sentence (syntactic planning), and selecting words that the speaker intends to produce (lexicalization). During articulation, accessing pieces of internal speech and motor execution are performed. The present dissertation focuses mainly on the syntactic planning stage of formulation, i.e. the stage where selecting syntactic information such as gender and number is specified (Levelt, 1989).

Chronometric measures such as naming latency along with speech error rates are important sources of data for speech production research. Response latency measures are based on varieties of picture naming tasks such as picture-word interference and simple picture naming paradigms. In the picture-word interference task, participants are instructed to name pictures while ignoring distractor words. The relation between the target picture and the distractor word may affect the speed and the accuracy of the

response. In the simple picture naming task, one or two pictures are presented without distractor words, which make it a pure production task without the effect associated with comprehension processes of distractor words. Moreover, there are no assumptions regarding the way distractors activate their abstract gender features and their associated morphemes, and the way these processes correlate with accessing the target (Jescheniak, Schriefers, & Lemhöfer, 2014). In the studies reported in the present dissertation, both picture-word interference and simple picture naming tasks were used to determine the status of the so-called plural gender and the selection mechanism of bound gender-marked morpheme in Konso.

Much research on speech production has shown that gender may influence language processing in gender-marking languages. It has repeatedly been shown in some Germanic languages such as Dutch and German that participants are slower to produce a picture in the presence of a distractor word when the target picture name and the distractor word had a different gender compared to when they had the same gender (e.g. Schriefers, 1993 in Dutch; Schiller & Costa, 2006 in German). This is because the presentation of a target picture in the presence of a distractor word with a different gender may activate two different gender values. The concurrent activation of two different gender values may result in competition. As a result of this competition, the selection of gender value of the target is delayed compared to the situation when both the target and distractor word activate the same gender value. This is the assumption behind competitive selection processing mechanism. This effect has not been consistently reported in other gender-marking languages such as Italian (Miozzo & Caramazza, 1999). Moreover, there is an on-going debate as to whether the selection of bound gender-marked

morphemes, such as adjectival agreement suffixes, follows the competitive processing mechanisms similar to the selection of freestanding gender-marked elements, such as determiners. In the studies reported in the present dissertation, we conducted a series of picture-word interference and simple picture naming tasks in Konso. In these tasks, we examined whether bound gender-marked morphemes are selected competitively besides determining the status of the so-called plural gender.

1.2. The number of genders in Cushitic languages

Cushitic is a branch of the Afro-asiatic language family that hosts more than 30 languages that are spoken in North Eastern and East Africa. As shown at the beginning of this chapter, there are two competing analyses regarding the number of genders in Cushitic languages. According to one analysis, only masculine and feminine genders are recognized for all Cushitic languages. According to an alternative analysis, there are three values of gender and the third one, in addition to masculine and feminine, is plural gender for those languages that have this value.

In Cushitic languages, there are three agreement domains for gender (Mous, 2008). These are agreement with the subject on the verb, agreement with the head noun for demonstratives and possessives including possessive nominal, and agreement of adjectives with head nouns (Mous, 2008). In the domain of noun phrases, most Cushitic languages distinguish three values for gender; namely masculine, feminine and plural genders. Exceptionally, Oromo, Somali, Rendille and Dhaasanach have only two values for gender (masculine and feminine). In the domain of clauses, Cushitic languages with two-way gender agreement systems are K'abeena,

Elmolo, and Dhaasanach. In the clause domain, Cushitic languages that are said to have plural gender in addition to masculine and feminine genders are Bayso, Konso, Dirayta, Ts'amakko, Rendille, and Boni of the Southern Lowland as well as Iraqw, Alagwa, and Burunge of Southern Cushitic languages. This means that at least one third of the Cushitic languages have three-way gender agreement systems in which the third is said to be plural gender. The assumption behind this research is that, in Konso, the plural agreement class (as realized on definite markers and verbal inflection) is the morphosyntactic realization of a third gender value, the plural. This dissertation aims to test the validity of this assumption by investigating the psychological reality and the processing of the plural agreement class.

1.3. What is the status of the so-called plural gender in Cushitic languages?

In an earlier section, mention was made that plural gender is analyzed as a proper gender value in most descriptive studies on Cushitic languages and as a value of number in some theoretical and typological studies. The first analysis is based on most descriptive studies on Cushitic languages and argued for in Mous (2008). Mous explains that gender and number are two independent agreement systems and adjectives show agreement for both features independently. This means that treating the third value (plural) as a value of number would create an inconsistent scenario whereby adjectives show conflicting values for number and gender in agreement with one and the same head noun.

The second analysis is based on typological and theoretical studies on gender, in which a value is said to belong to only one

feature (Corbett, 2012). This restrictive view, does not allow treating plural as a value of gender possibly to keep the morphosyntactic features distinct. Following this line of argument, Corbett proposes only two values of gender for Bayso and by extension for other Cushitic languages that have similar features (Corbett & Hayward, 1987; Corbett, 1991, 2005, 2012). Note that the original analysis of gender in Bayso distinguishes three values of gender for which nouns are classified based on the agreement shown outside the noun itself (Hayward, 1979). These three values of gender include masculine, feminine and plural genders. Corbett and Hayward (1987) reexamined this original analysis and come to the conclusion that only two values (masculine and feminine) should be accepted as values of gender and there is no need to postulate a third value of gender in Bayso. The authors reasoned that nouns in the third value are small in number that can be treated by properties showing irregularity in number morphology similar to *pluralia tantum* nouns. In this way, plural is excluded from the gender feature and nouns with this value are treated as part of the number feature marked for their exceptional behavior, as nouns requiring plural agreement for single-reference. The studies reported in the present dissertation examined the above two competing analyses using standard behavioral methods developed for the investigation of grammatical gender processing during speech production.

As stated earlier, Cushitic languages that are characterized by having the so-called plural gender value are Konso, Bayso, Dirayta, Ts'amakko, Rendille, Boni, Iraqw, Alagwa, and Burunge (Mous, 2008). Efforts were made to include at least the first two languages in the present dissertation since these languages are the basis for the aforementioned two contrasting analyses. In actual terms, however,

the experiments, which are reported in the present dissertation, were conducted in Konso due to practical reasons related to the nature of experiments mainly the need for sizeable number of participants and availability of adequate stimulus materials. According to the Central Statistic Agency of Ethiopia (2007), the population of Konso is about 250,000, much larger than the number of Bayso speakers, which stands at 5,500. This means that recruiting large number of suitable candidates for participating in experiments was easier in Konso compared to Bayso. In terms of accessibility and facility, there is a high school at the heart of Konso town (Karat), in which the majority are Konso native speakers and there is access to electricity and relatively suitable room for undertaking experiments. Similarly, based on the available data, Konso has relatively large number of non-derived plural gender nouns. Another motivation for choosing Konso includes the availability of an in-depth analysis of the grammar of the language (Orkaydo, 2013), dictionary, and native speaker linguist (Ongaye Oda Orkaydo).

Konso, the language we studied in the present dissertation, belongs to the Lowland East Cushitic branch and spoken in the southwest of Ethiopia. Konso is said to have a three-way gender distinction system and the third, beside feminine and masculine, is said to be plural gender (Orkaydo, 2013). This three-way gender agreement is marked in the subject inflection on the verb. Accordingly, feminine nouns take the same agreement form as the third person female subject, marked by the suffix *–t* as shown in (1). Masculine nouns take the same agreement form as the third person male subject, marked by the suffix *–ay*, see example (2). Plural gender nouns take the same agreement form as the third person

multiple-reference subject, marked by the suffix *–n* as illustrated in (3).

Konso gender agreement in the subject inflection on the verb in overt subject sentences (Orkaydo, personal communication)

(1) lafta-siʔ i=akk-am-**t-**i
bone-DEF.M/F 3=show-PAS-3F-PF
'The bone was shown.'

(2) ʗoyra-siʔ i=akk-am-**ay**
tree-DEF.M/F 3=show-PAS-PF.3M
'The tree was shown.'

(3) kosaa-siniʔ i=akk-am-i-**n**
granary-DEF.P 3=show-PAS-PF-3**P**
'The granary was shown.'

As the examples above show, simple sentences can have overt subjects, verb roots with subject proclitics and inflectional suffixes in Konso (Orkaydo, 2013, p. 59). The overt subjects can also be omitted and they can be understood from the gender agreement markers on the verb (See examples (4), (5) and (6)).

Konso gender agreement in the subject inflection on the verb in null subject sentences (Orkaydo, personal communication).

(4) i=akk-am-**t-**i
3=show-PAS-3F-PF
'She was shown.'

(5) i=akk-am-**ay**
3=show-PAS-PF.3M
'He was shown.'

(6) i=akk-am-i-**n**
3=show-PAS-PF-3**P**
'They were shown.'

Native Konso speakers were instructed to respond to pictures using overt subject sentences, similar to (1), (2) and (3), and null subject sentences, similar to (4), (5) and (6), in the different experiments reported in the present dissertations.

Native Konso speakers were also requested to respond to pictures using definite nouns. In Konso, the gender of nouns determines the selection of definite marking on nouns and

distinguishes only between plural and non-plural gender (feminine and masculine) definite nouns (Orkaydo, 2013, pp. 77-78). Plural gender nouns take the definite suffix *–sini?* (e.g. *kosaa*$_{P}$-*sini?*$_{DEF.P}$ 'the granary'). Non-plural (masculine and feminine) gender, however, take the definite suffix *–si?* (e.g. *ɠimayta*$_{M}$-*si?*$_{DEF.M/F}$ 'the old man' or *alleeta*$_{F}$-*si?*$_{DEF.M/F}$ 'the hut').

Moreover, there are five multiple-reference suffixes in Konso that mark multiplicity of nouns, of which *–ɗɗaa* and *–ɗaa* are the most productive ones (Orkaydo, 2013). Both *–ɗɗaa* and *–ɗaa* were mainly used in the production of the multiple-object picture naming condition of the experiments reported in the present dissertation as they can attach to the base nouns with different gender values. For instance, the word *kosaa* 'granary' is plural in gender and it takes the multiple-reference suffix *-ɗɗaa* as in *kosaa-ɗɗaa* /granary-MULT/ 'granaries' (Orkaydo, 2013, p. 81). The definite multiple-reference form of this noun would be *kosaa-ɗɗaa-sini?* /granary.P-MULT-DEF.P/ 'the granaries'.

In summary, there are two competing traditions to analyze the so-called plural gender in Cushitic languages that are said to have this value. In one tradition, only masculine and feminine are accepted as values of gender and the third value is treated as part of number feature (Corbett & Hayward, 1987; Corbett, 2012). In another tradition, three gender values are recognized including plural as a gender value (Mous, 2008; Savà, 2005; Orkaydo, 2013). In the present dissertation, we examined these two competing analyses (plural as a value of gender vs. plural as a value of number) behaviorally by measuring response times and error rate using picture-word interference task in Konso.

1.4. The psycholinguistics of grammatical gender

In speech production research, grammatical gender has been playing a vital role in understanding how linguistic information is represented in brain and accessed for speech. In this regard, an area of interest for theories of speech production would be the cognitive process required for activating grammatical gender information and using this information to select appropriate gender-marked elements. There have been different models of speech production to account for the mechanism by which processes of gender retrieval are specified. Basically, most prominent models of speech production share the assumption that gender is a stored lexical property that is involved in inflectional processes (see e.g., the network model of Caramazza, 1977; interactive model of Dell, 1986; and Word Encoding by Activation and VERification (WEAVER ++) model of Levelt, Roelofs, & Meyer, 1999).

However, these models predict different processing mechanisms for gender feature retrieval and these predictions were examined empirically by several psycholinguistic studies. In other words, it is not entirely clear as to the specificities of accessing and selecting gender feature since the empirical data display differences in cross-linguistic processing of gender. Studies also differ in addressing the question whether selecting a gender feature involves competitive processes at all. Assuming that gender is selected competitively, the question has also been raised whether it occurs at the grammatical encoding or at the phonological encoding level. There have been further inquiries as to whether selection by competition applies to bare nouns or whether it is confined to gender-marked morphemes, and even more critically as to whether it applies to all gender-marked morphemes including bound morphemes.

For instance, Schriefers (1993) has shown that gender affects the production of noun phrases using picture-word interference tasks in Dutch. Although the effect of gender congruency has been replicated in Dutch and German many times under different conditions by different researchers (e.g. Van Berkum, 1997; La Heij, Mak, Sander, & Willeboordse, 1998; Schriefers & Teruel, 2000; Schiller & Caramazza, 2003), it has not been consistently reported in other languages. For instance, the effect has not been observed in any Romance languages presumably because the selection of determiners in those languages not only depends on the gender value of the noun but also on phonological properties, thus delaying the process of determiner selection and making resolution of gender conflict possible (Costa, Sebastian-Galles, Miozzo, & Caramazza, 1999; Miozzo & Caramazza, 1999; Alario & Caramazzza, 2002). This shows the language-specific property of gender congruency effect.

Moreover, the available literature on speech production provides two competing hypotheses for the selection mechanism of gender-marked morphemes. These are competitive and non-competitive selection processes. The selection-by-competition hypothesis assumes that competitive processing mechanism play a role in selecting gender-marked morphemes (Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014). This means that activating the target utterance also activates its competitors, and the activation of these competitor items delays the selection times of the target utterance and sometimes affects the accuracy of the response (Jescheniak et al., 2014). Jescheniak and colleagues offer a review of the literature on the selection mechanism of gender and conclude that the existing evidence supports a competitive lexical selection

mechanism for gender-marking morphemes including bound morphemes. Noncompetitive selection hypothesis, on the other hand, assumes that the selection times of a target utterance depends only on the activation level of the target itself, and not the activation level of other competitors (Janssen, Schiller, & Alario, 2014). Janssen et al. (2014) argue that the pattern of the available and new data in simple picture naming task is less consistent than what has been described by Jescheniak et al. (2014). Janssen et al. (2014) analysed these data using arguably a more appropriate approach to isolate an idiosyncratic item effect, namely analysing the Number (single-reference vs. multiple-reference) by Format (noun phrase vs. bare noun) interactions for each gender class separately. Studies in the present dissertation examined which one of these competing hypotheses accounts for the selection of gender-marked suffixes in Konso.

Schriefers (1993) observed significantly longer naming latencies in the gender-incongruent condition compared to the gender-congruent condition in Dutch noun phrase (NP) production. He interpreted the observed gender congruency effect as showing competition in the selection of the abstract gender feature of the noun at the syntactic level. The reason was that two different gender values compete for selection in the gender-incongruent condition. This was not the case in the gender-congruent condition as both the target and the distractor activate one and the same gender value. However, Miozzo and Caramazza (1999) propose that the gender congruency effect reflects processing at the phonological encoding level and not at the grammatical encoding level following their failure to find the effect in Italian. Initially, the authors argued that the effect would have to be observed in bare noun naming as well if the congruency

effect shows competition between syntactic features at the grammatical encoding level and not between the word forms at the phonological encoding level. In line with this argument, La Heij et al. (1998) failed to observe a gender congruency effect in bare noun naming although they observed the effect in determiner and noun naming in Dutch. However, the absence of the effect in bare noun production can also be accounted for by assuming that gender information is selected only when needed for noun phrase production (Levelt et al., 1999).

Schiller and Caramazza (2003) provide strong evidence for the hypothesis that the gender congruency effect is located at the phonological encoding level and not at the grammatical encoding level. They observed congruency effect for single-reference NPs but not for multiple-reference NPs in Dutch and German. In these languages, there are distinct gender-marked forms in single-reference but there is only one form for all genders in the multiple-reference NPs. The logic was that the congruency effect should have been found both in single-reference and multiple-reference NPs if the effect was originated at grammatical encoding level. The absence of the effect in the multiple-reference NPs, in which the gender feature does not surface overtly, shows that the congruency effect is located at the phonological encoding level, where the gender-marked phonological forms are selected. This means that gender-marking forms and not the abstract gender nodes are subjected to competition for selection.

Another critical issue in the study of gender feature retrieval has to do with the selection processes of bound versus freestanding morphemes. As will be shown later, some studies propose that only freestanding gender-marked elements are selected competitively but

bound gender-marked morphemes do not involve competitive selection processes (Schiller & Caramazza, 2003; Costa, Kovacic Fedorenko, & Caramazza, 2003; Schiller & Costa, 2006). Other studies propose that there is no need to propose different selection mechanism for bound and freestanding morphemes as they both are selected in a competitive manner (Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014).

In sum, the experimental study of gender feature retrieval in language production has been shedding more light on the mechanisms that govern the selection of lexical grammatical features and their role in the processing of inflectional morphology. As the above review illustrates, the question regarding the selection mechanism of bound gender-marked morphemes is not adequately addressed yet. This means that additional empirical studies are necessary to provide further evidence to broaden our understanding of the processing mechanism of gender in speech production. The studies reported in the present dissertation applied the picture-word interference and simple picture naming tasks to Konso. These studies aimed at filling the gap of cross-linguistic confirmation on the selection mechanism of gender from non-Indo-European languages and introducing experimental approaches for studying gender in Cushitic languages.

1.5. Does producing bound morphemes involve competitive processes?

In speech production, the selection processes of grammatical function (closed-class) items such as definite suffixes are different from content (open-class) words such as nouns and verbs (Garrett, 1982).

For instance, the material necessary for accessing and selecting nouns is mainly provided by the semantic structure (Caramazza, 1977; Dell, 1986; Levelt et al., 1999). This is different in the case of function words such as definite markers. As in the case of many gender-marking languages, selection of definite markers depends on the specific properties of the noun in Konso, the language we investigated in the present dissertation (e.g., *furaa-sini?* /key.P-DEF.P/ 'The key' vs. *kuta-si?* /dog.M-DEF.M/F/ 'The dog'). The choice of the correct definite suffix in Konso depends on the grammatical gender of the noun. Konso single-reference definite nouns are associated with either plural or non-plural genders. This means that the selection of a particular definite suffix in a single-reference definite noun in Konso relies on accessing information on definiteness and gender. In other words, selecting a definite suffix happens following the selection of the noun and accessing its gender information provided that plural is indeed a gender value in Konso.

In some works on the processing mechanism of closed-class items, a further distinction has been proposed for the selection processes of different closed-class items (Costa et al., 2003; Schiller & Caramazza, 2003; Schiller & Costa, 2006). This distinction contrasts the selection of bound closed-classed morphemes with that of freestanding morphemes. According to this contrast, bound morphemes are selected following noncompetitive processes, while freestanding morphemes are selected competitively. For the processing of bound morphemes, some proposed a noncompetitive transformation of a base form (Costa et al., 2003). On the other hand, one and the same processing mechanism has been proposed for selecting both bound and freestanding closed-class items, which is selection by competition (Schriefers, 1993; Schriefers et al., 2002,

2005; Jescheniak et al., 2014). The studies in the present dissertation provided additional evidence that bound morphemes follow competitive selection processes.

Using picture-word interference paradigm, Schriefers (1993) investigated whether competition is involved in the production of Dutch noun phrases (NPs) consisting of an adjective with a gender-marked suffix and a noun (Experiment 2). In Dutch, gender is marked by the inflectional suffix of the adjective when the NP is produced without a definite article. For neuter gender, the adjective is used in its citation form (which is identical to its stem, e.g., *groen* in *groen huis* 'green house'); for common gender nouns it carries the suffix *–e* (schwa) as in *groene stoel* 'green chair'. Schriefers (1993) observed a congruency effect in gender-marked adjectives and noun production. Recall that Schriefers obtained a congruency effect in his first experiment that contained freestanding gender-marked morphemes. He interpreted the results of both experiments as showing competition for selecting bound morphemes related with the gender inflection of the adjective as well as for selecting freestanding gender-marked determiners.

A study by Schiller and Caramazza (2003), however, did not observe an effect of congruency in producing gender-marked bound morphemes either in Dutch or in German. Note that Schiller and Caramazza reported congruency effects for the corresponding freestanding morphemes in producing a gender-marked determiner and noun or determiner plus adjective followed by a noun in Dutch and in German. Costa et al. (2003) reported a similar finding as Schiller and Caramazza (2003) using Croatian speakers. Costa et al. (2003) found a congruency effect in the production of freestanding morphemes consisted of gender-marked accusative pronouns (e.g.

vidim ga$_{M}$ vs. *vidim je*$_{F}$ 'I see it') but not in the production of bound morphemes consisted of a gender-marked possessive pronoun and a noun (*moj*$_{M}$ + noun vs. *moja*$_{F}$ + noun 'my + noun'). Similarly, Schiller and Costa (2006) examined whether bound morphemes processed differently from freestanding morphemes in German. The authors reported a congruency effect for producing freestanding morpheme in the form of a gender-marked definite determiner and a noun (*der*$_{M}$ + noun vs. *die*$_{F}$ + noun 'the + noun'). However, they did not observe a congruency effect for bound morpheme production consisting of a gender-marked indefinite determiner and a noun (*ein*$_{M}$ + noun vs. *eine*$_{F}$ + noun 'a + noun').

Contrary to reports that show contrasting effects for bound versus freestanding morphemes, Bordag and Pechmann (2008) obtained a congruency effect for bound gender-marked morphemes and freestanding morphemes in Czech. The authors observed congruency effect when Czech participants produced freestanding morphemes consisted of demonstrative and noun (Experiment 1) as well as bound morphemes consisted of a gender-marking ordinal number (adjective) and a noun (Experiments 2 & 3).

As can be seen in the above reviews, picture-word interference studies investigating whether bound morphemes follow competitive selection processes are small in number and provide contradictory evidences. In our picture-word studies (Chapters 2, 3 & 4), we investigated whether the selection of gender-marked bound morphemes involve competitive processing mechanisms in addition to resolving the status of plural gender in Konso.

Following the inconsistent evidence on the selection processes of bound gender-marked morphemes in picture-word studies, Schriefers et al. (2005) introduced simple picture naming task for investigating

whether selecting bound morphemes follow competitive processing in German. Rather than a picture-word task, a simple picture naming task is said to be an appropriate paradigm for adjudicating between competitive and noncompetitive hypotheses (Janssen et al., 2014). Schriefers et al. (2005) tested the naming of noun phrases with gender-marked size adjectives in German (Experiment 3).

In German, there is a convergence of bound inflectional morphemes for nouns of feminine gender, and divergence for nouns of masculine and neuter gender in single-reference and multiple-reference utterances. Schriefers et al. (2005) obtained gender by number interaction in the naming of noun phrases containing a gender-marked adjective and a noun but not in the bare noun naming. This provides support for the hypothesis that bound morphemes is selected competitively (Schriefers et al., 2005).

However, resolving between competitive and noncompetitive hypotheses requires further analyses on shapes of gender by number interactions (Janssen et al., 2014). This is because both hypotheses can account for the effect depending on the shape of interactions. Therefore, the most important point regarding a competitive selection mechanism has to do with the presence or the absence of a cost effect in multiple-reference trials when the single-reference and multiple-reference gender-marked items have divergent forms (Jascheniak et al., 2014). Jascheniak et al. (2014) further contend that the presence or absence of a clear cost term might depend on the proportion with which the different gender-marked morphemes have to be used in the experiment. For example, keeping the proportion of determiners equal, Schriefers et al. (2002) observed a multiple-reference cost in the naming of neuter gender nouns and a marginally significant multiple-reference cost in the naming of masculine nouns in German

freestanding morpheme production (Experiment 1). In a study by Lemhöfer et al., (2006) on Dutch NP production, however, with 75% of trials requiring the converging form *de*, there was a multiple-reference gain for this converging form and a reduced multiple-reference cost for the diverging forms (*de* vs. *het*). Chapter 5 of the present dissertation examined whether varying the occurrence of the percentage of bound gender-marked morphemes could affect the shape of gender by number interaction.

1.6. Introduction to experimental chapters

Gender in Cushitic languages has an intriguing property due to its interaction with number. This property is reflected in the agreement patterns of the third agreement class, which is arguably treated as a value of gender beside masculine and feminine (Hayward, 1979; Mous, 2008; Orkaydo, 2013). The subject matter of the studies in the present dissertation is that determining the psycholinguistic status of plural gender in Cushitic languages with particular reference to Konso. The dissertation is also aimed at shedding more light on the retrieval mechanism of bound gender-marked morphemes. Series of picture-word interference and simple picture naming experiments were conducted in Konso using native speakers of the language in their homeland setting. I have conducted the experiments in three field trips between 2012 and 2014. These experiments are presented in four chapters in the dissertation. In what follows, I introduce the four experimental chapters briefly.

Chapter 2 of this dissertation contains the first sets of experiments in Konso. The experiments reported in this chapter are the first in the language and in the area. In this sense, the study opened the window for further investigations as they indicated the

feasibility of conducting behavioral studies in under-studied languages and in less-resourced semi-rural areas of Konso. The aim of the study was examining whether gender congruency effect, which we see in Germanic languages such as Dutch and German, can be obtained in non-Indo-European languages. More specifically, I report the results of two picture-word interference experiments on bare noun and definite noun naming in Konso. In Experiment 1, participants named pictures by producing a bare noun while ignoring a simultaneously presented auditory distractor word, which has the same gender or different gender as the target. In Experiment 2, participants produced nouns with a gender-marked definite suffix while disregarding a gender-congruent or a gender-incongruent distractor word. The results of the experiments provided some indication for the presence of gender congruency effect in the language although the over all effects fail to reach robust significance levels.

In chapter 3, I report the first behavioral evidence regarding the status of plural gender in Cushitic languages. In this chapter, two picture-word interference experiments examined whether plural gender shows similar effects as the already accepted gender values of the language. In Experiment 1, native speakers of Konso were requested to produce nouns with gender-marked definite suffixes while ignoring a simultaneously presented auditory distractor that has same or different gender as the target. In Experiment 2, participants were instructed to respond to pictures by producing an overt subject or a null subject sentence while disregarding a gender-congruent or a gender-incongruent distractor. The central aim of the experiments reported in this chapter was to examine whether nouns with plural gender produce the same pattern of interference from gender-

incongruent and/or facilitation from gender-congruent distractor words as masculine and feminine genders. If plural is a value of gender in Konso, naming utterances with plural gender should produce similar congruency effects as masculine and feminine genders. Conversely, if such effects were absent in naming utterances with plural gender but present only in masculine and feminine gender, plural would not be treated as a value of gender. Combined, compared to the gender-congruent condition, gender-incongruent distractor words slowed down the naming latencies of the target pictures significantly. Crucially, the results of the two experiments displayed that plural gender nouns show gender congruency effects like masculine and feminine nouns. This indicates that plural is processed in the same way as masculine and feminine genders, which supports the analysis that the so-called "plural" gender indeed is part of the system of gender features in Konso.

As described above, chapter 3 presented the finding of comparable congruency effect for the production of plural gender as masculine and feminine genders. Chapter 4 included regular multiple-reference forms both as a target and as a distractor to adjudicate between *plural-as-a-gender feature analysis* and *plural-as-a-number feature analysis*. Thus, Chapter 4 investigates whether plural gender is processed as a gender or as a number feature using three picture-word interference experiments. Participants were presented with pictures of one or two objects with a single-reference or a multiple-reference distractor that has the same or different gender as the target. In experiment 1, Konso participants named pictures using gender-marked definite nouns; and in Experiment 2 and 3, they responded by producing a sentence with overt subject and null subject, respectively. The aim was to investigate whether plural

gender nouns are processed in the same way as feminine and masculine nouns or in the same as regular multiple-reference nouns.

In these experimental contexts, the *plural-as-a-gender feature analysis* would predict that a plural gender produces a similar pattern of effects as those of feminine and masculine gender but a different effect compared to regular multiple-reference nouns. The *plural-as-a-number feature analysis*, however, would predict that the so-called plural gender produces a similar effect as that of regular multiple-reference nouns but a different pattern of effects from those of the feminine and masculine gender. Significant effects of gender congruency were observed in the single-object picture naming condition where the selection of gender suffixes is determined by the target's gender, but not in the multiple-object picture naming condition where the gender-marked suffixes are identical for all. The overall results suggest that plural gender nouns are processed similarly to feminine and masculine single-reference nouns, and differently from regular multiple-reference nouns. This supports the analysis of plural as a gender but not as a number feature in Konso.

All of the above-mentioned experimental chapters provide evidence for the selection processes of bound gender-marked morphemes since all of gender-marked elements in those studies were suffixes (bound morphemes). Chapter 5 investigates the selection processes of bound morpheme in more detail using a different and possibly an appropriate paradigm for the issue, namely simple picture naming task. The aim was to examine whether bound gender-marked morphemes such as gender-marked definite suffixes or verb inflections are selected competitively. In chapter 5, we conducted two simple picture naming experiments for which no distractor words were used. Konso speaking participants were

presented with picture of one or two objects and instructed to produce a single-reference or a multiple-reference gender-marked utterances and a bare noun (control experiment).

In Experiment 1a, definite noun naming, the proportion of bound gender-marked morphemes were kept equal. On the other hand, in Experiments 2a (overt subject sentence naming) and 2b (null subject sentence naming), two third of the trials required a converging form (–n morpheme) in single-reference and multiple-reference. In Experiment 1a, the finding of a gender by number interaction with multiple-reference costs for diverging gender-marked forms, which correspond to the form of non-plural gender, provided evidence for bound morpheme selection-by-competition hypothesis. In Experiments 2a and 2b, a benefit in the multiple-reference utterances for the plural gender but a reduce cost for masculine and feminine genders was also in line with bound morpheme selection-by-competition hypothesis.

Thus, this dissertation is a compilation of four independent experimental chapters in addition to the introduction and conclusion chapters. Admittedly, there is overlap of contents among the experimental chapters as they are based on individual studies that investigate a central question, which are published/submitted/prepared for submission to different publishing outlets. As explained above, the central issue of these chapters remains to be closely related and twofold: the status of plural gender, and the selection mechanism of bound gender-marked morphemes. However, a closer consideration of the individual studies may illustrate their distinct ways of addressing these issues. For instance, chapter 2 focussed mainly on the feasibility of doing behavioral studies in semi-rural areas of Konso, and whether gender congruency

effect can be obtained in non-Indo-European languages. This was important for establishing the basis for testing the central theses of the dissertation. Chapter 3 provided the first evidence for plural as a value of gender in Konso, which shows that plural gender produced similar congruency effect as masculine and feminine genders. Chapter 4 compared the analyses of plural as a gender versus as a number feature by contrasting the production of plural gender with regular multiple-reference number utterances. Chapter 5 addressed the selection mechanism of bound gender-marked morphemes using another and possibly more appropriate paradigm to address the question.

CHAPTER 2

2. Picture-word tasks during bare noun and definite noun production in Konso

A version of this chapter is published as:

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Abstract

The paper presents two experiments that examined gender congruency effects in Konso. The gender congruency effect refers to the influence of the grammatical gender of the distracting noun (same or different as target) on the naming latencies to the target object (picture) on the screen. In the first experiment, participants named pictures by producing a bare noun while ignoring a simultaneously presented distractor noun. An overall congruency effect of 19 milliseconds (ms) was found (gender-congruent condition faster than gender-incongruent), which was significant only in the subject analysis of the target gender. In the second experiment, participants produced nouns with a gender-marked definite marker suffix. A non-significant 13 ms overall congruency effect was observed. A separate analysis, however, showed a significant 32 ms congruency effect in the plural gender definite noun production. The results of the two experiments weakly suggest that the so-called “plural” gender is a proper gender value but solving the issue of whether plural gender is a proper gender value or a value inherent to the number feature requires additional experiments.

2.1. Introduction

The grammatical features gender and number are related in a complex way in Cushitic languages (see Hayward, 1979; Corbett & Hayward 1987; Mous, 2008). The relation between gender and number becomes apparent in the so-called "plural" gender nouns. Interestingly and arguably, a third value of grammatical gender in addition to masculine and feminine has been identified for some Cushitic languages (Hayward, 1979; Mous, 2008). In contrast to other languages that have three-way gender distinction systems, this third value is not neuter in Cushitic. In terms of agreement, this third gender value requires the same agreement pattern as the third person plural. As a result, it is called "plural" gender in many studies of Cushitic languages. In order to avoid confusion, the term "plural" is used to refer to this gender value and "multiple-reference" to refer to the multiplicity of number with the abbreviations M, F and P to stand for masculine, feminine and plural gender values in that order, and MULT and SG to represent multiple-reference and single-reference nouns, respectively, throughout this chapter, after Hayward (1984) and Mous (2008). This complex interrelatedness between grammatical gender and number sometimes paves ways to different, often conflicting analyses of these features in different Cushitic languages.

Two conflicting hypotheses have been put forward to analyze the gender systems of Cushitic languages. The first one comes from Corbett and Hayward (1987), in which only two gender values are recognized and the third value is analyzed as part of the number feature. This analysis is applied to Bayso, a Lowland East Cushitic language. The argument is that this value has a small membership

and should be analyzed with features indicating irregularity in number agreement, marked as irregular nouns taking plural agreement (Corbett & Hayward, 1987). Corbett (2012, pp. 223-233) explains that taking the value plural from the number system as a value in the gender system as well runs counter to the general principle of exclusiveness that one value belongs to just one feature. This principle is at the basis of both typology and theoretical studies. A language system in which plural operates as a value for gender undermines this central principle and any alternative analysis of such a gender and number system should be scrutinized. This is exactly what Corbett (2012, pp. 224-233) does for Bayso in great clarity and detail. The proposed analysis for Bayso has the added advantage that it explains anomalies in the system at the cost of marking only a limited numbers of nouns with lexical features for exceptional behavior. If we can show that the plural value of the gender feature is like the masculine and feminine value of this feature in terms of psycholinguistic relevance, this poses an important challenge to the general principle that a value can only belong to one feature, provided that the plural values for gender and number are indeed instances of the same value.

The second one is the position taken in most descriptive studies on Cushitic languages (Hayward, 1979, for Bayso; Pillinger & Galboran, 1999, for Rendille; Savà, 2005, for Ts'amakko; Orkaydo, 2013, for Konso) and argued for in Mous (2008). The argument is that gender and number are two independent agreement systems and adjectives show agreement for both features independently (Mous, 2008). If the third value of gender is taken to be plural in number (i.e. multiple-reference), a situation can arise in which adjectives show conflicting values for number and gender agreement with one

and the same head noun. For instance, a word in Iraqw that is of multiple-reference and plural in gender has two different agreement markers on the adjective. One agreement system (gender) has low tone on the final syllable for feminine and plural gender head nouns and high tone for masculine head nouns irrespective of number; the second agreement system has a different form of the adjective for multiple-reference nouns (for examples, see Mous, 2008, p. 156).

The analysis that Corbett (2012) proposes for Bayso introduces extra challenges when applied to Konso. First of all, in the case of Konso the number of non-derived plural gender nouns is much larger than in Bayso. Based on a count of the appendix of nouns in Orkaydo's (2013) grammar of Konso, 96 non-derived nouns are plural gender, against 135 faminine and 245 masculine gender nouns. It becomes less satisfactory to treat all plural gender nouns as exceptional. Secondly, in Konso, gender and number display two separate agreement systems. An adjective agrees in number with the head noun by initial reduplication and in gender by a final suffix, for example *filaa-sini? poor-aa* /comb-DEF.P SG.black-P/ 'the black comb' against *orra-si? ka~kapp-a* /people-DEF.M/F MULT-fat-.M/F/ 'the fat people' (Orkaydo, 2013, p. 79). If this plural gender head noun were analysed as not having a gender value but showing multiple-reference number agreement, the morphological analysis would be /comb-DEF.MULT SG.black-MULT/ with competing values of number on the two agreement slots of the adjective. Moreover, the agreement on the definite marker and the final suffix of the adjective would be according to gender for one set of nouns but according to number for another set of nouns – note that multiple-reference words like *orra* 'people' can be masculine in gender. The Cushitic languages that are mentioned in Corbett (2012,

p. 233) do not have these additional challenges because they do not show independent number agreement (Bayso, Kambaata), or do not have a plural gender value (Sidamo, Kambaata). The analysis for Bayso taking certain nouns as exceptional and similar to *pluralia tantum* nouns had the added advantage of explaining anomalies in the system. The analysis of plural as a value for gender has the disadvantage of downplaying a number of anomalies of the Konso gender and number system. Nouns that are derived for number have predictable gender properties: singulatives, derived single-reference nouns, are either masculine or feminine (depending on the formative, not on the gender of the base as is the case in Bayso) and never plural in gender; pluratives, derived multiple-reference nouns, are all plural in gender; there are seven different plural formations (5 number suffixes, reduplication and gemination) in Konso and all impose plural gender (Orkaydo, 2013, pp. 80-84). Thus, there is ample indication in Konso for an association of plural gender words and plurality in number.

This chapter aims at providing experimental, psycholinguistic evidence to shed light on the processing of grammatical gender in Cushitic languages and possibly decide whether the third value (plural) is a proper gender value or rather belongs to the number system in Cushitic languages that have this value. We employed the picture-word interference (PWI) paradigm, a commonly used paradigm in the study of lexical access. In this paradigm, participants are asked to name a picture while ignoring a distractor word presented with it. It has been shown that the naming time of the picture is affected by the relationship between the to-be-named and the to-be-ignored words. When the words are semantically related, for example, interference appears (slower naming times), however,

facilitation (faster naming times) occurs when the two words are phonologically related. Whereas the interference effect is due to competition at the level of lexical node selection, the facilitation effect is due to the priming at the level of the phonological form activation (Levelt, Roelofs, & Meyer, 1999). In the same way, the so-called gender congruency effect, i.e. naming times of a picture are faster when the to-be-named and the to-be-ignored words have the same gender compared to when they have a different gender, has been proposed for gender processing mechanisms.

The discussions of the gender congruency effect in psycholinguistic research have begun after 1993 following Schriefers' work. Schriefers (1993) found faster reaction times (RTs) when the target picture and the distractor word had the same gender compared to when they had a different gender in Dutch noun phrase (NP) production. He interpreted the effect as demonstrating the competition for selection of a word's syntactic features (in this case gender).

According to Bordag and Pechmann (2008), many features inhibit the gender congruency effect and its interpretation might be more complicated than suggested by Schriefers (1993). Bordag and Pechmann (2008) point out that the gender congruency effect has been found to be language-specific, which leads to the question of cross-linguistic differences in gender representation and NP production mechanisms. Another point of debate is whether the effect is really a gender congruency effect or rather a determiner congruency effect (Schiller & Caramazza, 2002, 2003), which leads to the question of whether it reflects competition at the grammatical (abstract gender nodes) or at the phonological level (phonological forms). Finally, Bordag and Pechmann (2008) mention the presence

of inconsistent evidence in relation to the scope of the gender congruency effect. Thus, Schiller and Caramazza (2003) found the effect only when an NP in the form of a free morpheme (article or other determiner) + noun was produced, whereas Schriefers (1993) also obtained the effect in the production of NPs consisting of an adjective ending in a gender-marked inflection (a bound morpheme) + a noun. Moreover, La Heij, Mak, Sander, and Willeboordse (1998) observed the effect only when participants named the pictures with gender-marked NPs, but not when bare nouns were produced in Dutch, implying that the gender feature may not be always selected. Cubelli, Lotto, Paolieri, Girelli, and Job (2005), on the other hand, obtained an interference effect due to gender congruency when bare nouns were produced in Italian.

This chapter, therefore, attempts to contribute to filling the gap of cross-linguistic confirmation from non-Indo-European languages in all these areas, specifically on the scope of gender congruency effect, that is, whether or not the effect is found in naming bare nouns (Experiment 1), and in naming a noun + a gender-marked inflection (a bound morpheme; Experiment 2) in addition to addressing the issue of deciding whether or not the third value is a proper gender value in Cushitic languages.

Cushitic languages that arguably have a three-way gender distinction system with the third being plural besides feminine and masculine are Bayso, Konso, Dirayta, Ts'amakko, Rendille, and Boni of the Southern Lowland as well as Iraqw, Alagwa, and Burunge of Southern Cushitic languages (Mous, 2008). The language we investigate is Konso, a Lowland East Cushitic language. Konso is spoken in the southwest of Ethiopia by 250,000 people (Central Statistics Agency of Ethiopia, CSA, 2009), see the map for its

location. The language has no standardized writing system, proper dictionary or published grammar book yet. However, Ongaye Oda Orkaydo has recently finished his PhD thesis on the grammar of Konso (Orkaydo, 2013). Most of the materials for the experiments reported in this chapter are taken from him and his work. Konso was chosen for several reasons: first, it has a relatively large number of non-derived plural gender nouns; second, an in-depth analysis of the grammar of the language is available (Orkaydo, 2013); third, Ongaye Oda Orkaydo, a native-speaker linguist was available to help with the selection of the stimuli; fourth, carrying out experiments is feasible in Konso because the population is large enough and relatively easily accessible.

2.2. Gender system of Konso

Konso is said to have a three-way gender distinction system, and the third gender, besides feminine and masculine, is plural gender (Orkaydo, 2013). According to Orkaydo (2013), for the majority of the nouns neither the form of a noun nor its meaning predicts its gender value. Nouns in Konso can be classified into three gender values on the basis of their agreement on the verb: those nouns that show the same agreement as the third person masculine singular subject (marked on the verb by the suffix *–ay*) are masculine; those nouns that show the same agreement as the third person feminine singular subject (marked on the verb by the suffix *–t*) are feminine; and those nouns that show the same agreement as the third person plural subject (marked on the verb by the suffix *–n*) are plural. Note that gender on the verb is realized as long as nouns function as non-focused subjects.

For example, nouns that are semantically masculine, such as *sakoota* ‘coward’ may have feminine gender agreement on the verb. Similarly, nouns that are semantically feminine, for example *okkatta* ‘cow’, may have masculine gender agreement; also, nouns that are semantically singular, *filaa* ‘comb’, may have a plural gender agreement. Likewise, nouns that are semantically undetermined for sex (as feminine or masculine) may have masculine, feminine or plural gender agreement on the verb; see examples from (7) to (10).

Konso subject gender agreement on the verb (Orkaydo, personal communication)

(7) sakoota-siʔ i=ɗey-t-i
coward.DEF.F/M 3=come-3F-PF
‘The coward came.’

(8) okkatta-siʔ i=pat-ay
cow-DEF.F/M 3=disappear-PF.3M
‘The cow disappeared.’

(9) filaa-siniʔ i=pat-i-n
comb-DEF.P 3=disappear-PF-3P
‘The comb disappeared.’

(10) iskatta-siʔ parre i=ɗey-a
women-DEF.F/M tomorrow 3=come-IPF.FUT.M
‘The women will come tomorrow.’

The examples below show that the assignment of definite marking on nouns is determined by the gender of the noun. Thus, nouns that show the same gender agreement as the third person masculine or feminine subject take the single-reference definite suffix *–siʔ* while those that show the same agreement as the third person plural subject on the verb take the definite suffix *–siniʔ*.

Assignment of definite marking on nouns in Konso (Orkaydo, 2013, pp. 77-78)

(11) ʧimayta-siʔ i=kutiʔ-ay
old.man-DEF.F/M 3=sit.down-PF.3M
'The old man sat down.'

(12) alleeta-siʔ i=piʔ-t-i
hut-DEF.F/M 3=fall-3F-PF
'The hut fell.'

(13) innaa-siniʔ i=muk-i-n
child-DEF.P 3=sleep-PF-3P
'The child slept.'

(14) laha-ɗɗaa-siniʔ i=kat-am-a-n
ram-MULT-DEF.P 3=sell-PASS-IPF.FUT-3P
'The rams will be sold.'

Taken together, there are two divergent ways of analyzing the so-called plural gender in Cushitic languages that are characterized by this value. On the one hand, only two gender values, namely masculine and feminine, are recognized and the third value is analyzed as part of number feature (Corbett & Hayward, 1987). On the other hand, three gender values are recognized and the third is treated as a proper gender value (Mous, 2008; Savà, 2005; Orkaydo, 2013). We want to investigate whether words like *innaa* 'child (boy)', which are plural in gender, are represented like words such as *karmaɗaa* 'lions' which are plural in number (supporting Corbett's analysis) or are treated like words such as *furaa* 'key', which are also plural in gender (supporting Mous' analysis) in Konso.

2.3. Gender congruency effect experiments in Konso

Two gender congruency effect experiments that measured and compared naming times were conducted in Konso for the first time in the language and in the area. The first experiment was on the production of bare nouns and the second was on the production of definite nouns. Both experiments were carried out at a Konso high school, where the majority of the students speak Konso natively.

Overview of the experiments

Participants

Forty-six high school students, aged between 17 and 25 years, took part in the two experiments. Twenty-two and 24 students participated in the first and in the second experiments, respectively. All participants were native speakers of Konso and they all had normal vision and hearing. They were all paid for participating in the study.

Materials

Targets were selected from various semantic categories and were presented as black line drawings on a white background. Names of different gender nouns were equally represented in both target and distractor conditions. Each target picture was presented with gender-congruent and gender-incongruent words as well as with gender-neutral pink noise. The reason to use a neutral distractor condition (pink noise) was to see if participants processed the distractor words. Targets and distractor words were not related in terms of meaning (they did not belong to the same or related semantic categories) and sound (their initial sounds were not the same and they did not share more than three phonemes). The target pictures were presented in the center of a 15.6-inch laptop screen accompanied by one of the distractor words, which was auditorily presented via headphones.

Procedure

Participants were tested individually in a quiet room. They sat in front of a laptop screen at a viewing distance of around 60 cm. Reaction times (RTs) were measured from the onset of the target stimulus to the beginning of the naming response using a voice key. Participants were instructed that they would see a picture and hear a

word or pink noise and were asked to name the target picture while ignoring the word/pink noise they heard.

Each trial began with a fixation point (+) presented in the centre of the screen for 500 ms followed by the target picture along with the auditorily presented distractor word until response or for maximally 2,000 ms. Then the asterisk sign (*) in the centre of the screen was shown before the presentation of the next trial. The experimenter registered errors and malfunctioning of the voice key.

The whole experiment was conducted in three phases; familiarization, practice and test. During the familiarization phase, participants were presented with all the target pictures along with their intended names twice so as to encourage the use of the designated picture names of each target. In the practice phase, each picture was put on the laptop screen for 350 ms accompanied by pink noise. Participants were asked to name the picture and corrected when they produced a noun different from the intended one. In the last phase, the test proper, participants were asked to name the picture as quickly and as accurately as possible while ignoring simultaneously presented auditorily distractor words/pink noise. The Stimulus Onset Asynchrony (SOA) was 0 as the target picture and the distractor element were presented at the same time. The stimuli were presented in different blocks with a break between them. Under each block, trials were pseudo-randomized using a Latin square so as to avoid the subsequent appearance of each distractor condition in a row.

Analysis

Responses were excluded from further analyses in light of the following criteria: (a) unintended name for the picture; (b) non-verbal

sounds that triggered the voice key; (c) unregistered responses including responses given after 2,000 ms; and (d) reaction times shorter than 250 ms and longer than 1,900 ms. Analyses of Variance (ANOVAs) were conducted on the filtered correct responses based on the aforementioned criteria to compare reaction times in different distractor conditions. The significance level used in both experiments was $p = 0.05$. All ANOVAs that are reported in this chapter were performed on the means per participant (F1) and the means per item (F2).

Experiment 1: Production of bare nouns in Konso

In this experiment, participants were asked to name the picture by producing the noun only (the bare noun). The aim was to be able to decide whether the gender value "plural" is a proper gender value or rather a value inherent to the number feature. The logic behind this experiment was that a picture should be named relatively faster when a word with the same gender is used as a distractor than the use of a word with a different gender. If plural is a proper gender value in Konso, we should find a gender congruency effect in the production of plural nouns, that is, naming a picture with plural value should be relatively faster when a gender-congruent distractor word is presented as compared to the presentation of a gender-incongruent distractor word. If it does not show these properties, this may be due to the value plural not belonging to the gender feature and hence probably belonging to the number feature instead. Such a finding would also have an implication on the analysis of current models of language production (see below).

Materials

A total of 60 target pictures corresponding to non-derived Konso nouns were selected. Twenty of the nouns were masculine, 20 feminine and 20 plural gender nouns. For each target picture, in addition to neutral pink noise, a gender-congruent and two gender-incongruent (labeled as incongruent I and incongruent II) distractor words were selected. A total of 240 (20 target pictures × 3 target genders × 4 distractor conditions) trials were used in this experiment.

Table 1 shows the design for the first experiment. Each target picture was presented four times, each time associated with different distractors. For the masculine target *tuyyuura* 'air plane', for example, we had a gender-congruent distractor word *ammayitta* 'breakfast' in one trial, a gender-incongruent feminine word *paakkota* 'span (measurement)' in another trial, another gender-incongruent (incongruent II) plural gender *xoffaa* 'groin' and a neutral 'pink noise' as a control in different trials. The same was true for the other targets as well. The list of items used in Experiment 1 can be found in Appendix A.

Table 1 Example of the experimental items used in Experiment 1

Target picture name	Gender	Distractor word conditions*			
		Congruent	Incongruent I	Incongruent II	Neutral
kaawwata 'mirror'	feminine	*eetota* 'dinner/supper'	*muutiya* 'worm'	*ɲupuraa* 'component of loom'	pink noise
tuyyuuraa 'air plane'	masculine	*amma?itta* 'breakfast'	*paakkuta* 'span (measurement)'	*χoffaa* 'groin'	pink noise
kupaʔtaa 'tortoise'	plural	*marfaa* 'hip'	*hiparaata* 'bat'	*hallaka* 'fat'	pink noise

* For M target, F is incongruent I and P is incongruent II; for F target, M is incongruent I and P is incongruent II; and for P target, F is incongruent I and M is incongruent II

Results and discussion

From a total of 5,280 observations, 982 (19%) were discarded from the analysis, as they were incorrect responses and 207 (3.92%) were labeled as outliers, RTs shorter than 250 ms and longer than 1,900 ms. Thus, a total of 4,091 (77.48%) data points were included in the statistical analysis.

Table 2 Reaction Times (RTs) in ms and error in percentage (%e)

Distractor conditions	Congruent	Neutral	Incongruent*	Congruency effect
RT (%e)	1010 (5%)	908 (3%)	1029 (11%)	19 (6%)

* Represents a combined effect of incongruent I and incongruent II conditions

Table 2 shows the mean RT in the three-distractor conditions (congruent, neutral and incongruent). The first overall ANOVA was performed with Distractor Condition (congruent, neutral and incongruent) and Target Gender (masculine, feminine and plural) as independent factors. This analysis showed a significant effect of the factor Distractor Condition in both the participant and the item analyses ($F_1(2,42) = 25.098$, $p < .0001$; $F_2(2,110) = 45.193$, $p < .0001$). It took the participants slightly more time to produce a noun in the gender-incongruent condition (picture-word pairs having a different gender value) than to produce a noun in the congruent (picture-word pairs having the same gender value) or in the pink noise (neutral) conditions. The fastest RTs in the pink noise condition reveal that participants indeed processed the distractors, as processing words interferes more with naming a picture than processing pink noise. The factor Target Gender reached significance in the participant analysis ($F_1(2,42) = 13.340$, $p < .0001$) but not in the item analysis ($F_2(2,55) = 1.552$, $p < .22$). The interaction between Target Gender and Distractor Condition, however, failed to reach significance in both participant and item analyses (both $Fs < 1$).

In the bare noun production, the mean RTs in the gender-congruent condition were 19 ms faster than naming latencies in the incongruent condition. To examine the effect of gender congruency (congruent versus incongruent), a separate ANOVA was performed on the mean reaction times per participant (F1) and per item (F2) with Distractor Condition (congruent and incongruent) and Target Gender (masculine, feminine and plural) as independent factors. This analysis showed a significant effect only on the participant analysis of the factor Target Gender ($F_1(2,42) = 12.072$, $p < .0001$; $F_2(2,55) = 1.28$, $p < .29$) and was close to reaching significance on the participant analysis of the factor Distractor Condition ($F_1(1,21) = 3.848$, $p < .06$; $F_2(1,55) = 1.526$, $p < .22$).

One could speculate, however, that the overall slow RTs, the nature of the language (gender is not marked on the nouns) and methodological issues might be possible causes for the inhibition of the effect in the variables that did not reach significance level. Compare the 982 ms mean RT of our study to that of less than 700 ms in previous studies (e.g. La Heij et al., 1998). Moreover, the comparatively weak performance of participants reflected in the relatively high rate of incorrect responses, i.e. 982 (19%), compared to less than 10% in previous studies. This means that participants of this language require more training than set by the standard, as they are inexperienced in participating in this sort of experiments and working with some of the equipment. Additional experiments with better training of participants ensuring faster and better performance, may give us a better picture of the issue.

The fact that gender is not marked on the nouns themselves in Konso might also inhibit the effect from being revealed. Involving gender-marking elements such as verbs as part of the experiment

might help here. Although all possible precautions were taken in the absence of norms in the language to control for factors such as frequency, familiarity, typicality and age of acquisition, it could be the case that our result is inconclusive because of some methodological flaws such as the use of badly selected words in the experiment (see below).

Table 3 Mean RTs by target gender and distractor condition

Target gender	Distractor condition			
	Congruent	Incongruent	Neutral	Congruency effect
Masculine	978	998	872	20
Feminine	1047	1048	923	1
Plural	1007	1042	932	35

Table 3 shows that 20 ms congruency effect in masculine noun production and 35 ms in the plural gender noun production but almost nothing in feminine noun production (1 ms). In order to see why we failed to obtain a congruency effect in feminine noun production in the presence of a comparable effect in masculine and plural gender nouns, we conducted item-by-item analysis of both the target and distractor words. Our investigation revealed that participants performed very slowly in naming certain nouns. Table 4 shows that the majority of the nouns that have relatively slow RTs are feminine nouns (6 out of 10) followed by plural gender nouns (3 out of 10) and only one masculine noun had slow RTs. This might be due to semantic interference effects between different targets and the clarity of the pictures used (see Table 4). Only further research will exclude the possibility of the role of methodological flaws for the absence of the congruency effect on feminine noun production.

Table 4 Targets that show relatively slow RTs with possible reasons

Target	Gender*	Potential reasons for slow RT
muklaa 'bangle'	plural	Less familiar word
tuuyyata 'pig'	feminine	Less familiar word and semantic interference with *kaharta* 'ewe' (used as a feminine target)
hirribaa 'eyelash'	plural	Less clear picture
napahata 'ear'	feminine	The preferred word is *kurra* 'ear' and it has masculine gender value
xashitta 'shoulder'	feminine	Less clear picture and semantic interference with *kessa* 'arm' (used as a masculine target)
mulaketa 'frog'	feminine	Less clear picture and semantic interference with *kupataa* 'tortoise' (used as a plural target)
paala 'feather'	masculine	
hiipta 'lip'	feminine	Semantic interference with *afaa* 'mouth' (used as a plural target)
loqta 'leg'	feminine	Semantic interference with *kessa* 'arm' and *xashitta* 'shoulder'
hashallaa 'leaf '	plural	

*Three plural gender words, 6 feminine words and 1 masculine word

Thus, explaining the present result in the light of current models of language production is not straightforward. Recall, however, that La Heij et al. (1998) failed to find a gender congruency effect in bare noun production in Dutch. Moreover, most current models of language production suggest that syntactic properties such as gender are not selected in bare noun naming (Caramazza 1997; Levelt et al., 1999).

According to Caramazza's (1997) Independent Network (IN) model, a word's grammatical gender is activated after the selection of the related lexical node and hence its selection is an automatic (non-competitive) process. Although the WEAVER + + model of Levelt et al. (1999) assumes that the activation of a noun's gender takes place before the selection of the lexeme node, it also assumes that the activation of gender has no effect on the activation level of the nodes related to nouns with the same gender. This model, therefore, predicts no gender congruency effect in bare noun naming as the

selection of gender is expected only in the production of NPs that involve the selection of gender marked elements such as determiners.

Cubelli et al. (2005), however, found interference effect of grammatical gender in the production of bare nouns with Italian speakers. They interpret the result as showing the obligatory selection of grammatical gender, and thus gender is always selected whenever its noun has to be named, which is in opposition to the prediction of the WEAVER + + model. Moreover, they argue that the selection of the noun's gender is a competitive process in contrast to the assumption of IN model. In order to explain the variation of their data with the assumption of both WEAVER + + and IN models, they came up with the Double Selection model, which assumes the independent and competitive selection of both lexical-semantic and lexical-syntactic information prior to the selection of the phonological form of a word.

In sum, the overall naming latencies in the gender incongruent condition were 19 ms slower than the congruent condition. This result, however, failed to reach significance except in the participant analysis of the factor Target Gender. Moreover, a 35 ms congruency effect observed in naming plural gender nouns could be taken as a sign for recognizing plural as a proper gender value in Konso.

Experiment 2: Production of definite nouns in Konso

The gender of nouns also determines the assignment of definite marking on nouns in Konso (Orkayda, 2013). Plural gender nouns take the definite suffix *–sini?* (e.g. *innaa-sini?* 'the child'). Nouns that show the same gender agreement as the third person masculine or feminine subject, however, take the singular definite suffix *–si?*

(e.g. *ɠimayta-si?* ‘the old man’). In Experiment 2, we investigated the gender congruency effect in naming nouns with a suffixed definite marker (noun + *–si?* for masculine or feminine definite nouns versus noun + *–sini?* for plural gender definite noun). If plural is a proper gender value in Konso, we should find a gender congruency effect in the production of plural gender definite nouns.

Materials

Forty target line drawings were selected from Experiment 1, i.e. twenty (noun + *–sini?*, plural gender definite noun) and 20 (noun + *–si?*, masculine or feminine non-plural gender definite nouns). A total of 120 (20 pictures × 2 genders × 3 conditions = 120) trials in three blocks were used in this experiment. The list of items used in Experiment 2 can be found in Appendix B.

Table 5 Examples of the experimental items used in Experiments 2

Target gender	Target picture	Distractor conditions		
		Congruent	Incongruent	Neutral
Plural gender definite noun	*fi̱laasini?* ‘the comb’	*oytaasini?* ‘the upper part of the compound’	*tuubutasi?* ‘the false banana bread’	pink noise
Non-plural (M/F) gender definite definite noun	*kaawwatasi?* ‘the glass’	*eetutasi?* ‘the dinner’	*pakaannaasini?* ‘the root crop’	pink noise

Results and discussion

From a total of 2,880 observations, 491 (17%) were eliminated from the analysis, as they were incorrect responses and 137 (4.76%) were labeled as outliers, RTs outside of 250 to 1,900 ms. Thus, a total of 2,252 (78.19%) data points were included for statistical analysis.

Table 6 Reaction Times (RTs) in ms and error in percentage (%e)

Distractor condition	Congruent	Neutral	Incongruent	Congruency effect
RT (%e)	1210 (7%)	980 (4%)	1223 (6%)	13 (-1%)

Table 6 shows the mean RTs in the three-distractor conditions (congruent, neutral and incongruent). An ANOVA was performed with Distractor Condition and Target Gender as independent factors. This analysis showed a significant effect of the factor Distractor Condition in both the participant and the item analyses ($F_1(2,46) = 129.733$, $p < .0001$; $F_2(2,76) = 62.975$, $p < .0001$). It took the participants slightly more time to produce a noun in the gender-incongruent condition than to produce a noun in the gender-congruent and the pink noise condition. The factor Target Gender reached significance only in the item analysis ($F_2(1,38) = 64.489$, $p < .002$). The interaction between Target Gender and Distractor Condition, however, failed to reach significance in both participant and item analyses ($F_1(2,46) = 1.241$, $p < .29$; $F_2(2,76) = .160$, $p < .85$). Although we obtained 13 ms congruency effect, ANOVAs comparing only the gender-congruent and incongruent conditions did not reach significance for any variable.

To examine the effect of gender congruency between plural-congruent versus plural-incongruent and non-plural congruent versus non-plural incongruent in the distractor conditions, separate ANOVAs were performed on these data. These analyses only showed a significant effect in the participant analysis between plural-congruent versus plural-incongruent ($F_1(1,23) = 4.395$, $p < .05$) but not between non-plural congruent versus non-plural incongruent. The congruency effects were 32 ms and -6 ms, respectively, as can be seen in Table 7. Similar to the first experiment that showed no effect of gender congruency in feminine noun productions, the non-plural

gender definite nouns (in which half of them are feminine definite nouns taken from Experiment 1) had a non-significant reversed congruency effect.

Table 7 Mean RTs by target gender and distractor condition

Target gender	Distractor conditions			
	Congruent	Incongruent	Neutral	Congruency effect
Plural	1197	1228	977	32
Non-plural	1223	1217	982	-6

Studies investigating the issue of whether the competition for selection hypothesis applies to the retrieval of gender-marked inflections or restricted to only free-standing morphemes like determiners are few and present contradictory results (see Schriefers, 1993; Schiller & Caramazza, 2003, Bordag & pechmann, 2008; Schiller, 2013).

Schriefers (1993) obtained a congruency effect when participants produced NPs in the form of adjective + noun in Dutch (gender is marked in the adjectives suffixed as bound morphemes, e.g. *groen*$_{N}$ *boek*$_{N}$ 'green book' versus *groene*$_{COM}$ *tafel*$_{COM}$ 'green table'), suggesting that either the gender features compete for selection, or else there is competition for selection of the bound morphemes associated with the gender inflection of the adjective.

Schiller and Caramazza (2003), however, failed to replicate this result in both German and Dutch. To account for the failure of replicating Schriefers' (1993) result in the production of adjective + noun that involve the selection of a gender-marked bound morpheme, the assumption that the gender congruency effect reflects competition at the level of gender-marked, free-standing morpheme selection is hypothesized.

The significant 32 ms congruency effect in plural gender definite noun productions shows the effect could be obtained in gender-

marked bound morphemes in Konso. In light of the present result, one could also argue that the so-called plural gender nouns that take *–sini?* as their definite suffix are belonging to the proper gender feature in Konso.

2.4. General discussion

This chapter attempted to address the issue of deciding whether the so-called plural gender is a proper gender value or a value inherent to the number system in Cushitic languages using a picture-word interference (PWI) paradigm in two experiments. Besides, the psycholinguistic investigations of gender are restricted to a limited number of Germanic and Romance languages. We believe that field-based psycholinguistic investigations in less studied languages are important to provide additional empirical and cross-linguistic evidence as well as to broaden our knowledge of language processing in general and the cognitive representation of gender features in particular. In this regard, we took a new step to fill the gap of cross-linguistic confirmation from non-Indo-European languages and to introduce psycholinguistic approaches into the study of Cushitic languages by tackling Konso.

The two experiments reported in this chapter attempted to shed more light on the scope of the so-called gender congruency effect in psycholinguistic research, particularly whether or not the effect is obtained in naming bare nouns (Experiment 1), and in naming a noun + a gender-marked inflection (a bound morpheme; Experiment 2).

In the bare noun production (Experiment 1), we found 35 ms and 20 ms congruency effects for the production of the so-called plural gender nouns and masculine nouns, respectively, though we found no effect of congruency for the feminine nouns. As far as the issue of

plural gender in Cushitic is concerned, the 35 ms congruency effect observed in naming plural gender nouns could be taken as a preliminary sign for recognizing plural as a proper gender value in Konso although the 19 ms overall congruency effect is significant only in the participant analysis of the factor Target Gender. Mention was made of the effect in the other factors (that were not significant) might be masked by the overall slow RTs, lack of overt gender markers on the nouns in the language and methodological issues in relation to the selection of stimuli.

In Experiment 2, we investigated the gender congruency effect in naming nouns with a suffixed definite marker with the prediction that a gender congruency effect in the production of plural gender definite nouns should be observed if plural is a proper gender value in Konso. We found a significant 32 ms congruency effect in the plural gender definite noun productions. This result provides an indication for the so-called "plural" gender nouns, which take *–sini?* as their definite suffix marker, to belong to the proper gender value in Konso. It also shows that gender congruency effect could be obtained in the production of gender-marked bound morphemes, which confirms the prediction of *gender feature selection hypothesis* (Schriefers, 1993).

The non-significant overall 13 ms congruency effect and -6 ms congruency effect in the non-plural gender definite noun production of the present result, however, pose the question whether gender congruency effects are found in a gender-marked bound morpheme production at all. Note that the *gender-marked freestanding morpheme congruency hypothesis* (Schiller & Caramazza, 2003), predicts no effect of gender congruency in a gender-marked bound morpheme production. The negative congruency effect observed in the non-plural gender definite nouns might also be due to the overall

slow RTs, lack of overt gender marking on the nouns in the language and methodological issues in relation to the selection of stimuli. This is because half of the stimuli in the non-plural gender definite noun group are the feminine nouns that were also used in Experiment 1.

Taken together, the overall results in both experiments fail to reach robust significance levels and hence it is difficult to make any strong generalizations. Parts of the results of the two experiments (i.e. the presence of gender congruency effects in the plural gender nouns in both experiments), however, tend to suggest that the so-called "plural" gender is a proper gender value. Nevertheless, it is emphasized that there is an urgent need for replicating both experiments by giving better trainings to participants, by involving gender marking elements such as verbs as part of the experiment and by replacing part of the stimuli that are identified as problematic with better ones.

Table 8 Appendix A: Stimulus materials in Experiment 1

Target picture name	gender	Distractor word conditions*		
		Congruent	Incongruent I	Incongruent II
kaawwata ‘mirror’	feminine	eetuta ‘dinner/supper’	muutiya ‘worm’	ɲupuraa ‘component of loom’
lawaʃeeta ‘mouse’	feminine	fillayyaata ‘flea’	saalpataa ‘belt’	pahnaa ‘example’
harreeta ‘donkey’	feminine	ɟureeta ‘dirt’	toma ‘bowl’	pakataa ‘wide shield’
piirtuta ‘sun’	feminine	ɟooɠɠita ‘mud’	hoppatta ‘guts’	miɗaa ‘cabbage leaves’
hiɓta ‘lip’	feminine	ɟileeta ‘stick used by old women’	kaɓa ‘canal for irrigation’	payraa ‘type of farm tool’
pottaata ‘pumpkin’	feminine	haaruta ‘revenge’	hoʃʃa ‘cliff’	saaraa ‘poem’
ɠapaleeta ‘monkey’	feminine	ɗalta ‘seed’	χaʔtiya ‘fly’	pohaa ‘contribution, tribune’
ɟifeeta ‘a ring’	feminine	ohta ‘cloth (worn in the night)’	kanta ‘sub-village’	piʃaa ‘water’
napahta ‘ear’	feminine	haaɗita ‘load, burden’	kasirayta ‘tick (parasite)’	paankaa ‘machete’
irroota ‘mountain’	feminine	hoollata ‘sheep skin’	hiiɓa ‘meat soup’	peeɠaa ‘quarrel’
kaharta ‘ewe’	feminine	kaaɓtuta ‘farm tool’	hawla ‘grave, tomb’	mookkaa ‘cassava’
tika ‘house’	feminine	koorita ‘type of cloth’	sataʔta ‘heart’	leɠaa ‘a loan (money)’
muukuta ‘frog’	feminine	kanaʔta ‘palm’	kappaa ‘wheat’	teepaa ‘rope’
lafta ‘bone’	feminine	koromta ‘heifer’	karayta ‘tributary’	urmalaa ‘market’
loɠta ‘leg’	feminine	kulleeta ‘hood; cap’	ɗaammaa ‘flour’	pakaannaa ‘root crop’
farta ‘horse’	feminine	kusumta ‘navel’	ʃenɠera ‘hook’	χallaa ‘kidney’
tuuyyata ‘pig’	feminine	leemmuta ‘bubble’	kaasa ‘horn’	paarkaalaa ‘enemy’
oχinta ‘fence’	feminine	kuuɲata ‘gnat’	kuuɲata ‘gnat’**	ɗooʃʃaa ‘sarcasm’
χampirteeta ‘bird’	feminine	kannoota ‘calabash to drink from’	ilkitta ‘tooth’	koofinaa ‘lung’
taaltaallata ‘giraffe’	feminine	kawwatta ‘terrace’	orritta ‘devil’	masaanaa ‘autumn’

*For F target, M is incongruent I and P is incongruent II ** Has F gender value and also used as a congruent distractor for oχinta ‘fence’ F.

Appendix A: Stimulus materials in Experiment 1 (continued)

Target picture name	gender	Distractor word conditions*		
		Congruent	Incongruent I	Incongruent II
arpa ‘elephant’	masculine	hoofa ‘hole’	χoraa ‘fine, punishment’**	kawlaa ‘metal tool for ginning’
kessa ‘chest’	masculine	alkitta ‘sisal’	mooluta ‘bald’	tiraa ‘liver’
paala ‘feather’	masculine	ekerta ‘olive’	noodduta ‘bribe’	kolkaa ‘food without cabbage’
harka ‘arm’	masculine	dila ‘field’	moonta ‘sky’	toorraa ‘opposition’
murkuɟaa ‘fish’	masculine	ɟalaɠɠitta ‘flat stone’	pokkeeta ‘short (with pockets)’	tiyyaa ‘dispute’
tuyyuuraa ‘air plane’	masculine	ammaʔitta ‘breakfast’	paakkuta ‘span (measurement)’	χoffaa ‘groin’
mottooɠaa ‘truck’	masculine	ukkaʃʃa ‘husk’’	hakayta ‘second round harvest’	toɟaa ‘water droplet’
sookitta ‘salt’	masculine	hallaka ‘fat’	paallata ‘piece of clay to fetch fire with’	torraa ‘speech, talk’
okkatta ‘cow’	masculine	urratta ‘cloud’	pooyta ‘mourning, cry’	ʃaaɓɓaa ‘stretcher’
ɠoyra ‘tree’	masculine	irɲa ‘gum’	poɠoota ‘lower jaw’	ilmaamaa ‘tears’
tuuma ‘onion’	masculine	ɟapara ‘rig’	furoota ‘type of bead’	sindaa ‘urine’
lukkalitta ‘chicken’	masculine	ditiitaa ‘sweat’	ɠaawuta ‘coughing’	χapnaa ‘forest’
ɠayranta ‘leopard’	masculine	daʔta ‘butter’	mateʔta ‘upper millstone’	χaaʃaa ‘reed’
ɠupitta ‘finger’	masculine	ɟaɓɓaa ‘weed’	ʃaloota ‘cotton thread’	kaaɟaa ‘money’
kuta ‘dog’	masculine	dakaa ‘stone’	taamta ‘branch’	elalaa ‘cowrie shell’
oraayta ‘hyena’	masculine	dapna ‘temple’	kalaʔta ‘spider’	kasaraa ‘dreadlocks’
χaʃʃitta ‘shoulder’	masculine	damayta ‘wind’	talteeta ‘she-goat’	ɟaɓɓeernaa ‘belt for bullets’
parɟuma ‘stool’	masculine	dikla ‘elbow’	keeʔuta ‘belching’	eennaa ‘vacant homestead’
pora ‘road’	masculine	ɠayya ‘smoke’	kaankita ‘mule’	koottaa ‘buttocks’
karmaa ‘lion’	masculine	duttana ‘belly’	landeeta ‘spleen’	ɟiiɟaa ‘curse’

* For M target, F is incongruent I and P is incongruent II** has a P gender value.

Appendix A: Stimulus materials in Experiment 1 (continued)

Target picture name	gender	Distractor word conditions*		
		Congruent	Incongruent I	Incongruent II
innaa ‘boy’	plural	hiippaa ‘a riddle’	taammata ‘desert bee’	hikkitta ‘star’
ukukkaa ‘egg’	plural	ararsaa ‘local beer made for sale’	tampoota ‘tobacco’	arrapa ‘tongue’
furaa ‘key’	plural	aataa ‘culture’	tolloʔta ‘hump’	kirra ‘river’
filaa ‘comb’	plural	oytaa ‘upper part of the compound’	tuuɓuta ‘false banana bread’	kolalta ‘acacia’
haaʃʃullaa ‘leaf’	plural	makkaa ‘sickness’	tulluppaata ‘wood boring beetle’	kokaa ‘skin, hide’
ɲirfaa ‘hair’	plural	aannaa ‘milk’	keltoota ‘cattle louse’	koɗaa ‘work’
uwwaa ‘dress’	plural	ellaa ‘spirit’	furoota ‘type of bead’**	hakalaa ‘cabbage’
fulaa ‘door’	plural	ikkaamaa ‘selected seeds’	χaayyata ‘nightmare’	keltayta ‘baboon’
rikaa ‘a tooth brush’	plural	erkannaa ‘message’	yoʔta ‘greed’	kawsa ‘chin, beard’
timɓaa ‘drum’	plural	ipsaa ‘light’	χarinta ‘horizontally placed fence bar’	ɗankaa ‘throat’
siinaa ‘nose’	plural	olsaa ‘dream’	yaakata ‘bead’	karitta ‘belly’
χolmaa ‘neck’	plural	unɠulaa ‘grain store from bamboo’	kaaɟɟata ‘t’eff’	mura ‘forest’
χopaa ‘shoe’	plural	ɟorrooɠaa ‘eye discharge’	moossuta ‘(piece of) bread’	leya ‘month’
ɲaaɲɲaa ‘tomato’	plural	kaariyyaa ‘devil (ghost)’	faroota ‘luck’	kittayyaa ‘bed bug’
kiʔsaa ‘cricket’	plural	utaa ‘faeces’	aχawuta ‘roasted grain’	tokkayta ‘porcupine’
afaa ‘mouth’	plural	fuuraa ‘fear’	puulluta ‘fermented dough’	kilpa ‘knee’
hirriiɓaa ‘eyelash’	plural	ɠolfaa ‘bark of trees’	χompalta ‘cactus’	fanɠala ‘splinter’
akataa ‘sugar cane’	plural	ɗarɗaa ‘lie, untruth’	ɗuusuta ‘fart’	roopa ‘rain’
muklaa ‘bangle’	plural	hanɟufaa ‘saliva’	uffaata ‘balloon’	ɗaltayta ‘relative’
kupaʔtaa ‘tortoise’	plural	marɟaa ‘hip’	hiparaata ‘bat’	hallaka ‘fat’***

*For P target, F is incongruent I and M is incongruent II ** it has also been used as a distractor for the target *tuuma* ‘onion’ M ***it has also been used as a distractor for the target *sookita* ‘salt’ M.

Table 9 Appendix B: Stimulus materials in Experiment 2

Target picture name	Gender	Distractor word conditions*	
		Congruent	Incongruent
innaasiniʔ ‘the boy’	plural	hiippaasiniʔ ‘the riddle’	taammatasiʔ ‘the desert bee’
ukukkaasiniʔ ‘the egg’	plural	ararsaasiniʔ ‘the local beer made for sale’	tampootasiʔ ‘the tobacco’
furaasiniʔ ‘the key’	plural	aataasiniʔ ‘the culture’	tolloʔtasiʔ ‘the hump’
filaasiniʔ ‘the comb’	plural	oytaasiniʔ ‘the upper part of the compound’	tuuputasiʔ ‘the false banana bread’
haaʃʃullaasiniʔ ‘the leaf’	plural	makkaasiniʔ ‘sickness’	tulluppaatasiʔ ‘the wood boring beetle’
ɲirfaasiniʔ ‘the hair’	plural	aannaasiniʔ ‘the milk’	keltootasiʔ ‘the cattle louse’
uwwaasiniʔ ‘the dress’	plural	ellaasiniʔ ‘the spirit (e.g. of well)’	furootasiʔ ‘the type of bead’
fulaasiniʔ ‘the door’	plural	ikkaamaasiniʔ ‘the selected seed’	χaayyatasiʔ ‘the nightmare’
rikaasiniʔ ‘the tooth brush’	plural	erkannaasiniʔ ‘the message’	yoʔtasiʔ ‘the greed’
timɓaasiniʔ ‘the drum’	plural	ipsaasiniʔ ‘the light’	χarintasiʔ ‘the horizontally placed fence bar’
siinaasiniʔ ‘the nose’	plural	olsaasiniʔ ‘the dream’	karittasiʔ ‘the belly’
χolmaasiniʔ ‘the neck’	plural	unɠulaasiniʔ ‘the grain store from bamboo’	murasiʔ ‘the forest’
χopaasiniʔ ‘the shoe’	plural	ƒorrooɠaasiniʔ ‘the eye discharge’	leyasiʔ ‘the month’
ɲaaɲɲaasiniʔ ‘the tomato’	plural	kaariyyaasiniʔ ‘the devil (ghost)’	kittayyaasiʔ ‘the bed bug’
kiʔsaasiniʔ ‘the cricket’	plural	utaasiniʔ ‘the feces’	arrapasiʔ ‘the tongue’
afaasiniʔ ‘the mouth’	plural	fuuraasiniʔ ‘the fear’	kilpasiʔ ‘the knee’
hirriiɓaasiniʔ ‘the eyelash’	plural	ɠolfaasiniʔ ‘the bark of trees’	keltaytasiʔ ‘the baboon’
akataasiniʔ ‘the sugar cane’	plural	ɗarɗaasiniʔ ‘the lie’	koɗaasiʔ ‘the work’
muklaasiniʔ ‘the bangle’	plural	hanƒufaasiniʔ ‘the saliva’	kawsasiʔ ‘the chin, the beard’
kupataasiniʔ ‘the tortoise’	plural	marƒaasiniʔ ‘the hip’	ɗankaasiʔ ‘the throat’

* Half of the incongruent distractors are masculine and the other half are feminine nouns.

Appendix B: Stimulus materials in Experiment 2 (continued)

Target picture name		Gender	Distractor word conditions			
			Congruent		Incongruent	
harreetasiʔ	'the donkey'	feminine	ɟureetasiʔ	'the dirt'	peeɗaasiniʔ	'the quarrel'
hiɓtasiʔ	'the lip'	feminine	ɟileetasiʔ	'the stick used by old women'	pakataasiniʔ	'the wide shield'
irrootasiʔ	'the mountain'	feminine	hoollatasiʔ	'the sheep skin'	miɗaasiniʔ	'the cabbage leaves'
ɟifeetasiʔ	'the ring'	feminine	ohtasiʔ	'the cloth (worn in the night)'	piʃaasiniʔ	'the water'
kaawwatasiʔ	'the glass'	feminine	eetutasiʔ	'the dinner'	pakaannaasiniʔ	'the root crop'
lawasheetasiʔ	'the mouse'	feminine	fillayyaatasiʔ	'the flea'	saaraasiniʔ	'the poem'
napahtasiʔ	'the ear'	feminine	haaɗitasiʔ	'the load, burden'	paankaasiniʔ	'the machete'
piirtutasiʔ	'the sun'	feminine	ɟooggitasiʔ	'the mud'	χapnaasiniʔ	'the forest'
pottaatasiʔ	'the pumpkin'	feminine	haarutosiʔ	'the revenge'	kaaɟaasiniʔ	'the money'
ɠapaleetasiʔ	'the monkey'	feminine	ɗaltasiʔ	'the seed'	pohaasiniʔ	'the contribution, the tribune'
arpasiʔ	'the elephant'	masculine	hoofasiʔ	'the hole'	tiraasiniʔ	'the liver'
harkasiʔ	'the arm'	masculine	ɗilasiʔ	'the field'	pahnaasiniʔ	'the example'
kessasiʔ	'the chest'	masculine	alkittasiʔ	'the sisal'	torraasiniʔ	'the speech, the talk'
mottooɠaasiʔ	'the truck'	masculine	ukkaʃʃasiʔ	'the husk'	toɟaasiniʔ	'the water droplet'
murkuɟaasiʔ	'the fish'	masculine	ɟalaɠɠittasiʔ	' the flat stone'	kawlaasiniʔ	'the metal tool for ginning'
okkattasiʔ	'the cow'	masculine	urrattasiʔ	'the cloud'	ʃaaɓɓaasiniʔ	'the stretcher'
paalasiʔ	'the feather'	masculine	ekertasiʔ	'the olive'	tiyyaasiniʔ	'the dispute'
ɠoyrasiʔ	'the tree'	masculine	irɲasiʔ	'the gum'	χoffaasiniʔ	'the groin'
tuumasiʔ	'the onion'	masculine	ɟaparasiʔ	'the rig'	ɲupuraasiniʔ	'the component of a set of weaving'
tuyyuuraasiʔ	'the air plane'	masculine	ammaʔittasiʔ	'the breakfast'	χaaʃaasiniʔ	'the reed'

CHAPTER 3

3. Psycholinguistic evidence for "plural" as a value of gender in Konso

A version of this chapter is submitted for publication as:

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Abstract

Some Cushitic languages are analyzed as having three genders: masculine, feminine and "plural". Plural is a value given for nouns that trigger the same agreement form as third person plural even when they conceptually have singular reference. However, it is unclear how plural gender nouns are processed online during speech production. In this study, two picture-word interference experiments examined whether or not nouns that have this third value, plural, show the same pattern of processing from gender-congruent/-incongruent distractor words that we see in Dutch and German. In Experiment 1, Konso speakers produced nouns with gender-marked definite suffixes while ignoring auditory distractor words. Naming latencies were significantly shorter when targets and distractor words matched in gender, compared to when they did not. In Experiment 2, participants responded to target pictures by producing one of two sentence types with gender-marked inflections, either with or without overt subject. Overall, compared to the gender-congruent condition, gender-incongruent distractor words slowed down the naming latencies of the target pictures significantly. The fact that this gender congruency effect was also observed for the production of plural gender nouns provides evidence that plural gender is processed similarly to masculine and feminine. This supports the analysis of plural as a value of gender. The results also demonstrate that a congruency effect can be obtained in the production of gender-marked bound morphemes, which is consistent with the competition hypothesis for the selection processes of bound morphemes.

3.1. Introduction

This study is a psycholinguistic investigation of grammatical gender in Cushitic languages, specifically the issue of the so-called "plural" gender in Konso, a Lowland East Cushitic language. Grammatical gender has a complex relationship with grammatical number in many Cushitic languages (see Hayward, 1979; Corbett & Hayward, 1987; Mous, 2008). Masculine and feminine are accepted genders across all Cushitic languages. There is, however, evidence suggesting a third gender in some Cushitic languages (Hayward, 1979; Mous, 2008). In contrast to many other languages having a three-way gender distinction, this third value is not neuter in Cushitic. Instead, this third gender triggers the same agreement form as the third person plural. For instance, in Konso subject-verb agreement, a conceptually singular reference word *innaa* 'child (boy)' triggers plural agreement just like regular plural number nouns (e.g. lahaɗɗaa 'rams') as shown in (15) and (16).

Konso gender agreement (Orkaydo, 2013, p. 78)

(15) innaa-siniʔ i=muk-i-n
child-DEF.P 3=sleep-PF-3P
'The child slept.'

(16) laha-ɗɗaa-siniʔ i=kat-am-a-n
ram-MULT-DEF.P 3=sell-PAS-IPF.FUT-3P
'The rams will be sold.'

Thus, nouns (like innaa 'child') that take plural agreement form even when they have singular reference are referred to as "plural" gender nouns and "plural" is treated as a distinct gender (of its own in addition to masculine and feminine) in those languages that have this feature (e.g. Hayward, 1979, for Bayso; Mous, 1993, 2008, for Iraqw; Pillinger & Galboran, 1999, for Rendille; Savà, 2005, for Ts'amakko; Orkaydo, 2013, for Konso). However, there is not yet

consensus in the literature over the notion of plural gender or whether this pattern should really be considered a gender type.

Corbett and Hayward (1987) reanalyzed the gender systems of Cushitic languages and the treatment of "plural" as a gender based on the work of Hayward (1979) in Bayso, another Lowland East Cushitic language. They argue that plural can be eliminated from the values of the gender feature due to the small number of nouns in Bayso that have this value, which can be labeled as lexical exceptions and analyzed with features indicating irregularity in number agreement — marked as irregular nouns taking plural agreement. Corbett (2012, pp. 223-233) further maintains that treating plural as a value of gender contradicts the general linguistic principle of exclusiveness, which prevents a value from belonging to more than one feature. Language systems that have plural as a value of gender challenge this principle. According to Corbett, any analysis of such a gender and number system is considered a feature-value mismatch and thus should be avoided.

Mous (2008), in contrast, defends the gender analysis and maintains the treatment of plural as a value of gender for those Cushitic languages that have this feature. According to Mous, analyzing plural as a gender provides a complete picture of the idiosyncrasy of the Cushitic system, facilitates the study of different languages in isolation, and emphasizes the interplay between gender and number as two close nominal categories like the verbal categories of tense and aspect (p. 155). Moreover, Tsegaye, Mous, and Schiller (2013) argue that applying the analysis Corbett (2012) used for Bayso to Konso would present additional challenges. To begin with, Konso has a relatively large number of non-derived plural gender nouns compared to Bayso. Out of the total of 476

nouns listed in Orkaydo's (2013, pp. 319-330) *The grammar of Konso*, no fewer than 96 non-derived nouns have plural gender, vis-à-vis 135 feminine and 245 masculine nouns — too many to be considered exceptional. Furthermore, gender and number exhibit two independent agreement systems in Konso. According to Orkaydo (2013, p. 79 & 169), an adjective agrees in number with the head noun by reduplicating the initial CV(C) of its root for semantically plural nouns as in (17), and in gender by a final suffix *–a* for masculine/feminine as in (17), and *–aaʔ* for plural gender as in (18).

Konso gender and number agreement of adjectives with head nouns (Orkaydo, p. 79 & 169)

(17)	orra-siʔ	**pop**~poor-a
	people-DEF.M/F	**MULT**~black-M/F
	'The black people'	
(18)	filaa-siniʔ	poor-**aaʔ**
	comb-DEF.P	SG.black-**P**
	'The black comb'	

Agreement with number on adjectives in Konso is obligatory and with words that are semantically multiple-reference number. The absence of multiple-reference marking on the adjective implies that the adjective is single-reference and that the head noun is single-reference as well. In (17) *orra* 'people' is a masculine word that is semantically multiple-reference and requires multiple-reference number agreement and masculine (M/F) gender agreement. The word *fìlaa* 'comb' has plural gender value that requires single-reference number agreement on the adjective and plural gender agreement on the demonstrative as shown in (18). Note that the morphological analysis would be /comb-DEF.MULT SG.black-MULT/ if this plural gender head noun were treated as displaying plural number agreement instead of having a gender value. This would mean that the two agreement places of the adjective would carry two

conflicting number values (SG vs. MULT). Furthermore, the agreement on the definite marker and the final suffix of the adjective would be according to gender for one group of nouns while according to number for another group of nouns. Bayso, the Cushitic language in which the reanalysis was applied (Corbett & Hayward, 1987; Corbett, 2012), does not have these additional challenges because it does not show independent number agreement.

One of the aims of this paper is, therefore, to uncover whether or not the third value (plural) is a gender value of its own in Cushitic languages that have this value, just like masculine and feminine. Based on the previous studies investigating gender processing (e.g. Schriefers, 1993; Bordag & Pechmann, 2008), we predicted that the production of Konso plural gender nouns would be slowed down by distractors that did not match in gender, compared to distractors that match in gender. To this end, the standard picture-word interference (PWI) paradigm is applied to Konso. In the PWI task, participants are requested to name a picture while ignoring a distractor word (e.g. Schriefers, 1993; Schiller & Caramazza, 2003; Schiller & Costa, 2006).

Schriefers was a pioneer in the investigation of the so-called gender-congruency effect using the PWI paradigm. Schriefers (1993) conducted two PWI experiments to investigate syntactic and lexical-semantic processes in Dutch noun phrase (NP) production. In the first experiment, he presented his participants with colored line drawings and asked them to name pictures by producing a determiner–adjective NP (e.g., *het groene boek*$_{N}$ ‘the green book’ vs. *de groene tafel*$_{COM}$ ‘the green table’). Schriefers obtained a significant gender congruency effect, i.e. participants named the pictures more quickly when the distractor word had the same

grammatical gender than when it had a different grammatical gender. Note that determiners in Dutch agree with the gender of the head noun.

The second experiment was on the production of noun phrases consisting of an adjective with a gender-marked suffix plus a noun. In this experiment, participants were asked to name the pictures by using an adjective NP (e.g., *groen boek*$_{N}$ 'green book' vs. *groene tafel*$_{COM}$ 'green table'). Schriefers (1993) found a significant gender congruency effect under these conditions as well. He used the results of both experiments to argue that the gender congruency effect is the result of lexical competition involving both gender-marked freestanding and bound morphemes. Lexical selection by competition works under the assumption that lexical activation of the target word also activates other competitor words and these competitor words delay the selection of the target word. It is also assumed that the activation of the lexical-syntactic gender information of the distractor word slows down the selection of the target noun gender in the gender-incongruent condition relative to the gender-congruent condition and hence leading to the delay in the picture naming (Levelt, Roelofs, & Meyer, 1999).

The gender congruency effect found in Schriefers' (1993) first experiment, freestanding gender-marked morpheme production, has been replicated in Dutch and German many times under different conditions (e.g. Van Berkum, 1997; La Heij, Mak, Sander, & Willeboordse, 1998; Schriefers & Teruel, 2000; Schiller & Caramazza, 2003; Schiller & Costa, 2006). However, Schiller and Caramazza (2003) were not able to replicate the gender-marked bound morpheme effect observed in Schriefers' (1993) second experiment either in Dutch or in German. Costa, Kovacic,

Fedorenko, and Caramazza (2003) also failed to replicate the gender congruency effect in bound morpheme production with Croatian speakers. The present paper will address whether or not the stated gender congruency effect in Dutch bound morpheme production reported by Schriefers (1993) is replicable in non-Indo-European languages.

Schiller and Costa (2006) further addressed the issue of whether freestanding and bound morphemes follow the same or different processing mechanisms in two PWI experiments in German. In the first experiment, participants were asked to produce a bound gender-marked morpheme in the form of indefinite determiner plus noun (e.g. *ein*$_{M}$ *Tisch*$_{M}$ 'a table' versus *eine*$_{F}$ *Tür*$_{F}$ 'a door') while ignoring a gender-congruent or gender-incongruent distractor word. The second experiment was similar to the first one but here participants produced freestanding gender-marked morphemes in the form of a definite determiner plus noun (e.g. *der*$_{M}$ *Tisch*$_{M}$ 'the table' versus *die*$_{F}$ *Tür*$_{F}$ 'the door'). They found a significant congruency effect only in the second experiment and concluded that freestanding and bound morphemes follow different selection mechanisms, the former involving competition and the latter non-competitive processes.

A study by Bordag and Pechmann (2008) involving Czech speakers, however, suggests that a gender congruency effect can be obtained with bound morpheme production as well. Their second experiment involved naming of gender-marked numerals (bound morphemes) plus noun (e.g. *druh-ý*$_{M}$ *telefon* 'second phone'), in which they found 37 ms congruency effect. This facilitation effect was even greater than the effect they obtained in their first experiment when Czech participants named gender-marked

freestanding demonstrative pronouns plus nouns (e.g. *ten*$_{M}$ *telefon* 'this phone'). Moreover, Schriefers, Jescheniak, and Hantsch (2005) argue that both freestanding and bound morphemes follow a similar selection mechanism, which is selection by competition. They tested the production of one (single-reference, SG) or two (multiple-reference, MULT) 1 target pictures in a simple picture naming (SPN) task, i.e. without the involvement of distractor words. In Experiment 1, participants produced noun phrases containing a gender-marked freestanding determiner, an adjective, and a noun (e.g. *das*$_{N}$ *große Haus* 'the$_{N}$ large house' vs. *die*$_{MULT}$ *großen Häuser* 'the$_{MULT}$ large houses'); in Experiment 2, they produced a bare noun (e.g. *Haus* 'house' vs. *Häuser* 'houses'); and in Experiment 3, they produced an adjective followed by a gender-marked bound morpheme plus a noun (e.g. *großes*$_{N}$ *Haus* 'large$_{N}$ house' vs. *große*$_{MULT}$ *Häuser'* 'large$_{MULT}$ houses') in German. Schriefers et al. (2005) found an interaction between number and gender in Experiment 1 but not in Experiment 2, and they interpreted these results as showing competition between gender-marked lexical items. Interestingly, in Experiment 3, they found an interaction effect between gender and number suggesting that bound morphemes involve competition as well. These findings were replicated in Dutch (Lemhöfer, Schriefers, & Jescheniak, 2006).

Recently, Jescheniak, Schriefers, and Lemhöfer (2014) examined the available evidence on the matter of whether or not freestanding and bound morphemes are selected by the same

1 To avoid confusion with the use of plural as a value of gender, we will consistently use the terms 'single-reference' and 'multiple-reference' to refer to the number values representing single reference nouns (singular number) and multiple reference nouns (plural number), respectively, following Hayward (1981, 2004) and Mous (2008).

processing mechanism. They reviewed studies that employed the picture-word interference (PWI) and simple picture naming (SPN) tasks in the production of gender-marked freestanding and bound morphemes. Jescheniak et al. argue that the gender-congruency effects consistently reported in the production of freestanding morphemes in Germanic languages demonstrate the role of competition. Regarding bound morphemes, however, they recognized the presence of inconsistent results. On the one hand, Schriefers (1993), and Bordag and Pechmann (2008) obtained gender congruency effects in utterances that involved a bound morpheme; on the other hand, Schiller and Caramazza (2003), Costa et al. (2003), Schiller and Costa (2006) did not observe such an effect in bound morpheme production. According to Jescheniak et al. the use of small response set size and single stimulus onset asynchrony (SOA) possibly explains the absence of gender congruency effects in the latter studies. For instance, in both Costa et al. (2003) and Schiller and Costa (2006), the gender-marked bound morpheme condition consist of only a single item in the response set, which is not the case in the studies by Schriefers (1993) and Bordag and Pechmann (2008). Similarly, Schiller and Caramazza (2003) implemented a single SOA of 0 ms whereas Schriefers (1993) employed different SOA levels, though he found the effect at 0 ms SOA. After weighing all the evidence, Jescheniak et al. (2014) concluded that gender-marked bound morphemes are selected following the same processing principle like that of freestanding morpheme, i.e. competitive lexical selection processes.

Janssen, Schiller, and Alario (2014), on the other hand, argue that the existing evidence up to now on naming bound morphemes from PWI and SPN tasks is not conclusive and hence it is not easy

to determine which particular retrieval processes are involved. In their commentary on Jescheniak et al.'s (2014) work, Janssen et al. (2014) argue that the gender congruency effect in PWI experiments cannot easily distinguish between competitive and non-competitive selection hypotheses, and the use of the SPN task entails construing complex interaction forms. In other words, the gender congruency effect consistently reported in Germanic languages in the production of freestanding morphemes in PWI tasks could be explained by both competitive and non-competitive accounts. According to the competitive account, the slower naming latencies in the gender-incongruent condition results from the competition between different determiner forms whereas according to the non-competitive account faster naming latencies in the congruent condition are due to priming between the corresponding determiners.

Similarly, in the production of determiner NPs in SPN tasks (in which participants name single-reference or multiple-reference NPs with gender-marked morphemes), the competitive and non-competitive accounts assume different kinds of gender by number interactions. The reported studies are conducted in Dutch and German. In these languages, the determiner forms for one gender group are the same both in the single-reference and multiple-reference (e.g. for common gender, the determiner for both single-reference and multiple-reference nouns is "de" in Dutch) but different for other genders (e.g. for neuter gender the single-reference determiner is "het" but the multiple-reference determiner is "de"). In Dutch NP production, for instance, if it were found that longer naming latencies in the production of multiple-reference NPs with neuter gender compared to its single-reference counterpart, it

would be interpreted as showing competition in the selection of the multiple-reference determiner (competition between single-reference and multiple-reference determiners, here "het" vs. "de"). On the other hand, if it were found that faster naming latencies in the production of multiple-reference NPs of common gender compared to its single-reference counterpart, this could be due to the activation of the same determiner form ("de") from the common gender of single-reference noun and its multiple-reference form. This could also be interpreted as evidence for non-competitive selection processes (Janssen et al., 2014). Thus, the competitive account predicts what Janssen et al. call a *cost-type* (an increased competition due to the activation of different types of determiners, e.g. "het" vs. "de" in Dutch plural NPs naming with neuter gender) whereas the non-competitive account predicts a *benefit-type* (due to activation from both gender and number features, e.g. "de" and "de" in Dutch plural NPs naming with common gender) of gender by number interaction.

Note that Jescheniak et al. (2014) concluded that the results of SPN studies are in agreement with a competitive selection account following the assumption that the proportion of multiple-reference trials affects the gender by number interaction. In other words, the proportion of multiple-reference trials determines the presence or absence of multiple-reference cost in cases of diverging single-reference and multiple-reference determiners as in neuter gender in Dutch. Janssen et al. (2014) point out that unlike the data from the PWI task, the data from the SPN task require interpreting complex interaction forms due to the fact that the relevant comparisons are between item comparisons as different nouns with different genders are involved. They argue that any differences between single-

reference and multiple-reference in the bare noun production (the so-called control experiment that has been included in all relevant studies) should be considered so as to partial out idiosyncratic item effects and to determine the differences between single-reference and multiple-reference per individual gender in NP production. Janssen et al. analyzed the data from the previous studies using number by format interaction for each gender individually and the resulting analyses put a challenge against the proportion argument — as the proportion of multiple-reference trials increases in an experiment, the multiple-reference cost reduces and the multiple-reference benefit increases.

Using similar analysis methods (number by format interactions for each gender individually), Janssen et al. (2014) reported two new experiments in Dutch that examined whether the proportion of multiple-reference trials in the experiment affects the gender by number interaction. In their Experiment 1a — determiner NPs and bare noun production with 50% multiple-reference trials — Janssen et al. found a significant three-way interaction between response format, gender, and number. They interpret this interaction effect as showing the gender by number interaction was not the same between determiner NP and bare noun response types, and only determiner NP production was affected by the gender and number combination. Moreover, their analyses of the effect of number for the determiner NPs in each individual gender of format by number interaction show a significant benefit-type (a –25 ms interaction term) for common gender — but a non-significant cost-type (a 19 ms interaction term) for neuter gender. Janssen et al. (2014) also found a significant three-way interaction between response format, gender, and number in their Experiment 1b — determiner NPs and

bare noun production with 40% multiple-reference trials. As in their Experiment 1a, the analysis of the individual gender suggests a benefit-type -82 ms significant interaction term but a non-significant 22 ms cost-type interaction term. Using these results along with their reanalysis of previous data, they conclude that there is weak empirical support for the argument that the proportion of multiple-reference trials in the experiment affects the shape of the gender by number interaction.

These divergent accounts of the existing data indicate that resolving the issue needs further empirical research. Both recent studies by Jescheniak et al. (2014) and Janssen et al. (2014) admittedly recognized the presence of inconclusive data and the need of additional empirical evidence with respect to the gender congruency effect in bound morpheme production as well. This urgent need of conforming whether or not bound morpheme production involves competition partly motivated our research reported here. The second aim of the current study is, therefore, to contribute to filling the gap of cross-linguistic confirmation from non-Indo-European languages on gender-marked bound morpheme processing mechanisms. As our review shows, studies investigating the issue of whether competition for selection is limited only to freestanding morphemes or applies to bound morphemes as well are small in number and provide conflicting findings. Not surprisingly, almost all of these studies are based on Indo-European languages.

We report two PWI experiments that were conducted in Konso involving native speakers in their homeland, in a fieldwork setting. In Konso, the gender of nouns determines the assignment of definite marking on nouns (Orkaydo, 2013, pp. 77-78). Plural gender nouns take the definite suffix *–sini?* (e.g. *innaa*$_{\text{P}}$-*sini?*$_{\text{DEF.P}}$ ‘the child’).

Masculine and feminine gender, however, take the definite suffix *–si?* (e.g. *ɠimayta*$_{M}$*-si?*$_{DEF.M/F}$ ‘the old man’ or *alleeta*$_{F}$*-si?*$_{DEF.M/F}$ ‘the hut’). We will refer to nouns that take *–si?* as *non-plural gender definite nouns* though they have two subclasses, feminine and masculine, since they both take the identical definite suffix as opposed to *plural gender definite nouns*.

Konso shows gender agreement in the subject inflection on the verb as well. Thus, as can be seen in the examples below, feminine nouns take the same agreement form as the third person female subject, marked by the suffix *–t*; masculine nouns take the same agreement form as the third person male subject, marked by the suffix *–ay*; plural gender nouns take the same agreement form as the third person plural subject, marked by the suffix *–n* (Orkaydo, 2013, p. 73; see examples below). In Konso, simple sentences can have overt subjects, verb roots with subject proclitics and inflectional suffixes (Orkaydo, 2013, p. 59).

Konso gender agreement on the verb (Orkaydo, personal communication).

(19)	lafta-siʔ	i=akk-am-**t**-i	FEMININE
	bone-DEF.M/F	3=show-PAS-**3F**-PF	
	‘The bone was shown’		
(20)	ɠoyra-siʔ	i=akk-am-**ay**	MASCULINE
	Tree-DEF.M/F	3=show-PAS-PF.**3M**	
	‘The tree was shown’		
(21)	innaa-siniʔ	i=akk-am-i-**n**	PLURAL
	child-DEF.P	3=show-PAS-PF-**3P**	
	‘The child was shown’		

The overt subjects can be omitted and they can be understood from the gender agreement markers on the verb (Orkaydo, 2013, p. 59; see examples below).

Null subject sentences in Konso (Orkaydo, personal communication)

(22) i=akk-am-**t**-i FEMININE
3=show-PAS-**3F**-PF
'She was shown'

(23) i=akk-am-**ay** MASCULINE
3=show-PAS-PF.**3M**
'He was shown'

(24) i=akk-am-i-**n** PLURAL
3=show-PAS-PF-**3P**
'They were shown'

In Experiment 1, we investigated the gender congruency effect in naming nouns with a gender-marked definite suffix. In Experiment 2, participants responded to a target picture by producing a sentence (with and without an overt subject) with gender-marked inflections. Our hypothesis was that plural is a gender value of its own in Konso and hence it should show the same pattern of interference from gender-incongruent and/or facilitation from gender-congruent distractor words as the other genders, here masculine and feminine, that are accepted as gender values in the language. In other words, if plural is a gender feature in Konso, naming utterances with plural gender should yield similar congruency effects as masculine and feminine gender. However, if such an effect is absent in naming utterances with plural gender but present only in masculine and feminine gender, plural should be eliminated from the gender system. Moreover, the finding of a gender congruency effect would have further implications for bound morpheme processing, since elements that carry gender information are bound in Konso.

3.2. Experiment 1: Definite noun production

In this experiment, we examined the gender congruency effect in the production of plural gender definite nouns versus non-plural gender Konso definite nouns. If comparable gender congruency effects appear to be observed in naming plural and non-plural (masculine

and feminine) gender definite nouns, plural is indeed processed similar to as other genders, which would support the analysis of plural as a gender feature just like masculine and feminine in Konso. If, however, the congruency effect appears to be confined only in naming the already accepted genders (non-plural gender definite nouns) but not in naming plural gender definite nouns, that would be an indication for plural to belong to only the number feature instead. Furthermore, such a finding would provide additional evidence as to how gender-marked bound morphemes are processed during speech production, specifically whether or not they follow competitive processing mechanism.

Methods

Participants

Twenty-seven high school students and native speakers of Konso served as paid participants. All had normal vision and hearing.

Materials

Thirty-two target-pictures (black-on-white line drawings) and 64 distractor words were used (The names of the target line drawings and the distractor words are shown in Appendix A). The names of half of the stimuli were plural gender nouns that take the definite suffix *–sini?*. The other names were of non-plural gender nouns (half masculine and half feminine nouns that take the definite suffix *–si?*). Stimuli that were identified as problematic (e.g. due to close semantic relatedness between different target pictures and due to the use of less clear pictures) in the study of Tsegaye et al. (2013) were removed. Moreover, based on native speakers' intuitive judgment, the remaining stimuli were matched for frequency and familiarity.

Each of the target pictures was presented in three distractor conditions: gender-congruent, gender-incongruent, and control (pink noise). The control condition (pink noise) was included as an indicator to ensure participants processed the distractor words. However, this condition was not further analyzed. Targets and distractor words were not related in terms of meaning (they did not belong to the same semantic category) or sound (their initial sounds were not the same and they did not share more than three phonemes).

Procedure

Participants were tested individually in a quiet room. They sat in front of a laptop screen at a viewing distance of around 60 cm. The target pictures were presented in the center of a 15.6-inch laptop screen accompanied by one of the distractor words, which were presented via headphones. Participants were instructed that they would see a picture and hear a word or pink noise and were asked to respond to the target picture while ignoring the auditory stimulus. Reaction times (RTs) were measured from the onset of the target stimulus to the beginning of the naming response using a voice key. The software package E-prime was used to design and run the experiment, and a Serial Response Box was used to register the voice key.

Before the experimental phase, all 32 pictures with their intended names were introduced to the participants. Three practice blocks were carried out in which participants were instructed to name the target pictures with their appropriate definite suffixes. In the first practice block, each of the pictures was presented on the laptop screen one at a time; each picture was displayed for four seconds. In the second practice block, each of the pictures was presented with a

distractor word, which was not used in the experiment proper. The display duration was also reduced to three seconds and participants were asked to name only the picture with its appropriate definite suffix. In these two blocks, a naming error and inappropriate use of definite suffixes was corrected if necessary. In the third block, the second block was repeated with further reduction of the display duration to two seconds. In the test phase, participants named the pictures by producing the definite form of the noun while ignoring the simultaneously presented auditory distractor.

There were a total of 96 experimental stimuli (32 pictures × 3 distractor conditions) presented in three blocks (32 stimuli per block). In each block, stimuli were pseudo-randomized using a Latin square so that no target gender or distractor gender appeared more than twice in a row. There was a break of around one minute between blocks. The target line drawings were centered at the point of fixation. Each trial began with a fixation point (a plus sign) in the center of the screen for 500 ms, followed by the target picture and the distractor for a maximum of two seconds. Then, a blank screen appeared for 500 ms before the presentation of the next trial. The experimenter recorded whether the response was correct or incorrect, and the (mal)functioning of the voice key.

Results and discussion

Reactions times registered from utterances other than the designated one and from non-fluent utterances (stuttered and repaired utterances, production of nonverbal sounds that triggered the voice key) were labeled as erroneous. Thus, 188 observations (7.2%) were identified as erroneous. Short RTs (shorter than 350 ms) and long RTs (longer

than 1,500 ms), altogether 96 observations (4.0%), were also excluded from the following Analyses of Variance (ANOVAs).

As Table 10 shows, the overall RTs in the congruent condition were faster than the RTs of the incongruent condition in both target genders. Repeated Measures ANOVAs were conducted on the mean RTs per participant (F1) and per item (F2) with Target Gender (plural vs. non-plural) and Distractor Condition (congruent vs. incongruent) as within-participant factors. These analyses revealed a significant difference between gender-congruent and gender-incongruent distractor conditions; $F_1(1, 26) = 6.775$, $p < .015$; $F_2(1, 30) = 7.812$, $p < .009$. Participants were significantly slower in naming the target when the distractor had a different gender compared to the same gender. The mean congruency effect was 45 ms. The factor Target Gender and the interaction between Distractor Condition and Target Gender were not significant (all Fs < 1).

Table 10 Reaction times (RTs) in ms, error percentage (%e), and gender congruency effect in Experiment 1

Target gender	Distractor condition							
	Congruent		Incongruent		Control (Pink Noise)		Congruency effect	
	RTs	%e	RTs	%e	RTs	%e	RTs	%e
Plural	865	6.5	905	3.4	804	2.3	40	-3.1
Non-plural	873	3.1	924	3.2	794	3.2	51	0.1
Mean	869	4.8	914	3.3	799	2.8	45	-1.5

The analysis shows a robust gender congruency effect in Konso when naming noun plus gender-marked definite suffix. Moreover, the results show that not only the non-plural genders (masculine and feminine), but also the plural gender shows this congruency effect, in which comparable gender congruency effects were found (40 ms in the plural and 51 ms in the non-plural and the difference between them was statistically not significant, $F < 1$). This is an indication for "plural" to be a proper gender value in Konso. Note that this gender congruency effect is obtained with bound morpheme

production and we will discuss this fact in more detail in the Discussion section. Note also that compared to the Tsegaye et al. (2013) study, the overall RTs and the error rates decreased following the change of part of the stimuli and experimental procedure in the present research. At the same time, the overall congruency effect increased.

3.3. Experiment 2: Sentence production

The aim of Experiment 2 was to examine if the results of Experiment 1 are replicable and the gender congruency effect is a stable phenomenon in another bound morpheme production condition. The other aim of Experiment 2 was to investigate gender congruency effects in the three gender values at the same time (namely masculine, feminine, and plural gender values).

In this experiment, we examined gender congruency effects in sentence naming in PWI tasks. If significant gender congruency effects are observed across all gender values in this experiment, this suggests the so-called plural gender is processed similarly to masculine and feminine gender. This in turn would support the gender analysis of plural indeed being a value of gender in Konso, just like masculine and feminine. Similarly, such a result would provide further implications for theories of gender-marked bound morpheme processing mechanisms.

Methods

Participants

Twenty Konso native speakers, students from Karat High School, served as paid participants. Karat is the major town in Konso. All of the participants had normal vision and hearing.

Materials

Forty-five black-on-white line drawing pictures corresponding to non-derived Konso nouns were selected. Fifteen of the nouns were masculine, 15 were feminine and 15 had plural gender. Each target picture was presented four times and each time presented together with either gender-congruent or gender-incongruent distractor words or pink noise (control). A total of 135 (45 target pictures × 3 distractor conditions) trials were used in this experiment (see Appendix B). The selection of both the target pictures and distractor words was based on the same criteria as in Experiment 1.

Procedure

The general procedure was the same as in Experiment 1, except that there were two response types in this experiment. First, participants were instructed to respond to the target picture by producing an *overt subject* and a *verb* (picture name + *i=akk-am-M/F/P gender suffix* 'was/were shown', where *i=* stands for third person affirmative subject clitic). Hereafter, we will refer to this response type as the "*overt subject*" response type. Second, they were asked to respond to the target picture by producing the verb root with subject clitic and gender-marked inflectional suffixes (*i=akk-am-M/F/P gender suffix* 'he/she/they was/were shown'). Hereafter, we will refer to this response type as the "*null subject*" response type. Thus, all participants received two series of experimental trials corresponding to these two response types. The order of presentation was counterbalanced across participants. Half of the participants started with the overt subject response type while the others begun with the null subject response type.

Results and discussion

Observations were excluded on the basis of the same criteria as in Experiment 1. Thus, 657 (12.2%) observations were marked as erroneous. Similarly, 324 (6%) observations were found to be outside the RT range of 350 – 1,500 ms. To determine the statistical significance of the results, separate ANOVAs were conducted for participants and items, yielding F1 and F2 statistics, respectively. The first ANOVAs were conducted with Response Type (overt vs. null subject), Target Gender (feminine vs. masculine vs. plural) and Distractor Condition (congruent vs. incongruent) as within-participant factors.

Table 11 RTs in ms, percentages of errors (%e), and gender congruency effect across the two response types of Experiment 2

		Target Gender	Congruent		Incongruent		Control (pink noise)		Congruency effect	
			RTs	%e	RTs	%e	RTs	%e	RTs	%e
Response type	Overt subject	Feminine	928	4.6	945	4.8	863	3.2	17	0.2
		Masculine	964	2.9	989	3.9	886	2.7	25	1.0
		Plural	898	2.4	936	2.7	840	4.2	38	0.2
		Mean	930	3.3	957	3.8	863	3.4	27	0.5
	Null subject	Feminine	927	6.2	980	4.9	840	4.9	53	-1.3
		Masculine	889	5.1	945	4.9	821	4.6	56	-0.2
		Plural	894	3.8	960	3.9	831	3.4	66	0.1
		Mean	904	5.0	962	4.6	830	4.3	58	-0.5

Table 11 provides the mean RTs, percentages of errors, and gender congruency effects of each target gender in different distractor conditions of the two response types. Over all, participants were faster in the null subject than in the overt subject response type and the mean gender congruency effect was higher in the former than the latter response type (58 vs. 27 ms). This effect, however, was not statistically reliable ($F < 1$). Similarly, the mean gender congruency effect was higher in naming plural gender compared to masculine and feminine, and this effect was significant in the participant analysis but not in the item analysis, ($F1(2, 28) = 3.294$, $p < .05$;

$F2(2, 42) = 1.289$, $p < .29$). Most important, it took participants significantly longer to produce the utterances when the gender of the target picture was different from the gender of the distractor word (gender-incongruent) than when they were the same (gender-congruent), $F1(1, 19) = 21.537$, $p < .0001$; $F2(1, 42) = 19.203$, $p < .0001$. The interaction between Response Type and Target Gender was significant ($F1(2, 38) = 9.096$, $p < .007$; $F2(2, 42) = 7.021$, $p < .002$). The *T* test revealed that the difference in reaction times between null subject and overt subject response type was only significant in the item analysis for only masculine target gender, $t1(19) = 1.187$, $p < .25$; $t2(14) = 3.355$, $p < .005$. Moreover, the variation among the three target genders (feminine, masculine and plural) was reliable only in the overt subject response type of the participant analysis, $F1(2, 38) = 8.38$, $p < .001$; $F2(2, 42) = 2.597$, $p < .09$, and none of the remaining analyses were significant (all *F*s < 1).

The most important finding of the current experiment is that − compared to the gender-incongruent condition − gender-congruent distractor words sped up the naming time of the target pictures significantly. This finding replicates the result of a gender congruency effect in bound morpheme naming in Experiment 1, indicating the effect is a robust phenomenon in Konso. In this experiment, significant gender congruency effects were observed in the production of plural gender nouns, like masculine and feminine nouns. This provides evidence that nouns with plural gender value are processed similarly to masculine and feminine gender nouns, which supports the gender analysis that recognizes plural as a gender value of its own like that of masculine and feminine in Konso.

3.4. General discussion

This paper essentially examined the nature of Konso's third gender and its implication for the underlying mechanism of language production. Konso and other related Cushitic languages are analyzed as having three genders and the third, after masculine and feminine, is often called plural gender since its agreement pattern corresponds with that of the third person plural. However, recognizing plural as a distinct gender on its own has become a controversial issue. According to one position (see Corbett & Hayward, 1987; Corbett, 2012), only masculine and feminine are recognized as gender values and the third one is analyzed as part of the number system. Alternatively, plural is treated as a proper gender like masculine and feminine in many descriptive studies on those Cushitic languages that have this feature (Mous, 2008). In this study, we investigated whether or not the so-called plural gender nouns are processed as a proper gender in Konso by means of two PWI experiments in Konso.

In Experiment 1, definite noun production, participants produced nouns with a definite gender-marked suffix in response to the target picture accompanied by a distractor word. The production of definite nouns took significantly more time when the target and the distractor are gender incongruent than when they are congruent. In Experiment 2 (sentence production), participants responded to the target pictures by producing a sentence consisting of an overt subject (i.e. the name of the picture) and a verb in the overt response type, and by producing only a verb (a verb root with subject clitic plus a gender-marked inflectional suffix) in the null subject response type while ignoring a simultaneously presented distractor word. Overall, significant congruency effects of 27 ms in the overt and 58 ms in the null subject response types were found. As it has been shown in the

results of the two experiments, plural gender nouns show gender congruency effects like masculine and feminine nouns. This indicates that plural is processed like masculine and feminine gender, which supports the analysis that the so-called "plural" gender indeed is part of the system of gender features in Konso.

The results of the current study, thus, raise the question of how comparable the value "plural" for gender and the value "plural" for number are for Konso and similar Cushitic languages. We do not need to give up the axiom of exclusiveness if the similarity in terminology does not reflect an overlap of two features. The use of the term "plural" for gender is a logical one because the subject agreement on the verb is like that of a third person plural subject. There are additional links between the plural gender and plurality of number. One such link is the fact that coordinated nouns trigger plural agreement on the verb irrespective of the gender values of the coordinated nouns. For instance, the coordinated noun phrase combining a masculine and feminine word requires plural agreement form in Konso gender resolution as in (25).

Plural agreement used in coordinated noun phrases in Konso (Orkaydo, personal communication)

(25) ɕartaaynu iʃuʔ inantaaynu tikupa ikalin

ɕarta-aynu	iʃuʔ	inanta-aynu	tika-opa	i=kal-i-n
elder.brother.M-1SG.POSS.M/F	and	girl.F-1SG.POSS.M/F	house-to	3=return.home-PF-P

'My elder brother and my sister returned home.'

Second, number is a derivational category in Konso meaning that some nouns derive a multiple-reference form from a non-derived single-reference form (e.g. *maakaɗɗaa* 'snakes' from *maakaa*$_{M}$ 'snake'), others derive a single-reference from a non-derived multiple-reference form (e.g. *keltayta*$_{M}$ 'baboon' from *keltayaa* 'baboons'), and many other constellations (Orkaydo, 2013, pp. 80-

89). There are five different multiple-reference suffixes in Konso, and the one to be used is ultimately lexically determined. All these multiple-reference suffixes impose plural gender onto the noun and drived multiple-reference nouns shift in gender to plural gender. In these two ways, plural in gender and plural in number do overlap. The category of number in Konso has a number of properties that make it of a different nature than the category of gender. Agreement on the verb is only with gender and not with number. The main locus of number agreement is on the adjective in Konso and other Cushitic languages. An adjective will agree in number with the head noun. However, the agreement is semantic in nature: using a singular adjective modifying a multiple-reference head noun is acceptable and renders the reference of that noun as collective, thus semantically as singular. Moreover, number is a category that is not obligatorily expressed, i.e. a speaker has to choose between the use of a non-derived base noun or a derived noun marked for multiple-reference when referring to multiple objects, depending on how crucial she or he considers information on number in the given context. Konso is very different from most Indo-European languages in that respect. Our results show the necessity of investigating the category of number in Konso and Cushitic in more detail.

Our study also addressed the issue of whether or not gender congruency effect can be obtained in gender-marked bound morpheme production. As we have mentioned in the introduction, a relatively small number of studies have looked at gender-marked bound morpheme production and these few studies even provide inconsistent evidence that leads to inconclusive accounts of its underlying processing mechanism. The debate over whether gender-marked bound morphemes are processed through competitive or non-

competitive mechanisms mainly comes from studies that involve picture-word interference (PWI) and simple picture naming (SPN) experiments.

The gender congruency effect for freestanding morphemes in PWI experiments is an undisputed phenomenon in the so-called early selection languages (where the determiner selection can occur very early in the NP production process since the determiner form depends only on the grammatical gender of the head noun and not on the phonological context), such as Dutch and German (La Heij et al., 1998; Schriefers, 1993; Schriefers & Teruel, 2000; Schiller, 2013; Schiller & Caramaza, 2002, 2003; Schiller & Costa, 2006; Van Berkum, 1977). To date, the available data on bound morpheme production are, however, inconclusive as to which underlying processing mechanism (competitive vs. non-competitive) is involved. In some studies, a significant gender congruency effect is observed only in the production of gender-marked freestanding morphemes but not in the production of gender-marked bound morphemes (e.g. Schiller & Caramazza, 2003, in German and Dutch; Costa et al., 2003, in Croatian; Schiller & Costa, 2006, in German). As a result, these authors concluded that gender-marked bound morpheme production involves a non-competitive processing mechanism while gender-marked freestanding morphemes involve selection-by-competition processes. In other studies, a gender congruency effect was found for gender-marked bound morpheme production as well (e.g. Bordag & Pechmann, 2008, in Czech; Schriefers, 1993, in Dutch). Thus, these authors concluded that gender-marked bound morpheme production also involves selection-by-competition processes like that of freestanding morphemes.

Similar to Schriefers (1993), as well as Bordag and Pechmann (2008), the results reported in the present study also indicate that a gender congruency effect can be observed in gender-marked bound morpheme production. Note, however, that the results are not in line with the position that postulates a non-competitive selection processing mechanism for gender-marked bound morpheme production. The reasons for these seemingly conflicting results could be cross-linguistic differences between Konso and other languages (e.g. Dutch and German in Schiller & Caramazza, 2002, 2003; Schiller & Costa, 2006; Croatian in Costa et al., 2003), in which no gender congruency effects were observed in gender-marked bound morpheme production. Most closed class functional items tend to be bound and rarely occupy word-initial position in Konso and other Cushitic languages. Thus the observed gender congruency effect in Konso bound morpheme production could be due to language-specific properties such as the role of gender inflections on nouns and verbs, the nature of gender-marked bound morphemes, and the role of gender agreement in the language and its complex interaction with number. For instance, in all relevant studies on the production of bound morphemes in Dutch and German, the adjective suffixes are presumably accessed as a result of a phonological transformation of the base form that does not involve selection from the lexicon (Schiller & Costa, 2006). In German indefinite determiner NPs production (Experiment 1a; e.g. *ein*$_{M}$ *Tisch* 'a table' vs. *eine*$_{F}$ *Tür* 'a door'; Schiller & Costa, 2006), for example, no effects of gender congruency are reported. The authors explained this absence of congruency effect as a result of response preparation. Since the bound morphemes begin with the same stem (*ein*), any effect of competition in the selection of affixes is inhibited. In other words,

participants prepare the production of the morpheme stem and start uttering once they have sufficient information about the noun, thus inhibiting any effects of competition that may arise in the selection of the gender-marked suffix. There is no re-syllabication process in Konso definite noun and sentence production experiments reported in the present study. The Konso definite markers ($–si?_{M/F}$ and $–sini?_{P}$) and verb inflections ($–ay_{M}$, $–t_{F}$ and $–n_{P}$) are not morphologically complex and they do not involve any phonological re-syllabification process that would mask the effect of competition.

In conclusion, the experiments reported in this study offer new data regarding the issue of plural gender in Cushitic and the selection of gender-marked bound morphemes. In addition to other linguistic evidence, such as the distinct agreement system for gender and number with a large number of plural gender nouns in Konso, the significant gender congruency effects observed in naming gender-inflected nouns and verbs in the present study support the treatment of plural as a value of gender in Konso. Whether or not this is also the case in other Cushitic languages that have a similar feature is an issue for future research.

Last but not least, the current study played a vital role in extending the psycholinguistic investigation of grammatical gender beyond Indo-European languages. Psycholinguistic investigation of gender in language production has been confined to a small number of closely related languages (some Germanic and Slavic languages). This is also the case in other areas of psycholinguistic research. So far, the languages that have been mentioned in the psycholinguistic literature on language production are fewer than 30 languages and most of them are closely related both geographically and genetically (Jaeger & Norcliffe, 2009). Partly, the problem is that language-

specific behaviors are said to have little or no effect on language processing since the underlying mechanisms are assumed to be universal. Although some elements of language processing could be universal, individual language differences have been attested even within these closely related languages that have been examined. The language-specific nature of the so-called gender congruency effect and the scope of its effect, which was also examined in the current study, could be an example.

Another issue investigated here was whether it is feasible to apply standard experimental methods to under-represented languages within the field of psycholinguistics in a fieldwork setting. Psycholinguistic experiments are often carried out as lab research that requires ingenious experimental designs, advanced lab equipment such as eye-trackers, electroencephalography or even functional magnetic resonance imaging, large groups of experimental participants, and detailed statistical analyses. Our study has shown that it is indeed challenging to carry out psycholinguistic studies on less studied languages in the field due to, among other things, the difficulty of finding adequate stimulus materials, lack of normative data such as measures on the word frequency of stimulus materials, difficulty of finding proficient participants and training them to do the experiments, and infrequent access to electricity. However, it is not totally impossible to conduct experiments in the fieldwork context. In this regard, the current study uniquely examined the status of plural gender in Konso using behavioral methods, which also provides additional empirical and cross-linguistic evidence as far as gender-marked bound morpheme processing is concerned. Thus, we promote the expansion of field-based psycholinguistic investigations in less studied languages as they provide additional empirical and

cross-linguistic evidence and expand our knowledge of language processing mechanisms.

Table 12 Appendix A: stimulus materials in Experiment 1

			Distractor word conditions				
Target utterance	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
akataasiniʔ	The sugar cane	Plural	ɗarɗaa	lie, untruth	furoota	type of bead	Feminine
furaasiniʔ	The key	Plural	aataa	culture	tolloʔta	hump	Feminine
innaasiniʔ	The boy	Plural	hiippaa	riddle	taammata	desert bee	Feminine
ɲaaɲɲaasiniʔ	The tomato	Plural	hanʄufaa	saliva	tampoota	tobacco	Feminine
ɲirfaasiniʔ	The hair	Plural	aannaa	milk	keltoota	cattle louse	Feminine
uwwaasiniʔ	The dress	Plural	ɠolfaa	bark of trees	χarinta	horizontally placed fence bar	Feminine
χopaasiniʔ	The shoe	Plural	ikkaamaa	selected seeds	tulluppaata	wood boring beetle	Feminine
afaasiniʔ	The mouth	Plural	fuuraa	fear	kilpa	knee	Masculine
filaasiniʔ	The comb	Plural	oytaa	upper part of the compound	keltayta	baboon	Masculine
haaʃʃullaasiniʔ	The leaf	Plural	ʄorrooɠaa	eye discharge	karitta	belly	Masculine
kiʔsaasiniʔ	The cricket	Plural	marʄaa	hip	leya	month	Masculine
rikaasiniʔ	The tooth brush	Plural	erkannaa	message	kawsa	chin, beard	Masculine
siinaasiniʔ	The nose	Plural	olsaa	dream	koɗaa	work	Masculine
timpaasiniʔ	The drum	Plural	ipsaa	light	ɗankaa	throat	Masculine
ukukkaasiniʔ	The egg	Plural	ararsaa	local beer made for sale	arrapa	tongue	Masculine
χolmaasiniʔ	The neck	Plural	unɠulaa	grain store from bamboo	mura	forest	Masculine
arpasiʔ	The elephant	Masculine	urratta	cloud	χoffaa	groin	Plural
karmasiʔ	The lion	Masculine	hoofa	hole	toʄaa	water droplet	Plural
kessasiʔ	The chest	Masculine	ʄapara	rig	miɗaa	cabbage leaves	Plural
mottooɠaasiʔ	The truck	Masculine	ukkaʃʃa	husk	χaaʃaa	reed	Plural
ɠupittasiʔ	The finger	Masculine	ɗila	field	piʃaa	water	Plural
sookittasiʔ	The salt	Masculine	alkitta	sisal	χapnaa	forest	Plural
tomasiʔ	The bowl	Masculine	ekerta	olive	pohaa	contribution, tribune	Plural
tuyyuuraasiʔ	The air plane	Masculine	ammaʔitta	breakfast	pakaannaa	root crop	Plural
laftasiʔ	The bone	Feminine	ohta	cloth (worn in the night)	kaaʄaa	money	Plural
oχintasiʔ	The fence	Feminine	ʄureeta	dirt	saaraa	poem	Plural
tikasiʔ	The house	Feminine	ɗalta	seed	ʄaɓɓeernaa	stretcher	Plural
χampirteetasiʔ	The bird	Feminine	tirayta	sheep skin	paankaa	machete	Plural

Appendix A: stimulus materials in Experiment 1 (Continued)

			Distractor word conditions				
Target utterance	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
harreetasiʔ	The donkey	Feminine	eetuta	dinner/supper	kawla	metal tool for ginning	Plural
irrootasiʔ	The mountain	Feminine	ʄileeta	stick used by old women	ɲupuraa	component of loom	Plural
kaawwatasiʔ	The mirror	Feminine	haaɗita	load, burden	pakataa	wide shield	Plural
piirtutasiʔ	The sun	Feminine	ʄooɠɠita	mud	tiraa	liver	Plural

Table 13 Appendix B: stimulus materials in Experiment 2

Target Picture	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
akataa	sugar cane	Plural	ɗarɗaa	lie, untruth	uffaata	balloon	Feminine
filaa	comb	Plural	oytaa	upper part of the compound	hiparaata	bat	Feminine
ɲaaɲɲaa	tomato	Plural	hanʄufaa	saliva	faroota	luck	Feminine
ɲirfaa	hair	Plural	aannaa	milk	keltoota	cattle louse	Feminine
siinaa	nose	Plural	olsaa	dream	yaakata	bead	Feminine
ukukkaa	egg	Plural	ararsaa	local beer made for sale	tampoota	tobacco	Feminine
uwwaa	dress	Plural	ɠolfaa	bark of trees	χarinta	horizontally placed fence bar	Feminine
χolmaa	neck	Plural	unɠulaa	grain store from bamboo	moossuta	(piece of) bread	Feminine
afaa	mouth	Plural	fuuraa	fear	kilpa	knee	Masculine
furaa	key	Plural	aataa	culture	keltayta	baboon	Masculine
innaa	boy	Plural	hiippaa	riddle	hikkitta	star	Masculine
kiʔsaa	cricket	Plural	marʄaa	hip	tokkayta	porcupine	Masculine
rikaa	a tooth brush	Plural	erkannaa	message	kawsa	chin beard	Masculine
timɓaa	drum	Plural	ipsaa	light	ɗankaa	throat	Masculine
χopaa	shoe	Plural	ʄorrooɠaa	eye discharge	kirra	river	Masculine

Appendix B: stimulus materials in Experiment 2 (Continued)

Target Picture	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
karmaa	lion	Masculine	ɗuttana	belly	lanɗeeta	spleen	Feminine
kessa	chest	Masculine	urratta	cloud	mooluta	bald	Feminine
mottooɠaa	truck	Masculine	ukkaʃʃa	husk	hakayta	second round harvest	Feminine
ɠayranta	leopard	Masculine	ɗaʔta	butter	mateʔta	upper millstone	Feminine
sookitta	salt	Masculine	hallaka	fat	paallata	piece of clay to fetch fire with	Feminine
toma	bowl	Masculine	ɗila	field	poɠoota	lower jaw	Feminine
arpa	elephant	Masculine	hoofa	hole	moonta	sky	Feminine
murkuƒaa	fish	Masculine	ƒalaɠɠitta	flat stone	tiyyaa	dispute	Plural
oraayta	hyena	Masculine	ɠayya	smoke	kasaraa	dreadlocks	Plural
parƒuma	stool	Masculine	ɗikla	elbow	χapnaa	forest	Plural
ɠupitta	finger	Masculine	ƒaɓɓaa	weed	kaaƒaa	money	Plural
saalpataa	belt	Masculine	ɗamayta	wind	kolkaa	food without cabbage	Plural
tuuma	onion	Masculine	ƒapara	rig	sinɗaa	urine	Plural
tuyyuuraa	air plane	Masculine	ammaʔitta	breakfast	χoffaa	groin	Plural
kuta	dog	Masculine	ɗakaa	stone	elalaa	cowrie shell	Plural

Appendix B: stimulus materials in Experiment 2 (Continued)

Target Picture	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
kalaʔta	spider	feminine	ʄileeta	stick used by old women	ɗaammaa	flour	Masculine
lafta	bone	feminine	koromta	heifer	karayta	tributary	Masculine
piirtuta	sun	feminine	ʄooɠɠita	mud	hoppatta	guts	Masculine
ɠapaleeta	monkey	feminine	ɗalta	seed	kanta	sub-village	Masculine
taaltaallata	giraffe	feminine	kawwatta	terrace	kasirayta	tick (parasite)	Masculine
tika	house	feminine	koorita	type of cloth	irɲa	gum	Masculine
harreeta	donkey	feminine	ʄureeta	dirt	kappaa	wheat	Masculine
ekta	tail	feminine	talteeta	she-goat	paankaa	machete	Plural
irroota	mountain	feminine	ohta	cloth (worn in the night)	χallaa	kidney	Plural
kaawwata	glass	feminine	eetuta	dinner/supper	piʃaa	water	Plural
kaharta	ewe	feminine	kusumta	navel	mookkaa	cassava	Plural
ollaʔta	leaf	feminine	kulleeta	hood; cap	pakaannaa	root crop	Plural
oχinta	fence	feminine	pooyta	mourning, cry	ɗooʃʃaa	sarcasm	Plural
pottaata	pumpkin	feminine	haaɗita	load, burden	saaraa	poem	Plural
χampirteeta	bird	feminine	kannoota	calabash to drink from	ɲupuraa	component of loom	Plural

CHAPTER 4

4. Picture-word tasks support plural as a category of gender instead of number in Konso

A version of this chapter is in preparation for publication as:

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Abstract

Konso, a Cushitic language, has a third gender class sometimes called "plural" gender since it takes the same agreement form as the third person multiple-reference (plural) number even for words that refer to a single entity. We investigated whether this feature ("plural") is processed as gender or number using picture-word tasks. Pictures of one or two objects were presented with a single-reference or a multiple-reference distractor that has the same or different gender as the targets. In Experiment 1, participants responded to the pictures using gender-marked definite nouns; and in Experiments 2 and 3, they responded by producing a sentence with overt subject and null subject, respectively. Significant effects of gender congruency were observed in the single-object picture naming condition where the selection of gender suffixes is determined by the target's gender, but not in the multiple-object picture naming condition where the gender-marked suffixes are identical for all. The overall results suggest that plural gender nouns are processed similarly to feminine and masculine single-reference nouns, and differently from regular multiple-reference nouns. This supports the analysis of plural as a gender but not as a number feature in Konso. It also indicates that the gender congruency effect occurs at the phonological encoding level, and the selection of gender-marked suffixes involves competitive processes.

4.1. Introduction

This study examines how grammatical gender and number, specifically how the so-called plural gender, are processed online during speech production in Konso, a Lowland East Cushitic language of Ethiopia. The study also provides additional evidence for two theoretically interesting issues: the locus and the scope of the so-called gender congruency effect.

Speech production generally involves multilevel processes of conceptualization, formulation and articulation (Levelt, 1989). As speakers, we first determine what to say at the highest message-level representation (conceptualization). Then, we translate this conceptual representation into a linguistic form (formulation). Finally, we transform this linguistic form into utterances that involve detailed phonetic and articulatory planning (articulation). To produce a word, for instance, we need to access its conceptual, syntactic and phonological information from our mental lexicon. To produce phrase level utterances, we may also need to access gender, number and other grammatical elements of a word. For instance, in Konso each noun has a specific grammatical gender. However, gender is not explicitly marked on the noun itself. Gender is expressed in terms of agreement outside the noun, for example, by definite marking or verb inflections. The noun's gender determines the form of the definite marking and verb inflections, and hence they are syntactically dependent on the noun. This means that a word´s syntactic information, such as its gender, has to be accessed in order to produce gender-marked elements, such as definite nouns or sentences in Konso.

Research on the syntactic processing of gender in speech production has received a reasonable attention after Schriefers' (1993) pioneering work on Dutch noun phrase production (NP), in which he used the picture-word interference (PWI) task to examine the syntactic processes involved in selecting gender-marked determiners (Experiment 1) and adjectival inflection (Experiment 2). In the PWI task, participants respond to a picture while ignoring a distractor word presented either visually or auditorily. In both Experiments 1 and 2, Schriefers observed significantly longer naming latencies in the gender-incongruent condition compared to the gender-congruent condition. He interpreted the observed gender congruency effect as showing competition in the selection of the abstract gender feature of the noun at the syntactic level (*competitive grammatical feature selection hypothesis*). The reason was that two different gender values compete for selection in the gender-incongruent condition. This was not the case in the gender-congruent condition as both the target and the distractor activate one and the same gender value.

Miozzo and Caramazza (1999) pointed out that the congruency effect might stem from lexical competition between determiner forms at the phonological level instead of at the syntactic level. They failed to observe a gender congruency effect in Italian and the effect was not found in other Romance languages, either (e.g. Costa, Sebastinan-Galles, Miozzo, & Caramazza, 1999, in Catalan and Spanish; Alario & Caramazza, 2002, in French). Note that in all these Romance languages, unlike the determiner system in Dutch, the selection of the appropriate determiner form is not determined by a noun's gender alone, but it also depends on the local phonological environment wherein the determiner occurs. This will make the

selection of the determiner in these languages a relatively late process in NP production because the production system has to wait with the selection of the determiner form until the phonological context is known. As a result, a vital cross-linguistic distinction was made between Dutch and other Germanic languages on the one hand where the so-called gender congruency effect has been observed (*early selection languages*); and Italian and other Romance languages on the other where such an effect has not been found (*late selection languages*; Miozzo & Caramazza, 1999; Caramazza, Miozzo, Costa, Schiller, & Alario, 2001). This shows that language-specific features affect the gender congruency effect, which suggests the necessity of examining further the cross-linguistic differences in a gender and other grammatical feature selection processes. In this regard, the present study provides additional evidence as to whether the gender congruency effect reflects competition at the syntactic (abstract gender nodes) or at the phonological level (word forms) in Konso.

Miozzo and Caramazza (1999) were the first to propose that the gender congruency effect reflects processing at the phonological level and not at the syntactic level following their failure to find the effect in Italian. Their initial argument was that the effect would have to be visible in the bare noun production as well if the congruency effect mirrors competition between grammatical features at the grammatical encoding level and not between the word forms at the phonological encoding level. In support of this position, La Heij, Mak, Sander, and Willeboordse (1998) failed to observe a gender congruency effect in bare noun naming although they found the effect in determiner plus noun production in Dutch. Levelt et al. (1999), however, maintained that grammatical gender is selected only when required for production and thus the absence of a gender

congruency effect in bare noun naming does not undermine the *competitive grammatical feature selection hypothesis*. The selection of the gender feature is not needed in bare noun naming in Dutch since determiners are not part of the utterance.

It is Schiller and Caramazza (2003) who provide stronger evidence in support of the proposal that the congruency effect occurs at the phonological encoding level instead of at grammatical encoding level. They investigated 'single-reference' (singular) and 'multiple-reference'2 (plural) NP productions in German and Dutch. These languages show interesting property that determiners are gender marked in the single-reference but not in the multiple-reference. Thus, although there are three different forms in the single-reference in German (*der, die* & *das*) and two (*het* & *de*) in Dutch, there is only one definite article form for the multiple-reference nouns (*die* in German & *de* in Dutch).

Schiller and Caramazza carried out a number of experiments and they consistently reported the congruency effect only for single-reference NPs and not for multiple-reference NPs. They hypothesized that the congruency effect should have been observed both in the single-reference and multiple-reference NP productions if the congruency effect occurred at the level of grammatical feature selection (*Gender Selection Interference Hypothesis*, GSIH). According to Schiller and Caramazza, the fact that the effect is found only in the single-reference but not in the multiple-reference context supports the position that the congruency effect occurs at the

2 To avoid confusion with the use of plural as a value of gender, we will consistently use the terms 'single-reference' and 'multiple-reference' to refer to the number values representing single reference nouns (singular number) and multiple reference nouns (plural number), respectively, following Hayward (1981, 2004) and Mous (2008).

phonological encoding level (*Determiner Selection Interference Hypothesis*, DSIH). This means that, in the production of single-reference NPs, determiner forms and not their abstract gender nodes compete for selection. In the production of multiple-reference NPs, however, there is no such competition as there is only one determiner form available for selection, and therefore no congruency effect was obtained. We examine if this is also the case in a genetically and geographically unrelated language, Konso.

As will be shown later, similar to German and Dutch determiners, Konso's gender-inflected definite markers on nouns and gender markers on verbs are identical for one gender class in the single-reference and multiple-reference, but differ for the other gender classes. Thus, although Konso has two different definite markers in the single-reference (*–si?* & *–sini?*), it has only one definite form for multiple-reference (*–sini?*). In the subject agreement on the verb, Konso has three different gender-marking suffixes in the single-reference. The three gender markers are *–t* for feminine, *–ay* and *–n* for masculine and plural gender, respectively. Nonetheless, it has only one verb ending (*–n*) in the multiple-reference for all, which corresponds with that of the so-called plural gender of the single-reference. Unlike the determiner forms in German and Dutch, all the gender-inflected forms in Konso are suffixes that occur at the end of the definite noun or the verb. The present research also investigates whether the gender congruency effect is observed in utterances ending in gender-marking suffixes in a language where gender information is solely provided by a suffix (a bound morpheme).

Previous studies on the production of gender-marking bound morphemes provide inconsistent evidence and the question regarding the retrieval mechanisms of gender-marked inflections are not

adequately answered yet. Schriefers (1993) observed a congruency effect in the production of gender-marked adjectives and nouns (Experiment 2) in Dutch. Similarly, Bordag and Pechmann (2008) have obtained effects of gender congruency in the production of gender-marked numerals (bound morphemes) plus noun in Czech. On the other hand, Schiller and Caramazza (2003) did not observe an effect of gender congruency in gender-marked bound morpheme production in either Dutch or German. The absence of a gender congruency effect in bound morpheme production was also reported in Croatian (Costa, Kovacic, Fedorenko, & Caramazza, 2003). Relatedly, Schiller and Costa (2006) found a significant congruency effect only in the production of freestanding gender-marked morphemes (a definite determiner plus noun) but not in bound gender-marked morpheme production (indefinite determiner plus noun) in German.

On the other hand, using a different experimental paradigm, namely the simple picture naming (SPN) task that involves no distractors, Schriefers, Jescheniak, and Hantsch (2005) have demonstrated that bound morphemes involve competition. In the SPN task, participants produce single-reference or multiple-reference NPs with gender-marked elements. Schriefers et al. found a gender by number interaction effect in German when participants produced an adjective followed by a gender-marked bound morpheme plus a noun (Experiment 3), which indicates that the selection of gender-marked bound morphemes takes place in a competitive manner (see also Schriefers, Jescheniak, & Hantsch, 2002; Janssen & Caramazza, 2003; Lemhöfer, Schriefers, &

Jescheniak, 2006)3. In the present study, however, we use PWI tasks to investigate whether or not gender congruency effects are present in Konso bound morpheme production.

As the above review of previous research shows, there clearly is a lack of consensus among researchers in the field regarding the locus and the scope of the gender congruency effect. The question of whether the congruency effect occurs at an abstract lexical level (Schriefers, 1993; Levelt et al., 1999) or a word form level (Miozzo & Caramazza, 1999; Caramazza et al., 2001), and whether it can be observed in bound morpheme production (Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Bordag & Pechmann, 2008) or not (Schiller & Caramazza, 2002, 2003; Costa et al., 2003; Schiller & Costa, 2006) have not yet been resolved. Furthermore, the evidence accumulated so far about the cognitive representation of gender and number features is largely based on Germanic and Romance languages, and is in need of cross-linguistic confirmation from non-Indo-European languages. The present study investigates the above-mentioned issues in an understudied language within experimental psycholinguistics: Konso, which has a unique grammatical feature (plural as a value of gender) that provides further insight into the cognitive processes of gender and number features.

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3 The matter of whether or not selection of gender-marked bound morphemes takes place competitively was part of the discussion in recent works by Jescheniak, Schriefers, and Lemhöfer (2014), as well as Janssen, Schiller, and Alario (2014). Jescheniak et al. argue that the available data from the SPN task support the view that the selection of gender-marked closed-class elements (including bound morphemes) follows competitive processes. In a response to this argument, Janssen et al. argue that this conclusion is overtly optimistic and they suggest that the pattern of the available and new data is less consistent than what has been described by Jescheniak et al. when these data are analysed from a different and more appropriate viewpoint, namely analysing the Number (single-reference vs. multiple-reference) by Format (NP vs. bare noun) interactions for each gender class separately.

Konso is a Lowland East Cushitic language spoken in southwest Ethiopia. In Konso and some other related Cushitic languages, nouns are categorized into three gender classes according to the agreement they trigger on the verb (Mous, 2008). These three gender classes are feminine (F), masculine (M) and plural (P) genders (Hayward, 1979; Mous, 2008). The use of the term plural as a value of gender is not uncommon in Cushitic language studies (e.g. Hayward, 1979, for Bayso but see also Corbett & Hayward, 1987; Pillinger & Galboran, 1999, for Rendille; Savà, 2005, for Ts'amakko; Mous, 1993, 2008, for Iraqw; Orkaydo, 2013, for Konso). This analysis is based on the fact that nouns in this class trigger the same agreement form as third person multiple-reference irrespective of their number values (single-reference or multiple-reference).

Nevertheless, the analysis of 'plural' as a value of gender has been challenged and an alternative analysis has been proposed (Corbett & Hayward, 1987; Corbett, 1991, 2005, 2006, 2012). This alternative analysis is based on typological and theoretical studies on gender and number features, which effectively eliminate plural as a gender feature and treat it as a number feature that shows irregularity in number agreement. According to Corbett (2012), nouns that take plural agreement for single-reference number instead of the expected agreement, such as *iloo* a word in Bayso for 'eye', should be lexically marked as exceptions similar to *pluralia tantum* nouns. The reason is that analyzing plural as a value of gender is taken to be a challenge for the typology of morphosyntactic features, which is based on the general principle of "exclusiveness — a value belongs to just one feature" (Corbett, 2012, p. 223). Accordingly, gender cannot take plural as its value and thus the analysis of plural as a

value of gender is ruled out (for details see Corbett, 2012, pp. 223-233).

In this study, we put the aforementioned two competing analyses (*plural-as-a-gender feature vs. plural-as-a-number feature*) to test using the picture-word interference (PWI) paradigm. In other words, we investigate whether the so-called plural gender is processed in the same way as the other genders (masculine or feminine), which are already accepted as values of gender in the language, or in the same way as regular multiple-reference number during on-line speech production. If the so-called plural gender indeed represents a gender feature, it should behave similarly as the other genders. If, however, it is rather a value of number, then it should behave like regular multiple-reference number.

Cushitic is a branch of the Afro-asiatic language family that hosts more than 30 languages, of which at least 11 arguably have the so-called plural gender in addition to feminine and masculine gender (Mous, 2008). We choose Konso to investigate whether plural is a value of gender or number for practical reasons. Among other things, there are the availability of relatively large wordlist (stimuli) and an adequate number of non-derived plural gender nouns in the language (245 masculine, 135 feminine, and 96 plural gender nouns; Orkaydo, 2013). Furthermore, a detailed analysis of the grammar of the language is available (Orkaydo, 2013) and a relatively large number of native Konso speakers are accessible (250,000 speakers, Central Statistics Agency of Ethiopia, 2009). Moreover, previous experimental work has shown evidence for the presence of a so-called gender congruency effect in the language (Tsegaye, Mous, & Schiller, 2013; submitted).

According to Orkaydo (2013), Konso distinguishes three genders in the noun system, i.e. feminine, masculine, and plural. This three-way gender agreement is marked in the subject inflection on the verb. Accordingly, feminine nouns take the same agreement form as the third person female subject, marked by the suffix *–t (*e.g. *lafta-si? i=akk-am-**t**-i* /bone-DEF.M/F 3=show-PAS-3F-PF/ 'The bone was shown'). Masculine nouns take the same agreement form as the third person male subject, marked by the suffix *–ay (*e.g. *ɠoyra-si? i=akk-am-**ay*** /tree-DEF.M/F 3=show-PAS-PF.3M/ 'The tree was shown'). Plural gender nouns take the same agreement form as the third person multiple-reference subject, marked by the suffix *–n* (e.g. *kosaa-sini? i=akk-am-i-**n*** /granary-DEF.P 3=show-PAS-PF-3**P**/ 'The granary was shown'). As the examples above show, simple sentences can have overt subjects, verb roots with subject proclitics and inflectional suffixes in Konso (Orkaydo, 2013, p. 59). The overt subjects can also be omitted and they can be understood from the gender agreement markers on the verb (Orkaydo, 2013, p. 60). For instance, *i=akk-am-**t**-i* /3=show-PAS-3F-PF/ 'She was shown'; *i=akk-am-**ay*** /3=show-PAS-PF.3M/ 'he was shown'; *i=akk-am-i-**n*** /3=show-PAS-PF-3**P**/ 'They were shown'.

In Konso, the gender of nouns determines the selection of definite marking on nouns and distinguishes only between plural and non-plural gender (feminine and masculine) definite nouns (Orkaydo, 2013, pp. 77-78). Plural gender nouns take the definite suffix *–sini?* (e.g. $kosaa_{P}$-$sini?_{DEF.P}$ 'the granary'). Non-plural (masculine and feminine) gender, however, take the definite suffix *–si?* (e.g. $ɠimayta_{M}$-$si?_{DEF.M/F}$ 'the old man' or $alleeta_{F}$-$si?_{DEF.M/F}$ 'the hut').

Number is usually thought of prototypically inflectional category based on, among others, the criteria of productivity, semantic

regularity and obligatoriness. The design of experiments reported in this chapter took into account this widespread notion. However, this assumption has been questioned and an alternative analysis that treat number as a derivational category has been proposed for Cushitic languages (Mous, 2008). Thus number is said to be a derivational category in Konso and it involves the derivation of multiple-reference nouns from non-derived single-reference nouns and to some extent the derivation of single-reference nouns from non-derived multiple-reference nouns (Orkaydo, 2013). Attaching multiple-reference suffixes, reduplicating the base-final consonant and geminating the last consonant of the base mark the derivation of multiple-reference (Orkaydo, 2013). All of these derivational processes impose plural gender agreement on the verb in the language (Orkaydo, 2013). Although there are five multiple-reference suffixes in Konso, *-ɗɗaa* and *-ɗaa* are the most productive ones (Orkaydo, 2013), and they both are used in the production of the multiple-object picture naming condition of the experiments reported in the present research. For instance, the word *kosaa* 'granary' is plural in gender and it takes the multiple-reference suffix *-ɗɗaa* as in *kosaa-ɗɗaa* /granary-MULT/ 'granaries' (Orkaydo, 2013, p. 81). The definite multiple-reference form of this noun would be *kosaa-ɗɗaa-sini?* /granary.P-MULT-DEF.P/ 'the granaries'.

In this study, we report a series of experiments with native speakers of Konso in which we examined whether the so-called plural gender is processed as a gender or a number feature and whether gender-marked inflections are subject to competitive process. The study also provides additional evidence as far as the locus of the congruency effect is concerned, i.e. whether it occurs at the phonological level or at syntactic level. In Experiments 1a and

1b, participants named the pictures by means of a single-reference or a multiple-reference definite noun (noun + gender-marked definite suffix) while ignoring a simultaneously presented auditory distractor with single-reference (Experiment 1a) or multiple-reference (Experiment 1b). In Experiments 2a and 2b, they responded to one (single-object) or two (multiple-object) pictures by using a sentence consisting of an overt subject (name of the picture) and a verb (*iakkam*-M/F/P suffix 'was/were shown') while ignoring a simultaneously presented auditory distractor with single-reference (Experiment 2a) or multiple-reference (Experiment 2b). Experiments 3a and 3b are the same as Experiments 2a and 2b, respectively, with the exception of the utterance format; here they produced a null subject sentence with only a gender-inflected verb (*iakkam*-F/M/P suffix 'she/he/they was/were shown').

Thus, in our experimental scenarios, the *plural-as-a-gender feature analysis* would predict that a plural gender produces a similar pattern of effects as those of feminine and masculine gender but a different effect compared to regular multiple-reference nouns. The *plural-as-a-number feature analysis*, on the other hand, would predict that the so-called plural gender produces a similar effect as that of regular multiple-reference nouns but a different pattern of effects from those of the feminine and masculine genders. Similarly, the *competitive grammatical feature selection hypothesis* predicts a gender congruency effect in both single-object (pictures of one object) and multiple-object (pictures of two objects) picture naming conditions. Presence of the effect only in the single-object picture naming condition, where there are distinct markers for all, and absence of the effect in the multiple-object picture naming condition, in which there is only one form for all, would support the hypothesis

that the congruency effect reflects processes at the phonological encoding level rather than at the grammatical encoding level (*competitive phonological form selection hypothesis*). The experiments reported in this study can also provide evidence in support of the bound morpheme competition hypothesis if any of them yield congruency effects since all gender-marked elements are bound morphemes in Konso.

4.2. Experiment 1: Definite noun naming

In Experiment 1, participants named pictures of one object (single-object picture naming condition) or two objects (multiple-object picture naming condition) by using either a single-reference definite noun or a multiple-reference definite noun, while ignoring simultaneously presented auditory distractors. Distractor words were single-reference nouns in Experiment 1a whereas they were multiple-reference nouns in Experiment 1b (see Table 14 for examples of utterances). *The plural-as-a-gender hypothesis* predicts that relative to multiple-reference definite nouns production (e.g. *furaa-ɗɗaa-sini?* /key.P-MULT-DEF.P/ 'The keys' vs. *kuta-ɗɗaa-sini?* /dog.M-MULT-DEF.P/ 'The dogs') the production of single-reference definite nouns (e.g. *furaa-sini?* /key.P-DEF.P/ 'The key' vs. *kuta-si?* /dog.M-DEF.M/F/ 'The dog') should yield a gender congruency effect. If we do find a gender congruency effect in the production of single-reference definite nouns where the selection of definite suffixes is governed by the target´s gender, but not in the multiple-reference definite nouns production where the definite suffix is identical for all, this would also suggest that the gender congruency effect occurs at the word form level instead of at lexical syntactic level, and gender-marked bound morphemes are subject to competitive processes.

Table 14 Examples of utterances in Experiment 1a and 1b

	Target picture name	Target Gender	Utterance	Distractor word		
				Distractor Condition	Experiment 1a (Single-reference)	Experiment 1b (Multiple-reference)
Single-reference						
	furaa	Plural	*furasini?*			
	'key'		'The key'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	unta 'grain'	*untaɗɗaa* 'grains'
				Neutral	Pink-noise	Pink-noise
	kuta	Non-plural	*kutasi?*			
	'dog'		'The dog'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	elalaa 'cowrie'	elalaɗɗaa 'cowries'
				Neutral	Pink-noise	Pink-noise
Multiple-reference						
	furaɗɗaa	Plural	*furaɗɗasini?*			
	'keys'		'The keys'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	*unta* 'grain'	*untaɗɗaa* 'grains'
				Neutral	Pink-noise	Pink-noise
	kutaɗɗaa	Non-plural*	*kutaɗɗasini?*			
	'dogs'		'The dogs'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	elalaa 'cowrie'	elalaɗɗaa 'cowries'
				Neutral	Pink-noise	Pink-noise

*The gender value of the target in multiple-reference and all distractors in Experiment 1b would be plural according to the position that all multiple-reference suffixes impose plural gender.

Method

Participants

Experiment 1a had 24 participants and Experiment 1b had 25 participants. All participants were native Konso speaking students from Karat High School, Karat being the major town in the Konso speaking area of Ethiopia. They were paid for their participation. All participants had normal hearing and vision.

Materials

Twenty-four pictures corresponding to non-derived Konso nouns were selected for naming. A single instance of a picture was presented during the single-object picture naming condition whereas two instances of a picture were presented side by side during the multiple-object picture naming condition. Table 14 contains examples of utterances that were used in this experiment. For instance, following the presentation of a key in one trial (single-object picture naming condition), participants should produce *furasini?* 'the key' but they should say *furaddasini?* 'the keys' when two pictures of a key were presented side by side in another trial (multiple-object picture naming condition).

Each picture was presented with a gender-congruent and a gender-incongruent distractor word as well as a gender-neutral pink noise— this was to make sure participants were processing the distractor words. Target picture names were semantically and phonologically unrelated to their respective distractor words. Distractor words were presented in their single-reference form in Experiment 1a whereas they were presented in their multiple-reference form in Experiment 1b. The complete list of target pictures

and distractor words can be found in Appendix A. Pictures were simple black line drawings of everyday objects presented on a white background. Distractor words were presented auditorily at the same time as the target pictures (SOA = 0 ms).

Each experimental picture occurred once in the single-object and once in the multiple-object picture naming condition, producing the following distribution of definite suffixes: 36 occurrences of *–si?* and 108 of *–sini?* (36 occurrences of *–sini?* from single-reference definite noun with plural gender nouns and 72 of *–sini?* from the multiple-reference definite nouns from both plural and non-plural gender classes). To equate the probability of occurrence for the two definite suffixes, we added another 24 filler items, half with names of masculine gender and half with names of feminine gender. Each of these filler items, along with its distractor word, occurred twice in a single-object naming condition. As a result, both definite suffixes occurred an equal number of times for the whole set of items, 108 times each.

Design

There were three crossed factors: the two-level factor Target Gender (plural vs. non-plural), the two-level factor Distractor Condition (gender-congruent vs. gender-incongruent), and the two-level factor Target Number (single-reference vs. multiple-reference). All factors were tested within participants (F1). Target Gender was tested between items (F2), and Distractor Condition and Target Number were tested within items (F2).

Procedure

Participants were tested individually in a quiet room. They sat in front of a 15.6-inch DELL laptop screen at a viewing distance of 60

cm. Pictures appeared in the center of the screen. On each trial, a fixation point (a plus sign) appeared for 500 ms followed by the picture and the distractor word. Participants were instructed to focus on the fixation point and to name the target picture as quickly and as accurately as possible with the appropriate definite noun in Konso.

Picture and distractor word were presented simultaneously, and disappeared from the screen after a response was provided and the voice key was triggered. Then, the next trial was started automatically. The next trial also began automatically if no response was recorded within two seconds. If the voice key was triggered wrongly, if an incorrect gender-marked suffix or incorrect picture name was used, or the response contained a speech error or it exceeded the time limit of two seconds, then the response was considered invalid. Invalid responses were not included in the statistical tests. The E-prime software package was used for designing and presentation of trial sequences, and a serial response box was used to measure the reaction time from picture onset to utterance onset.

Results

Three-hundred thirty-four (8.3%) observations in Experiment 1a and 362 (8.6%) observations in Experiment 1b had naming latencies smaller than 350 ms or longer than 1,500 ms, and were considered outliers. Utterances other than the designated one and non-fluent speech were considered as erroneous, 351 observations (8.7%) in Experiment 1a and 508 (12.1%) observations in Experiment 1b were marked as such. The mean naming latencies and error rates are summarized in Tables 15 and 16. Analyses of variance were run with factors Target Gender (plural vs. non-plural), Distractor Condition

(gender-congruent vs. gender-incongruent), and Target Number (single-reference vs. multiple-reference). Separate analyses were carried out with participants (F1) and items (F2).

Experiment 1a

In Experiment 1a, definite noun naming with single-reference noun distractors, pictures were named almost equally fast in the single-reference (1,023 ms) and in the multiple-reference (1,020 ms) definite noun productions. There was an overall 17 ms advantage in the gender-congruent condition over the gender-incongruent condition. This effect of Distractor Condition was significant by participants, ($F_1(1, 23) = 6.056$, $p < .02$), but not by items, ($F_2(1, 22) = .919$, $p < .35$). Similarly, the factor Target Gender was significant by participants but not by items, ($F_1(1, 23) = 8.148$, $p < .009$; $F_2(1, 22) = 2.625$, $p < .12$). However, the effect of Distractor Condition was modified by the factor Target Number indicated by a significant interaction between Target Number and Distractor Condition, ($F_1(1, 23) = 18.383$, $p < .0001$; $F_2(1, 22) = 38.325$, $p < .0001$).

Table 15 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 1a (Definite noun naming, single-reference distractor)

Target Number	Distractor Condition	Target Gender				Mean	
		Non-Plural		Plural			
		RTs	%e	RTs	%e	RTs	%e
Single-reference	Congruent	981	3.5	1008	4.9	995	4.2
	Incongruent	1024	4.5	1078	6.8	1051	5.6
	Neutral	951	3.1	956	3.3	953	3.2
Multiple-reference	Congruent	1015	3.1	1056	5.9	1030	4.5
	Incongruent	1004	5.7	1016	5	1010	5.4
	Neutral	956	4	961	1.7	959	2.9

In the single-object picture naming condition, there was 56 ms gender congruency effect, whereas in the multiple-object picture naming condition, there was a reverse 24 ms advantage of the

gender-incongruent over the gender-congruent condition. Analysis of the simple effects revealed that the congruency effect in the single-object (but not in the multiple-object) picture naming condition was reliable, ($F_1(1, 23) = 19.375$, $p < .0001$; $F_2(1, 22) = 11.506$, $p < .003$). There were no reliable effects in the error rate data (all Fs < 1).

Experiment 1b

In Experiment 1b, when definite noun naming had multiple-reference noun distractors, the effect of the factor Target Number (single-reference: 1,028 ms; multiple-reference: 1,033 ms) was not significant (both Fs < 1). Similarly, there was no effect of Distractor Condition (gender-congruent: 1,032 ms; gender-incongruent: 1,028 ms; both Fs < 1). The factor Target Gender was not significant (both Fs < 1), and none of the interaction effects were significant (all Fs < 1). The error rate analyses mainly mirrored the results of the response latency data. In the error rate data, only the factor Target Gender was significant, ($F_1(1, 24) = 7.471$, $p < .01$; $F_2(1, 22) = 5.923$, $p < .02$). Participants made slightly more errors in the plural gender definite noun naming (7.7%) than in the non-plural gender definite noun naming (5.4%).

Table 16 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 1b (definite noun naming, multiple-reference distractor)

Target Number	Distractor Condition	Target Gender					
		Non Plural		Plural		Mean	
		RTs	%e	RTs	%e	RTs	%e
Single-reference	Congruent	1010	3.3	1048	7.2	1029	5.3
	Incongruent	1020	5.0	1031	10.2	1026	7.6
	Neutral	963	3.2	984	4.2	973	3.7
Multiple-reference	Congruent	1042	5.5	1025	6.7	1034	6.1
	Incongruent	1013	5.7	1050	6.5	1031	6.1
	Neutral	993	7.2	991	4.3	992	5.8

Discussion

Unlike the results of Experiment 1a, the gender of the distractors in Experiment 1b did not affect the naming latencies. Recall that the only difference between the two experiments was the number value of the distractor words. All the distractor words were single-reference nouns in Experiment 1a but multiple-reference nouns in Experiment 1b. Note also that number in nouns is derivational in Konso and all distractor words in Experiment 1b were multiple-reference nouns derived from the single-reference nouns by attaching the multiple-reference suffixes and impose plural gender agreement (Orkaydo, 2013). Thus, there is no gender distinction in the multiple-reference nouns in Konso as such since they all trigger plural gender agreement. This might explain the presence of gender congruency effect only in the single-object picture naming condition with single-reference distractor words, where there was marked gender distinction, but the absence of the effect in all other conditions, where there was no marked gender distinction either in target picture names or in distractor words.

Moreover, similar to our study, picture-word interference studies in various utterance formats in Dutch and German have shown that the naming latencies of a target utterance were influenced by the gender value of a distractor word (e.g. Schriefers, 1993; Van Berkum, 1997; La Heij et al., 1998; Schriefers & Teruel, 2000; Schiller & Caramazza, 2003) but not the number values of the distractor (Schiller & Caramazza, 2003). And no effects of number congruency have been observed (Schiller & Caramazza, 2002). Moreover, Schiller and Caramazza (2003) have reported a gender congruency effect in the single-object but not in the multiple-object picture naming condition both with single-reference (Experiment 2a)

and multiple-reference distractor words (Experiment 3). Schiller and Caramazza use these findings to argue that the number value of the distractor has no influence in the picture-word interference task, which is consistent with our result. They further maintained that the number value of the target plays a role as well, which we did not observe in our Experiment 1b.

On the other hand, the results reported above in Experiment 1a are interesting for at least two main reasons. First, they provide further evidence that the gender congruency effect is a stable and robust effect in Konso, which has been reported previously under different conditions (Tsegaye et al., 2013; submitted). Recall that Tsegaye et al. (2013) reported a first indication of gender congruency effect in the language. Recently, Tsegaye et al. (submitted) found a robust gender congruency effect in the production of gender-marked definite nouns (Experiment 1), which was similar to part of the present experiment. They interpret the result as showing plural gender definite nouns processed in the same way as non-plural gender definite nouns. Here, we replicate this gender congruency effect in the single-object picture naming condition of Experiment 1a.

Second, our result goes beyond Tsegaye et al.'s (submitted) result because it shows that the gender congruency effect only occurs when pictures are named with their corresponding definite suffix in the single-object but not in the multiple-object picture naming condition. In the single-object picture naming condition, the appropriate gender-marked definite suffix has to be selected from the two competing suffixes, either *–si?* or *–sini?*. In the multiple-object picture naming condition, on the other hand, the definite suffix is the same for both definite nouns, which is always *–sini?*. This finding is also in line with the hypothesis that the congruency effect reveals

lexical competition at the phonological form level and not at the syntactic level (Miozzo & Caramazza, 1999; Schiller & Caramazza, 2003; Bordag & Pechmann, 2008). According to this hypothesis, the congruency effect, which is found in Konso single-reference definite noun naming, occurs in selecting the appropriate gender-marked definite suffix at the phonological form level but not in selecting the gender of the to-be-named picture at abstract syntactic level. This means that the two forms of definite suffixes (*–si?* vs. *–sini?)* in the gender-incongruent condition compete for selection during the single-reference definite noun production, which is why we observed longer naming latencies in this condition. This pattern of gender-marked definite suffix competition, however, was not observed in the multiple-object picture naming condition, as there is only one definite suffix form for all (i.e. *–sini?*). This demonstrates that the gender congruency effect indeed originates at the phonological form level; the competition is between gender-marked definite suffixes and not between abstract gender nodes. This position has largely received empirical support from a number of works (see, e.g. Schiller & Caramazza, 2003; Bordag & Pechmann, 2008). Note also that the finding of gender congruency in naming gender-marked definite nouns under the single-object picture naming condition (Experiment 1a) lends support for bound morpheme competition account as well (Schriefers, 1993; Schriefers et al., 2005; Bordag & Pechmann, 2008). This is because gender-marked elements in our experiment were also bound morphemes.

Experiment 1 compared the production of plural gender definite nouns with that of non-plural gender (feminine and masculine) definite nouns. This is because Konso definite markers on nouns distinguish only between plural and non-plural genders, *–sini?* for the

former and *–si?* for the later (Orkaydo, 2013). All three gender values in the language, namely feminine, masculine and plural genders, are distinctly marked on the concord between a noun in the subject position and the verb of the same sentence (Orkaydo, 2013). The aim of Experiment 2 was to examine if the results of Experiment 1 are replicable in a different utterance format (sentence naming), which examined all the three gender values at the same time.

4.3. Experiment 2: Overt subject sentence naming

In Experiment 2, native Konso speaking participants were asked to name a picture by producing a sentence with an overt subject. As in Experiment 1, pictures could either appear as a single object (single-object picture naming condition) or as two identical objects (multiple-object picture naming condition). In Experiment 2a, distractor words were presented in their single-reference form while in Experiment 2b, they were presented in their multiple-reference form. The number values of the distractors were manipulated to examine if the finding of a gender congruency effect only in the single-object picture naming condition with single-reference distractors in definite noun production (Experiment 1a) would be replicated in sentence production as well.

Table 17 Examples of utterances in Experiments 2a and 2b

Target Number	Target picture name	Target Gender	Utterance	Distractor word		
				Distractor Condition	Experiment 2a (Single-reference)	Experiment 2b (Multiple-reference)
Single-reference	*irroota*	Feminine	*irrootasiʔ iakkamti*			
	'mountain'		'The mountain was shown'	Congruent	*locʔta* 'leg'	*locʔtaɗɗaa* 'legs'
				Incongruent	*ɠussa* ''wall'	*ɠussaɗɗaa* 'walls'
	furaa	Plural	*furasiniʔ iakkamin*			
	'key'		'The key was shown'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	unta 'grain'	*untaɗɗaa* 'grains'
	kuta	Masculine	*kutasiʔ iakkamay*			
	'dog'		'The dog was shown'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	elalaa 'cowrie'	*elaladɗaa* 'cowries'
Multiple-reference	*irrootaɗɗaa*	Feminine*	*irrootaɗɗasiniʔ iakkamin*			
	'mountains'		'The mountains were shown'	Congruent	*locʔta* 'leg'	*locʔtaɗɗaa* 'legs'
				Incongruent	*ɠussa* 'wall'	*ɠussaɗɗaa* 'walls'
	furaɗɗaa	Plural	*furaɗɗasiniʔ iakkamin*			
	'keys'		'The keys were shown'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	*unta* 'grain'	*untaɗɗaa* 'grains'
	kutaɗɗaa	Masculine*	*kutaɗɗasiniʔ iakkamin*			
	'dogs'		'The dogs were shown'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	*elalaa* 'cowrie'	*elaladɗaa* 'cowries'

* The gender value of the target in multiple-reference and all distractors in Experiment 2b would be plural according to the position that all multiple-reference suffixes impose plural gender.

Method

Participants

Twenty native Konso speakers from Karat High School participated in Experiment 2a and 17 participated in Experiment 2b. None of the participants had participated in Experiment 1. They were paid for their participation in the experiment.

Materials

Stimuli were 30 black line drawings of everyday objects. There were an equal number of object names with feminine, masculine and plural gender. As in Experiment 1, a single instance of a picture was presented during the single-object picture naming condition whereas two instances of a picture were presented side by side during the multiple-object picture naming condition (see Table 17 for examples). Each picture was presented with a gender-congruent and a gender-incongruent distractor word. The distractor words were in their single-reference form in Experiment 2a whereas they were in their multiple-reference form in Experiment 2b. Distractor words were semantically and phonologically unrelated to the picture names. Appendix B contains the list of target pictures and distractor words used in this experiment. Similar to Experiment 1, distractor words and target pictures were presented simultaneously (SOA = 0).

Every picture appeared once in the single-object and once in the multiple-object picture naming condition, which produces 20 appearances of *–t*, 20 appearances of *–ay*, and 80 appearances of *–n* (20 appearances of *–n* from single-object picture naming condition with plural gender nouns and 60 of *-n* from the multiple-object picture naming condition of all). We put in another 30 filler items (15 items with names of masculine gender and 15 items with names

of feminine gender) to balance the frequency of appearance for the three verb endings. Each of these filler items was presented with a gender-congruent and a gender-incongruent distractor word. Moreover, they were presented twice in the single-object picture naming condition. Thus, all the three verb endings occurred an equal number of times for the entire set of trials, which is 80 times each.

Design

There were three crossed factors: the three-level factor Target Gender (feminine, masculine, and plural gender), the two-level factor Distractor Condition (gender-congruent vs. gender-incongruent), and the two-level factor Target Number (single-reference vs. multiple-reference). All factors were tested within participants (F1). Target Gender was tested between items (F2), and Distractor Condition and Target Number were tested within items (F2).

Procedure

The procedure was the same as in Experiment 1 with the exception of the utterance format. Here, participants were instructed to respond to a picture by producing a sentence. For example, participants would produce *irrootasi? iakkamti* 'The mountain was shown' when a picture of a mountain appeared on the screen in the single-object picture naming condition. However, they would produce *irrootadd'asini? iakkamin* 'The mountains were shown' when two identical pictures of a mountain were presented side by side in the multiple-object picture naming condition (see Table 17 for more examples).

Results

The same criteria as in Experiment 1 were employed to analyze the data. Thus, 388 observations (16.2%) in Experiment 2a and 349 (16.2%) in Experiment 2b were marked as erroneous, and 129 observations (5.4%) in Experiment 2a and 139 (6.4%) were marked as outliers. Tables 18 and 19 show mean naming latencies and error rates broken down by Target Number, Distractor Condition and Target Gender.

Experiment 2a

In Experiment 2a, for overt subject sentence naming that had single-reference noun distractors, there was no systematic effect of gender in the naming latencies analyses; however, the factor Target Gender was significant by participants but not by items, ($F_1(2, 38) = 7.247$, $p < .002$; $F_2(2, 27) = 2.268$, $p < .12$). Participants were slightly slower in the single-object picture naming condition (997 ms) than in the multiple-object picture naming condition (990 ms), and this 7 ms difference was not significant (both Fs < 1). Pictures were named faster in the gender-congruent (985 ms) than in the gender-incongruent condition (1002 ms). This 17 ms advantage just failed to reach significant level, ($F_1(1, 19) = 3.686$, $p < .07$; $F_2(1, 27) = 2.194$, $p < .15$), but the interaction between Distractor Condition and Target Number was fully significant, ($F_1(1, 19) = 10.453$, $p < .004$; $F_2(1, 27) = 19.437$, $p < .0001$). This interaction demonstrates that target-distractor congruency had a different effect on single-object picture naming condition, compared to multiple-object picture naming condition. Single-object pictures were named 55 ms faster in the gender-congruent condition (969 ms) than in the gender-incongruent condition (1024 ms), whereas multiple-object pictures

were produced 21 ms slower in the gender-congruent (1000 ms) than in the gender-incongruent condition (979 ms).

Analyses of simple effects show that the effect of Distractor Condition was significant in the single-object picture naming condition, ($F_1(1, 19) = 9.008$, $p < .007$; $F_2(1, 27) = 17.042$, $p < .0001$) but not in the multiple-object picture naming condition, ($F_1(1, 19) = 1.595$, $p < .22$; $F_2(1, 27) = 1.923$, $p < .18$). In the error rate analysis, there were significantly more errors in the multiple-object picture naming condition (3.4%) than there were in the single-object picture naming condition (2.1%), ($F_1(1, 19) = 8.266$, $p < .01$; $F_2(1,27) = 14.587$, $p < .001$). None of the remaining analyses were significant (all Fs < 1).

Table 18 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 2a (sentence naming, single-reference distractor)

Target Number	Distractor Condition	Target Gender							
		Feminine	%e	Masculine	%e	Plural	%e	Mean	%e
Single-reference	Congruent	954	2.4	961	1.3	993	1.5	969	1.8
	Incongruent	995	3.3	1036	1.4	1041	2.3	1024	2.3
Multiple-reference	Congruent	965	3.3	1001	3.0	1033	2.5	1000	2.9
	Incongruent	971	4.3	965	3.3	1002	3.8	979	3.8

Experiment 2b

In Experiment 2b, for overt subject sentence naming that had multiple-reference noun distractors, pictures were named slightly faster in the single-object picture naming condition (1,071 ms) than the multiple-object picture naming (1,077 ms); and participants were slightly faster in the gender-incongruent (1,072 ms) than in the gender-congruent condition (1,076 ms). Nevertheless, these differences were not statistically significant (all Fs < 1). The main effect of Target Gender was not significant, either (both Fs < 1.2). The interaction between Target Gender and Distractor Condition,

however, was significant by participants, $F_1(2, 32) = 5.554$, $p < .009$, and was marginally significant by items, $F_2(2, 27) = 3.131$, $p < .06$). None of the remaining analyses was significant (all Fs < 1).

Table 19 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 2b (sentence naming, multiple-reference distractor)

Target Number	Distractor Condition	Target Gender							
		Feminine	%e	Masculine	%e	Plural	%e	Mean	%e
Single-reference	Congruent	1068	6.5	1048	3.9	1096	5.6	1070	5.3
	Incongruent	1054	6.3	1095	4.6	1068	5.4	1072	5.4
Multiple-reference	Congruent	1074	5.4	1062	7.0	1111	6.5	1082	6.3
	Incongruent	1082	3.7	1066	5.0	1067	4.8	1072	4.5

Discussion

Over all, the results of the present experiment are similar to that of Experiment 1. The effect of gender congruency was found only in the single-object picture naming condition but not in the multiple-object picture naming condition in Experiment 2a, which is exactly what we have observed in the definite noun production experiment (Experiment 1a). Similarly, no effect of gender congruency observed when the multiple-reference form of a noun was used as a distractor in Experiment 2b similar to that of Experiment 1b. This supports the argument that the number value of the distractor does not affect gender congruency effects (Schiller & Caramazza, 2003).

Our data in both Experiments 2a and 2b further show that gender congruency effect is manipulated by the gender of the noun only when producing single-reference utterances. In Konso, there are three different verb inflections in the single picture naming condition that have to agree with the gender of the head noun in the subject position. These gender-marked verb inflections are *–t* for feminine, *–ay* for masculine and *–n* for plural gender. In the multiple-object picture naming condition, however, there is only one verb inflection

for all, which is *–n.* The absence of the congruency effect in the multiple-object picture naming condition could be due to the use of one and the same gender marking element in this condition, which have masked the expected competition. The presence of a gender congruency effect only in the single-object but not in the multiple-object picture naming condition is also in line with the *competitive phonological form selection hypothesis* that assume competition arises at the phonological encoding level instead of the grammatical encoding level (Miozzo & Caramazza, 1999; Schiller & Caramazza, 2003).

Furthermore, the finding of a gender congruency effect in the single-object picture naming condition supports the analysis of plural as a value of gender instead of number since we observed similar congruency effect in producing plural gender nouns like that of feminine and masculine gender nouns. This result replicates the finding of Tsegaye et al. (submitted) Experiment 2. Once again, the results in Experiments 2a and 2b are consistent with bound morpheme competition hypothesis (Schriefers, 1993; Schriefers et al., 2005; Bordag & Pechmann, 2008).

4.4. Experiment 3: Null subject sentence naming

In Experiment 3, native Konso participants were asked to name a picture by producing sentences with null subjects (only the verb root with subject clitic and gender-marked suffixes). Recall that it is possible to omit the overt subject that can be understood from the gender agreement markers on the verb in Konso. Thus, in the sentence *ɠoyrasiʔ iakkamay* 'The tree was shown,' omitting the overt subject *ɠoyrasiʔ* 'the tree' and producing *iakkamay* 'he was shown' is perfectly acceptable in Konso.

Similar to the previous experiments, pictures could either appear as a single object (single-object picture naming condition) or as two identical objects (multiple-object picture naming condition). Participants responded to the target picture while ignoring the simultaneously presented auditory distractor word. The distractor words were in their single-reference form in Experiment 3a whereas they were in their multiple-reference form in Experiment 3b (see Table 20 for examples of utterances).

Table 20 Examples of utterances in Experiments 3a and 3b

Target Number	Target picture name	Target Gender	Utterance	Distractor word		
				Distractor Condition	Experiment 3a (Single-reference)	Experiment 3b (Multiple-reference)
Single-reference	*irroota*	Feminine	*iakkamti*			
	'mountain'		'She was shown'	Congruent	*locʔta* 'leg'	*locʔtaɗɗaa* 'legs'
				Incongruent	*ɠussa* ''wall'	*ɠussaɗɗaa* 'walls'
	furaa	Plural	*iakkamin*			
	'key'		'It was shown'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	*unta* 'grain'	*untaɗɗaa* 'grains'
	kuta	Masculine	*iakkamay*			
	'dog'		'He was shown'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	*elalaa* 'cowrie'	*elalaɗɗaa* 'cowries'
Multiple-reference						
	irrootaɗɗaa 'mountains'	Feminine*	*iakkamin*			
			'They were shown'	Congruent	*locʔta* 'leg'	*locʔtaɗɗaa* 'legs'
				Incongruent	*ɠussa* 'wall'	*ɠussaɗɗaa* 'walls'
	furaɗɗaa	Plural	*iakkamin*			
	'keys'		'They were shown'	Congruent	*aataa* 'culture'	*aataɗɗaa* 'cultures'
				Incongruent	*unta* 'grain'	*untaɗɗaa* 'grains'
	kutaɗɗaa	Masculine*	*iakkamin*			
	'dogs'		'They were shown'	Congruent	*hoʃʃa* 'cliff'	*hoʃʃaɗɗaa* 'cliffs'
				Incongruent	*elalaa* 'cowrie'	*elalaɗɗaa* 'cowries'

* The gender value of the target in multiple-reference and all distractors in Experiment 3b would be plural according to the position that all multiple-reference suffixes impose plural gender.

Participants, materials, and design

Experiment 3a had 18 and Experiment 3b had 12 participants from Karat High School, all of them were native Konso speaking students. They all had normal vision and hearing, and none of them participated in the previous experiments. The materials and design were the same as those used in Experiments 2a and 2b.

Procedure

The same procedure was used as the previous experiments but here participants were asked to produce null subject sentences. For instance, as shown in Table 20, in response to the presentation of a picture of a dog in the single-object picture naming condition, participants would produce *iakkamay* 'He was shown'. When two identical pictures of a dog were presented abreast in the multiple-object picture naming condition on a different trial, however, they would say *iakkamin* 'They were shown'.

Results

The raw data were handled using the same criteria as in Experiment 1. According to these criteria, 345 observations (16%) in Experiment 3a and 659 (22.9%) in Experiment 3b were marked as erroneous, and 55 observations (2.2%) in Experiment 3a and 42 (1.5%) in Experiment 3b were marked as outliers. Tables 21 and 22 show mean naming latencies and error rates broken down by Target Number, Distractor Condition and Target Gender.

Experiment 3a

In Experiment 3a, for null subject naming that had single-reference noun distractors, the main effect of Number was significant, ($F1$(1,

17) = 22.630, $p < .0001$; $F_2(1, 27) = 16.204$, $p < .0001$). Pictures were named 42 ms faster in the multiple-object picture condition (889 ms) than in the single-object picture naming condition (931 ms). Pictures were also named faster in the gender-congruent (906 ms) than in the gender-incongruent condition (914 ms). This 8 ms advantage, however, failed to reach significance (both Fs < 1). The factor Target Gender was significant, ($F_1(2, 34) = 22.617$, $p < .0001$; $F_2(2, 27) = 8.590$, $p < .001$). The interaction between Distractor Condition and Target Number was almost significant by participants, ($F_1(1, 17) = 4.407$, $p < .05$) but not by items, $F_2(1, 27) = 1.701$, $p < .20$).

Table 21 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 3a (null subject sentence naming, single-reference distractor)

Target Number	Distractor Condition	Target Gender							
		Feminine	%e	Masculine	%e	Plural	%e	Mean	%e
Single-reference	Congruent	916	4.7	889	1.6	963	3.5	922	3.3
	Incongruent	905	5.8	916	3.1	999	5.3	940	4.7
Multiple-reference	Congruent	868	1.5	871	1.8	930	0.6	890	1.3
	Incongruent	857	1.7	871	1.4	934	1.1	888	1.4

The error rate analysis, however, offers interesting results. Overall, there were more errors in the single-object picture naming condition (4.0%) than there were in the multiple-object picture naming condition (1.4%). This effect was highly significant ($F_1(1, 17) = 111.163$, $p < .0001$; $F_2(1, 27) = 22.702$, $p < .0001$). The factor Target Gender was significant by participants but not by items ($F_1(2, 34) = 8.639$, $p < .001$; $F_2(2, 27) = 2.424$, $p < .11$). Participants made significantly more errors in the gender-incongruent than in the gender-congruent condition ($F_1(1, 17) = 8.175$, $p < .01$; $F_2(1, 27) = 6.353$, $p < .02$). Importantly, however, the interaction between Distractor Condition and Target Number was significant

($F_1(1, 17) = 5.224$, $p < .03$; $F_2(1, 27) = 8.074$, $p < .008$). This interaction demonstrates that target-distractor congruency had a different effect on single-object picture naming condition, compared to multiple-object picture naming condition. In single-object picture naming condition, there was 1.4% higher error rate in the gender-incongruent condition (4.7%) than in the gender-congruent condition (3.3%), whereas in the multiple-object picture naming condition there were almost identical error rate in the gender-congruent (1.3%) and in the gender-incongruent condition (1.4%). Analyses of simple effects display that the effect of Distractor Condition was significant in the single-object picture naming condition, ($F_1(1, 17) = 8.541$, $p < .009$; $F_2(1, 27) = 10.870$, $p < .003$), but not in the multiple-object picture naming condition (both Fs < 1).

Experiment 3b

In Experiment 3b, for null subject naming that had multiple-reference noun distractors, both gender-congruent (875 ms) and gender-incongruent (875 ms) naming conditions were named equally fast. Multiple-object pictures (863 ms) were produced faster than single-object pictures (887 ms). This 24 ms advantage was reliable, ($F_1(1, 11) = 5.271$, $p < .04$; $F_2(1, 27) = 8.213$, $p < .008$). This could be due to the fact that participants had to produce the same verb in the multiple-object picture naming condition irrespective of the gender and number values of the picture name and the distractor word. In the single-object picture naming condition, however, they had to decide the verb inflection depending on the gender value of the picture name, which would presumably require more processing time. All of the other analyses did not yield any significant effects.

Table 22 Mean naming latencies (RTs) in ms and percentage errors (%e) in Experiment 3b (null subject sentence naming, multiple-reference distractor)

Target Number	Distractor Condition	Target Gender Feminine	%e	Masculine	%e	Plural	%e	Mean	%e
Single-reference	Congruent	880	9.2	858	5.3	933	11.4	890	8.6
	Incongruent	862	7.5	859	6.1	930	8.9	884	7.5
Multiple-reference	Congruent	847	5	840	4.4	893	2.2	860	3.9
	Incongruent	862	7.8	853	5.3	879	4.2	865	5.8

Discussion

Similar to the results of Experiments 1b and 2b, Experiment 3b did not show a significant gender congruency effect. This strengthens the argument that the number value of the distractor has no role in the picture-word task (Schiller & Caramazza, 2003). In the reaction times analysis of Experiment 3a, unlike the results of Experiments 1a and 2a, the Target Gender by Distractor Condition did not reach significance. This might be due to its utterance format. Note that in Experiment 3a picture names were not part of the utterance, and participants used them to select the appropriate gender-marking suffix of the to be named verb (i.e. a null subject sentence). In Konso, the gender-marking verb inflections for one gender class are identical in the single-object and in the multiple-object naming conditions, but differ for the other gender classes. More specifically, the suffix *–n* is used on the verb for plural gender in the single-object and for all in the multiple-object picture naming condition. However, *–t–* and *–ay*, respectively, are used as feminine and masculine suffixes on the verb in the single-object picture naming condition. Thus, participants produced *iakkamti*, *iakkamay*, and *iakkamin* if the presented picture had feminine, masculine and plural gender, respectively, in the single-object picture naming condition but only *iakkamin* for all in the multiple-object picture naming condition.

Only the final syllable of the verb alters depending on the gender of the picture name in the single-object picture naming condition but it remains the same for all in the multiple-object picture naming condition.

The fact that participants had to start with identical parts of the verb has masked the interference effect of the gender-incongruent distractors from being visible in the reaction times data, which was measured from the onset of the picture till the onset of utterance. The interference effect of gender-incongruent distractor words, however, was reliably visible in the error rate data. This could be due to the fact that the correctness of the response was mainly determined by the final syllable of the utterance (the gender-marking suffix). Thus, a response was counted as correct if the correct form of the verb inflection was used. This means that the gender-marking suffixes seem to have played a relatively greater role in the error rates than in the reaction times when the name of the picture is not part of the utterance. Similarly, Schriefers et al. (2005) argued that the position of gender-marking elements in an utterance could affect the visibility of gender congruency effects. Schriefers et al. maintain that competition processes might be hard to detect by measuring onset-naming latencies for elements that occur in non-initial positions of the utterance. Here, our data seem to suggest that detecting the reaction times might be hard when the name of the picture is not part of the utterance instead.

4.5. General discussion

This study investigated the processes of grammatical gender and number in Konso during speech production. Some Cushitic languages have the interesting property that the third value of gender, beside

masculine and feminine, is plural— a class of nouns that take plural agreement form even when they represent single entities. Two different linguistic hypotheses have been proposed to analyze the status of the so-called plural gender: *plural-as-a-number feature* only (Corbett & Hayward, 1987; Corbett, 1991, 2005, 2006, 2012) versus *plural-as-a-gender feature* as well (e.g. Hayward, 1979; Pillinger, 1999; Savà, 2005; Mous, 2008; Orkaydo, 2013; Tsegaye et al., 2013; Tsegaye et al., submitted). We put these two competing hypotheses to an experimental test in Konso, an East Cushitic language that has this feature. In three picture-word experiments, pictures of one or two objects were presented along with a single-reference or a multiple-reference (plural number) distractor that had the same or different gender as the targets. In Experiment 1, participants responded to the pictures using gender-marked definite nouns. In Experiments 2 and 3, they responded by producing a sentence with an overt subject and a null subject, respectively.

In the context of the picture-word interference (PWI) tasks that we have conducted in Konso, the *plural-as-number feature hypothesis* would predict that the so-called plural gender produces a similar pattern of effect as that of regular multiple-reference nouns but a different effect from those of feminine and masculine genders. On the other hand, the *plural-as-a-gender feature hypothesis* would predict that a plural gender produces a similar pattern of effects as those of feminine and masculine gender but a different effect from regular multiple-reference nouns. The current study also provides additional evidence for two theoretically interesting issues: the locus and the scope of the so-called gender congruency effect.

The first issue is whether the gender congruency effect occurs at the phonological encoding level *(competitive phonological form*

selection hypothesis, Miozzo & Caramazza, 1999; Caramazza et. al., 2001; Schiller & Caramazza, 2002, 2003*),* or at the grammatical encoding level (*competitive grammatical feature selection hypothesis*, Schriefers, 1993; Levelt et al., 1999). In this regard, the *competitive grammatical feature selection hypothesis* predicts a gender congruency effect in both single-object and multiple-object picture naming conditions. The *competitive phonological form selection hypothesis,* on the other hand, predicts a congruency effect only in the single-object picture naming condition, where there are different forms for different genders, but not in the multiple-object picture naming condition, where there is only one form for all.

The second issue is whether the production of gender-marking bound morphemes is subject to competition: while some researchers have argued that the selection of gender-marking bound morphemes involves no competition (Costa et al., 2003; Schiller & Caramazza, 2003; Schiller & Costa, 2006), others have argued that the selection of gender marking bound morphemes does involve competition (Schriefers 1993; Schriefers et al., 2005; Bordag & Pechmann, 2008). Konso, similar to Dutch and German (languages in which most of the research on these issues have been conducted), has a characteristic that gender is marked in the single-reference (singular) but the gender marking is neutralized in the multiple-reference (plural number). Note that unlike Dutch and German, all the gender-marking elements in Konso are suffixes (bound morphemes) that occupy a non-initial position of an utterance. This gave us an interesting test case to investigate whether or not the production of gender-marked bound morphemes takes place in a competitive manner. Thus, if the selection of gender-marked bound morphemes does not involve competition processes, we should not observe the congruency effect

in any of the experiments reported in the present study since all of gender-marked elements in the present study were bound morphemes.

In Experiment 1, definite noun (noun + gender-marked definite suffix) naming with single-reference (Experiment 1a) and multiple-reference (Experiment 1b) nouns used as distractors, reliable effects of gender congruency were observed only in the single-object picture naming condition of Experiment 1a. In Experiment 2, sentences with overt subject (subject [name of the picture] + a verb with a gender-marked suffix [*iakkam*-M/F/P suffix 'was/were shown']) naming, single-reference and multiple-reference nouns were used as distractors in Experiments 2a and 2b, respectively. Here, we replicated the results of Experiment 1 with a different utterance format where participants produced a sentence instead of a definite noun, which examined the three gender classes simultaneously. Experiment 3 was the same as Experiment 2 but here participants produced a null subject sentence, only a gender-inflected verb, (*iakkam*-F/M/P suffix 'she/he/they was/were shown'). The error rate data of Experiment 3 support the findings of both of the previous experiments.

The finding of congruency effect only in the single-object picture naming condition, where there were different forms for different genders, has shown that the so-called plural gender produces a similar pattern of interference from gender-incongruent and/or facilitation from gender-congruent distractor words as feminine and masculine genders in Konso. The absence of a reliable effect of congruency in the multiple-object picture naming condition, where there are identical forms for all, indicates that plural gender produces a different effect from the regular multiple-reference (plural

number) nouns. This is clear evidence that plural is processed as a gender feature rather than a number feature in Konso.

One of the linguistic arguments against the analysis of plural as a value of gender is that treating plural as part of gender feature is said to be challenging for the general linguistic principle of Exclusiveness— values belong to one feature only (Corbett, 2012). According to this principle, values such as 'singular' and 'plural' belong only to the number feature and thus gender cannot take plural as its value. Corbett (2012), see also Corbett & Hayward (1987), identified only 11 nouns that take plural agreement for single-reference (unit reference) in Bayso, a Cushitic language. He analysed them as typically occurring in pairs or representing non-count nouns. His conclusion was that these nouns should be lexically marked as taking plural agreement when they are in the single-reference similar to *pluralia tantum* nouns and thus plural should be detached from the values of gender. This analysis might help for tackling seemingly non-standard structures in the system at the price of marking only a few numbers of nouns with lexical features for exceptional behavior (Tsegaye et al., 2013). In Bayso, Haywards's (1979) list of nouns that take plural agreement is small. However, one can notice that the word list of Hayward (1979) contains not more than a hundred nouns altogether and we may need a much larger list of words to see the actual distributions of nouns into different gender classes in Bayso. Orkaydo (2013) provides relatively larger list of words for Konso. In contrast to Bayso, Konso's plural gender nouns are too many to be treated as exceptional; there are 96 nouns with plural gender against 135 of feminine and 245 of masculine nouns.

Furthermore, Orkaydo (2013) points out that there is a strong link between plural in gender and the multiplicity of number in

Konso. First, number is a derivational category in the language and most multiple-reference nouns are derived from non-derived single-reference nouns. For instance, the multiple-reference word *kosaɗɗaa* 'granaries' derived from non-derived single-reference noun *kosa* 'granary'. Nouns that are derived for number have predictable gender values. The suffixes that are used to form multiple-reference nouns always trigger plural gender agreement. To some extent, single-reference nouns can be derived from multiple-reference non-derived nouns and these derived single-reference nouns never take plural gender agreement. Based on the formative, and not on the gender of the base like that of Bayso, these derived single-reference nouns take masculine or feminine gender in Konso. For example, the single-reference noun *fillayyaata*$_{F}$ 'flea' is derived from non-derived multiple-reference noun *fillayyaa*$_{P}$ 'fleas'. Second, coordinated nouns show plural agreement on the verb irrespective of the gender values of the coordinated nouns in Konso (for examples, see Tsegaye et al., submitted).

There is also linguistic evidence that supports the treatment of plural as a value of gender in Konso. Namely, gender and number represent two independent agreement systems and adjectives show agreement for both categories independently in Konso (Mous, 2008; Orkaydo, 2013; Tsegaye et al., 2013). Thus, an adjective agrees in number with the head noun by reduplication of initial CV(C) of its root for multiple-reference nouns (Orkaydo, 2013).

(26) waakkaa-ɗaa-siniʔ i=ɗeɗ~ɗer-i
wooden statue-MULT-DEF.P 3=RDP-be.tall-PF
'The wooden statues are tall.'

In the above example (26), the initial CVC of the adjective root *ɗer-* 'to be long' is reduplicated because the subject *waakkaa-ɗaa-siniʔ* 'the wooden statues' is a multiple-reference noun. However, in

the example below (27), the initial CVC of the adjective root *dɛ̀r-* is not reduplicated because the subject *waakkaa-sini?* 'the wooden statue' is a single-reference noun.

(27) waakkaa-sini? i=dɛ̀r-i
wooden statue-DEF.P 3=be.tall-PF
'The wooden statue is tall'

Gender is also marked on adjectives when they are used as attributes (Orkaydo, 2013). The suffix *–a* is used to mark masculine and feminine genders, and *–aa* is used for plural gender (Orkaydo, 2013). For instance, *waakkaa-sini? dɛ̀r-aa* /wooden statue-DEF.P SG.tall-P/ 'The tall wooden statue'. According to the treatment of plural as a number feature (multiple-reference), we would have two conflicting values of number on the two agreement places of the adjective (single-reference at the beginning of the adjective vs. multiple-reference marked by the suffix *–aa*) in agreement with one and the same head noun. Such a treatment could also lead into inconsistent classification of nouns; one group of nouns would be classified according to gender based on the agreement on the definite marker on nouns, and the other group would be classified according to number on the basis of the final suffix on the adjective. This kind of challenge would not be present in Bayso, the language examined in the analysis of Corbett (2012), since it does not show independent number agreement.

There are other important differences between the number and the gender features in Konso. Unlike the gender feature, the number feature is not obligatorily marked. Depending on the importance of the use of number markers in a given context, speakers choose between the use of a non-derived base noun or a derived noun marked for multiple-reference when denoting multiple objects. The hub of number agreement is mainly on the adjectives and it is

semantically motivated. For instance, a single-reference adjective could modify a multiple-reference head noun, which denotes a collective reference of that noun. Thus, the treatment of plural as a value of gender and not number is an appropriate one in Konso. Importantly, the present study showed that the so-called plural gender behaved as a gender type rather than a number type. In our experiments, significant effects of gender congruency were observed in naming single-object pictures where the selection of suffixes is determined by the target's gender, but not in naming multiple-object pictures where suffixes are identical for all.

These results are also in line with the *competitive phonological form selection hypothesis* that assume the so-called gender congruency effect originates from competition among gender-marked phonological forms rather than among abstract gender features (Miozzo & Caramazza, 1999; Caramazza et al., 2001; Schiller & Caramazza, 2002, 2003; Bordag & Pechmann, 2008). Schiller and Caramazza (2003) made use of the fact that single-reference definite determiners are gender-marked in Dutch (het_{N} & de_{COM}) and in German ($der_{M,}$ die_{F}, & das_{N}), whereas no gender distinction is made in the multiple-reference definite determiners (it is *de* in Dutch & *die* in German for all genders). They consistently found significant effects of gender congruency only in the single-object picture naming condition but not in the multiple-object picture naming condition. As a result, they argue that the so-called gender congruency effect is actually a determiner congruency effect since they found the effect when different determiner forms were used for different genders, and grammatical feature selection is non-competitive process as no effect was observed when the same determiner was used for all genders. This means that the locus of the gender congruency effect is at the

level of phonological form selection as stipulated by the *competitive phonological form selection hypothesis*. Similarly, the results of Experiments 1a and 2a in our study support the *competitive phonological form selection account,* in which we found a gender congruency effect in naming single-object pictures where different forms were used for different genders, but not in naming multiple-object pictures where the same form was used for all.

At variance with Schiller and Caramazza (2003), we did not observe a gender congruency effect in naming single-object pictures in all of our experiments that employed multiple-reference distractor words (Experiments 1b, 2b & 3b). This could be due to the fact that multiple-reference forming suffixes impose a plural gender value in Konso and hence only the gender feature matters in the picture-word naming task, and the number feature plays no part. Note that, unlike many Indo-European languages, Konso shows gender, not number, agreement in the subject inflection on the verb (Orkaydo, 2013). In other words, gender, not number, is used to control subject/verb agreement in verb phrases in Konso.

According to theories of language production that discuss the lexical-syntactic properties (Levelt et al., 1999), gender and number belong to two different feature categories. The former, gender, belongs to fixed syntactic features that are said to be idiosyncratic where there is no clear semantic and phonological cue with regard to its value. For instance, the definite marker suffix has to agree in gender with the head noun in Konso definite nouns (*innaa-sini?* /boy.P-DEF.P/ 'the boy' vs. *oχinta-si?* /fence.F-DEF.M/F/ 'the fence'). Yet, there is no conceptual motivation for *innaa* 'boy' to have plural gender whereas *oχinta* 'fence' has feminine gender in Konso. Number, on the other hand, belongs to variable syntactic

features, which are not word-specific and its value is based on a conceptual situation.

The results of the present study are in conflict with Experiments 1b and 4a of Schiller and Caramazza (2003) as well. Recall that they failed to observe a gender congruency effect when distinct suffixes were to be chosen in the gender-incongruent condition in the gender-inflected adjective (bound morpheme) and noun production with German (Experiment 1b) and Dutch (Experiment 4a) speakers. Schriefers (1993), however, obtained a gender congruency effect in the gender-marked adjective plus noun naming with Dutch speakers. The fact that there are two conflicting findings within one language (Dutch), however, suggests that further empirical evidence is necessary to determine the retrieval mechanisms of bound-morphemes in language production. Investigating the issue in languages where gender-marked elements are bound morphemes such as Konso is vital for understanding how bound morphemes are retrieved. As we have mentioned, most grammatical elements are bound morphemes in Konso, which provided us the opportunity to examine the processing mechanism of gender-marked bound morphemes during picture-word task in the language. As shown above, we consistently obtained gender congruency effects when participants produced gender-marked bound morphemes in different utterance formats at various experimental scenarios. Recall that Bordag and Pechmann (2008) reported a numerically larger gender congruency effect in bound morpheme compared to free-morpheme production in Czech. Thus, our data lend support to the view that bound gender-marking morphemes follow selection by competition. According to Jescheniak et al. (2014), since selection by competition can be used as a general umbrella to unite the selection mechanism

of closed and open class lexical elements, there is no need to hypothesize that closed class elements follow a different selection mechanism just because they surface as freestanding or bound morphemes.

Taken together, the experiments of the current study have shown that the so-called plural gender behaves as a gender type rather than as a number type, which provides evidence for the analysis that plural is indeed a value of gender in Konso. Secondly, the results provide further evidence for the view that the gender-congruency effect originates at the level of phonological form and not at a level of abstract gender features. Lastly, gender-marking bound morphemes are subject to competitive processes.

Needless to state, psycholinguistic studies of gender and other grammatical elements have been limited to a handful of Indo-European languages. Our study contributed to increasing the number of languages being researched in psycholinguistics. Importantly, it showed the feasibility of psycholinguistic experimentation in understudied languages within the field of psycholinguistics. This is a step forward to broaden our knowledge about language-specific properties of language production such as the one we have investigated, the so-called gender congruency effect, and about the retrieval mechanism of bound morphemes.

Table 23 Appendix A: Experiment 1: definite noun naming

Target name	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
farta	horse	feminine	pooyta	mourning, cry	paankaa	machete	plural
ilta	eye	feminine	kooɓta	tree sp.	pahnaa	example	plural
ritta	she-goat	feminine	ɗalta	seed	saaraa	poem	plural
taamta	branch	feminine	ɗamta	grass snake	χallaa	kidney	plural
tika	house	feminine	moonta	sky	urmalaa	market	plural
oχinta	fence	feminine	kusumta	navel	pohaa	contribution, tribune	plural
karma	lion	masculine	irnya	gum	torraa	speech, talk	plural
kuta	dog	masculine	hoʃʃa	cliff	elalaa	cowrie	plural
mottooɠɠaa	car	masculine	kanta	sub-village	kolkaa	ood without cabbage	plural
parɟuma	stool/chair	masculine	ɗuttana	belly	tiyyaa	dispute	plural
ɠupitta	finger	masculine	hoofa	hole	solaa	tail (of a bird)	plural
toma	bowl	masculine	kaɓa	canal for irrigation	tiraa	liver	plural
akataa	sugar cane	plural	kosaa	granary	koɗaa	work	masculine
filaa	comb	plural	oytaa	upper part of the compound	pirta	country	feminine
fulaa	gate, door	plural	unɠulaa	grain store from bamboo	χorma	ox, bull	masculine
furaa	key	plural	aataa	culture	unta	grain	feminine
innaa	boy	plural	hiippaa	a riddle	miinta	face	feminine
kiʔsaa	cricket	plural	marɟaa	hip	letta	day	feminine
ɲaaɲɲaa	tomato	plural	erkannaa	message	korkorta	sheath for knife or sword	feminine
rika	a tooth brush	plural	waakkaa	wooden statue	laha	ram	masculine
siinnaa	nose	plural	olsaa	dream	hirta	special men's knife	masculine
timɓaa	drum	plural	ʃahaa	honey comb	kurra	ear	masculine
ukukkaa	egg	plural	χaylaa	plant sp.	kuleenta	a threshold of gate	feminine
uwwaa	dress	plural	ɠolfaa	bark of trees	yooyta	jackal	masculine

Table 24 Appendix B: Experiments 2 & 3: Sentence naming

Target name	Meaning	Gender	Congruent	Meaning	Incongruent	Meaning	Gender
akataa	sugar cane	plural	kosaa	granary	koɗaa	work	masculine
filaa	comb	plural	oytaa	upper part of the compound	pirta	country	feminine
furaa	key	plural	aataa	culture	unta	grain	feminine
innaa	boy	plural	hiippaa	a riddle	miinta	face	feminine
kiʔsaa	cricket	plural	marɟaa	hip	letta	day	feminine
ɲaaɲɲaa	tomato	plural	erkannaa	message	korkorta	sheath for knife or sword	feminine
rika	a tooth brush	plural	waakkaa	wooden statue	laha	ram	masculine
siinnaa	nose	plural	olsaa	dream	hirta	special men's knife	masculine
ukukkaa	egg	plural	χaylaa	plant sp.	kuleenta	a threshold of gate	feminine
uwwaa	dress	plural	ɠolfaa	bark of trees	yooyta	jackal	masculine
karma	lion	masculine	irnya	gum	torraa	speech, talk	plural
kuta	dog	masculine	hoʃʃa	cliff	elalaa	cowrie	plural
mottooɠɠaa	car	masculine	kanta	sub-village	kolkaa	food without cabbage'	plural
parɟuma	stool/chair	masculine	ɗuttana	belly	tiyyaa	dispute	plural
ɠupitta	finger	masculine	hoofa	hole	solaa	tail (of a bird)	plural
toma	bowl	masculine	kaɓa	canal for irrigation	furoota	type of bead	feminine
arpa	elephant	masculine	ɗakaa	stone	moossuta	piece of bread	feminine
tuuma	onion	masculine	ɟapara	rig	yaakata	bead	feminine
tuyyuuraa	air plane	masculine	ammayitta	breakfast	keltoota	cattle louse	feminine
muuɠa	ladle	masculine	χorma	ox, bull	tampoota	tobacco	feminine
farta	horse	feminine	pooyta	mourning, cry	paankaa	machete	plural
ilta	eye	feminine	kooɓta	tree sp.	pahnaa	example	plural
ritta	she-goat	feminine	ɗalta	seed	saaraa	poem	plural
taamta	branch	feminine	ɗamta	grass snake	χallaa	kidney	plural
tika	house	feminine	moonta	sky	urmalaa	market	plural
oχinta	fence	feminine	kusumta	navel	matta	head	masculine
lafta	bone	feminine	ritta	young she-goat	tuuɗa	pillar	masculine
kaawwata	glass	feminine	harta	pond	konfa	short	masculine
kaharta	ewe	feminine	ikkirteeta	louse	parka	work team	masculine
irroota	mountain	feminine	loɠta	leg, foot	ɠussa	wall	masculine

CHAPTER 5

5. Bound gender-marked morphemes are selected competitively: evidence from simple picture naming tasks in Konso

A version of this chapter is in preparation for publication as:

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Abstract

In two experiments in Konso, we examined whether selecting bound gender-marked morphemes involve competitive processing mechanisms. Participants named pictures of one or two objects by producing a single-reference or a multiple-reference gender-marked utterance and a bare noun (control experiment). In Konso single-reference and multiple-reference utterances, bound gender-marked morphemes converge for nouns of plural gender and diverge for nouns of masculine and feminine gender. We found gender by number interactions in gender-marked utterances but not in bare noun productions. The results also showed a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ. This was the case when the occurrence of bound gender-marked morphemes was equally often (Experiment 1a). When the proportion of responses with the converging forms increased to two thirds of the trials, this cost effect disappeared and turned into a benefit effect for multiple-reference trials that have identical suffixes in single-reference and multiple-reference utterances (Experiments 2a & 2b). These patterns of results suggest that bound gender-marked morphemes in Konso are selected in a competitive fashion.

5.1. Introduction

How do people select bound morphemes (such as gender-marked suffixes) during speech production? The selection mechanism of bound gender-marked morphemes has been a main issue of debate in recent works of speech production (Jescheniak, Schriefers, & Lemhöfer, 2014; Janssen, Schiller, & Alario, 2014). There are two competing models that account for the selection mechanism of bound gender-marked morphemes in speech production. First, the *competitive selection model*, in which case a competitive processing mechanism may play a role in selecting bound gender-marked morphemes similarly to freestanding gender-marked morphemes (Schrefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014). The basic assumption of the competitive model is that activating a target utterance also activates competitors, and the activation of these competitors prolongs the selection time of the target utterance (Jescheniak et al., 2014). Second, the *noncompetitive selection model*, in which a competitive processing mechanism may not play a role during the selection of bound gender-marked morphemes unlike freestanding morphemes, which are subjected to competitive processes (Schiller & Caramazza, 2003; Costa, Kovacis, Fedorenko, & Caramazza, 2003; Schiller & Costa, 2006). Janssen et al. (2014) further propose a noncompetitive selection mechanism for all closed class items including freestanding morphemes and bound morphemes. The noncompetitive model assumes that the selection times of a target utterance rely only on the activation level of the target itself, and not the activation level of other competitors (Janssen et al., 2014). The present study

investigated which of these contending models accounts for the production of gender-marked suffixes in Konso, a Cushitic language of Ethiopia.

The above-mentioned two models are based mainly on studies that employed the picture-word interference (PWI) paradigm (Schriefers, 1993; Schiller & Caramazza, 2003; Costa et al., 2003; Schiller & Costa, 2006; Bordag & Pechmann, 2008) and the simple picture naming task (Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer et al., 2006; Jescheniak et al., 2014; Janssen et al., 2014). In the picture-word interference (PWI) task, participants name a picture while disregarding a distractor word, which accompanied the target picture. PWI studies stresses on the gender congruency effect: naming latencies should be faster when a distractor word and a target picture name match in gender compared to when they do not match. Schriefers (1993) revealed the gender congruency effect for the first time in his study on Dutch noun phrase (NP) naming. Schriefers also examined whether the processing of bound gender-marked morphemes follows a competitive manner. He obtained a gender congruency effect in naming noun phrases that consisted of an adjective with a gender-marked suffix and a noun (e.g. *rode*$_{\text{COM}}$ *tafel*$_{\text{COM}}$ 'red table'; *rood*$_{\text{N}}$ *huis*$_{\text{N}}$ 'red house', Experiment 2). Schriefers interpreted this result as an indication of lexical competition that contained the naming of bound gender-marked morphemes (in this case adjective suffixes). In other words, the effect resulted from competition in selecting bound gender-marked morphemes. Target noun and distractor noun activate one and the same adjective-suffix form when they match in gender whereas they activate different forms when they do not match in gender. As a result, naming latencies in the later condition are prolonged since the

selection between two different gender-marked adjective-suffix forms demands additional time. Bordag and Pechmann's (2008) study on Czech speakers reported a gender congruency effect in a gender-marked ordinal number (a bound morpheme) and noun production as well. This result provides further evidence for involving competition in selecting bound gender-marked morphemes.

Schiller and Caramazza (2003), however, did not observe a congruency effect in the naming of bound morphemes either in Dutch or in German. Note that Schiller and Caramazza obtained a congruency effect in the naming of freestanding morphemes (a gender-marked determiner in DET + N or DET + ADJ + N format) both in Dutch and in German (for similar findings see Costa et al., 2003, in Croatian; Schiller & Costa, 2006, in German). The absence of a gender congruency effect involving bound morphemes in these studies indicates that selecting bound morphemes may follow a non-competitive manner (Schiller & Caramazza, 2003; Costa et al., 2003; Schiller & Costa, 2006). The contrasting evidence regarding the selection of gender-marked bound morphemes entails the need for a more direct and focused study.

In this regard, Schriefers et al. (2005) applied the so-called simple picture naming (SPN) task in German to examine if selecting bound morphemes follows competitive processing. The SPN task is a naming task of one or two identical pictures without involving distractor words (Schriefers et al., 2002). According to Schriefers et al. (2002), there are two main advantages for employing this task over the picture-word interference (PWI) task that involve the to be ignored distractor word. First, no distractor related comprehension processes is involved since it is a pure speech production task. Second, no assumption is needed with respect to the activation of the

distractor noun's gender nodes as well as the activation of the respective gender-marked elements and the relation of these elements with the retrieval processes of the target. Critically, in the SPN task, the relevant contrasts involve between-item comparisons since different nouns with different gender classes or pictures representing one versus two objects have to be used. To control this constraint, Schriefers et al. included a bare noun naming experiment in which participants named the same set of stimuli by producing single-reference or multiple-reference (plural number) bare nouns instead of gender-marked utterances4. The logic was if gender-marked elements are subject to competition, there should be gender by number interaction in gender-marked utterances but not in the bare noun naming. Thus the presence or absence of gender by number interaction is critical in SPN studies.

Using the SPN task, Schriefers et al. (2005) tested the naming of noun phrases with gender-marked size adjectives in German (Experiment 3). In German, there is a convergence for nouns of feminine gender and divergence for nouns of masculine and neuter gender. The inflectional morpheme *–e* is used for adjectives in single-reference with feminine gender and for all gender classes in multiple-reference. The inflectional morpheme *–er* is used for single-reference adjectives with masculine gender and *–es* for single-reference adjectives with neuter gender. Schriefers et al. obtained a gender by number interaction in the naming of noun phrases containing a gender-marked adjective and a noun but not in the bare

4 Janssen et al. (2014) provide a new approach to partial out idiosyncratic item effect, which is analyzing the number (single-reference vs. multiple-reference) by format (NP vs. bare noun) interactions for each gender class separately.

noun naming. This may suggest that bound morphemes are selected competitively. The authors observed a significant multiple-reference gain of 19 ms for feminine nouns, while the effect was -2 for masculine and it was 8 ms for neuter nouns (both of these effects were not significant). A multiple-reference gain for feminine nouns may be due to the fact that the single-reference noun and its multiple-reference form result in converging activation to the same multiple-reference form, leading to an easier selection of the appropriate determiner (Schriefers et al., 2005). Lemhöfer et al. (2006) replicated Schriefers' et al. finding in Dutch, in which they tested the naming of a gender-marked adjective and a noun. The effects were a significant multiple-reference gain of 26 ms for common gender and an insignificant 1 ms difference in the other direction for neuter gender. Note that, in Dutch, the single-reference and multiple-reference inflectional suffixes of common gender have identical form, which is *–e*. However, the single-reference inflectional suffix of neuter gender differs from the multiple-reference inflectional suffix, i.e. the null morpheme for single-reference and suffix *–e* for multiple-reference. We examined whether this gender by number interaction in gender-marked bound morpheme production could be replicated in Konso, a language where gender information is solely provided by a suffix (a bound morpheme).

However, deciding between the competitive and noncompetitive model requires further analyses on the shape of gender by number interactions (Janssen et al., 2014). This is because both models can account for the effect depending on the shapes of interactions. In other words, competitive and noncompetitive models predict different types of gender by number interactions in the production of utterances with bound gender-marked morphemes. A competitive

model predicts a gender by number interaction with an extra cost in the production of multiple-reference trials for divergent forms in the single-reference and multiple-reference, i.e. a cost-type interaction (Janssen et al. 2014). A noncompetitive model, by contrast, predicts a gender by number interaction with a benefit in the production of multiple-reference trials for converging forms in the single-reference and multiple-reference, i.e. a benefit-type interaction (Janssen et al. 2014).

Therefore, the most important point regarding a competitive selection mechanism has to do with the presence or the absence of a cost effect in multiple-reference trials when the single-reference and multiple-reference gender-marked items have divergent forms (Jescheniak et al., 2014). The existing results, however, do not always show a multiple-reference cost effect when single-reference and multiple-reference gender-marked forms differ. For instance, in the Schriefers et al. (2005) study, there was a multiple-reference benefit for adjective plus noun naming (Experiment 3) with feminine nouns but no multiple-reference costs for the corresponding noun phrases with neuter and masculine nouns. Similarly, in Lemhöfer et al. (2006), there was a multiple-reference benefit for adjective plus noun naming with common gender nouns but no multiple-reference costs for the corresponding noun phrases with neuter nouns.

Jescheniak et al. (2014) argue that the presence or absence of a clear cost term might depend on the proportion with which the different gender-marked morphemes have to be used in the experiment. Besides, the visual distinction between single-reference and multiple-reference stimuli should be less noticeable. Thus, there would be multiple-reference costs for diverging single-reference and multiple-reference gender-marked forms when the proportion of

gender-marked morphemes is at least balanced in the experiment. For instance, keeping the proportion of determiners equal, Schriefers et al. (2002) observed a multiple-reference cost in the naming of neuter gender nouns and a marginally significant multiple-reference cost in the naming of masculine nouns in German freestanding morpheme production (Experiment 1). Moreover, the naming latency difference between multiple-reference and single-reference trials was not significant for feminine nouns, for which single-reference and multiple-reference gender-marking morphemes are identical. In contrast, when the proportion of a gender-marked form (i.e. the form that is also used in multiple-reference utterances) is very high, there would be a multiple-reference gain for converging single-reference and multiple-reference gender-marked forms, and a reduced or no multiple-reference costs in the diverging forms. This was the case in Dutch NP production, when 75% of trials required the convergence form "de", that is the determiner for common gender in the single-reference and for both common and neuter genders in multiple-reference trials (Lemhöfer et al., 2006). In the present study, we also examined whether varying the occurrence of the percentage of bound gender-marked morphemes could affect the shape of gender by number interaction.

Konso is a Lowland East Cushitic language and is spoken in the Southwest of Ethiopia by 250,000 people. Based on the subject agreement on the verb, Konso distinguishes three gender classes; namely masculine, feminine and "plural" gender (Orkaydo, 2013). Note that Konso and some other related Cushitic languages of East Africa have an interesting property that the value of the third gender category, in addition to masculine and feminine, is "plural". The motivation to use the term plural as a value of gender in these

languages comes from the fact that nouns in this class require plural agreement form even when they refer to single entities. In other words, nouns in the plural gender class behave as though they were plural by requiring a plural agreement form and hence this category is often named *plural gender* in many studies on Cushitic languages (e.g. Hayward, 1979, for Bayso, but see also Corbett & Hayward, 1987; Pillinger & Galboran, 1999, for Rendille; Savà, 2005, for Ts'amakko; Mous, 1993, 2008, for Iraqw; Orkaydo, 2013, for Konso). 5

Bound gender-marked morphemes in Konso are *–si?* and *–sini?* on definite nouns, and *–t*, *–ay* and *–n* on verbs. In Konso, the gender-marked suffix associated with plural gender nouns plays a similar role as the feminine gender in German and as the common gender in Dutch. German and Dutch are languages in which the relevant studies have been conducted (e.g. Schriefers et al., 2005; Lemhöfer et al., 2006). Konso's gender-inflected definite markers on nouns and gender markers on verbs are identical for one gender class in the single-reference and multiple-reference, but differ for the other gender classes. Thus, Konso has two different definite markers in the single-reference definite nouns (*–sini?* for plural gender, and *–si?* for non-plural gender). By contrast, there is only one form for all multiple-reference definite nouns (i.e., *–sini?*), which corresponds to the form of plural gender in the single-reference definite nouns. In the subject agreement on the verb, Konso has three different gender-

5 To avoid confusion with the use of plural as a value of gender, we will consistently use the terms 'single-reference' to refer to the number values representing single reference nouns (singular number) and 'multiple-reference' to refer to the number values representing multiple reference nouns (plural number), following Hayward (1981, 2004) and Mous (2008).

marking suffixes in the single-reference: *–t* for feminine, *–ay* for masculine, and *–n* for plural gender. However, there is only one verb ending (*–n*) for all in the multiple-reference trials, which corresponds with that of plural gender of the single-reference. The present research investigates whether bound gender-marked morphemes are processed competitively in Konso.

We expect to replicate the results reported in Schriefers et al. (2005) and Lemhöfer et al. (2006) with a different experimental setting in a different language. The aim of the present study, therefore, was to investigate whether the proposal made by Schriefers et al. (2005) and Lemhöfer et al. (2006) on bound gender-marked production is replicable beyond West Germanic languages. To this end, we conducted two experiments involving native Konso participants in their home area. In Experiment 1a, definite noun naming, participants responded to pictures by producing single-reference and multiple-reference definite nouns. We also had a control experiment, a bare noun naming (Experiment 1b), using the same material as Experiment 1a. In Experiment 2a, overt subject sentence naming, participants responded to pictures by producing single-reference and multiple-reference sentences with overt subjects. In Experiment 2b, null subject sentence naming, participants responded to pictures by producing single-reference and multiple-reference sentences with null subjects (only gender-marked verbs). Experiment 2c, bare noun naming, served as a control experiment for Experiments 2a and 2b.

In the present study, the frequency of occurrences of gender-marked suffixes is varied between Experiments 1 and 2. In Experiment 1a, the percentage of bound gender-marking morphemes were kept equal (50% of trials require *–si?* and the other 50% require

–sini?), which led to higher percentage of single-reference trials (66.67%). However, in Experiments 2a and 2b, the percentage of single-reference and multiple-reference trials is kept equal (50% each), which led to higher percentage (66.67%) of trials with a converging form in single-reference and multiple-reference condition, that is trials that require *–n* morpheme, the suffix for plural gender and for all trials in the multiple-reference.

In our Experiment 1a, where the proportion of gender-marked definite forms is balanced, we predicted a gender by number interaction with multiple-reference costs for diverging gender-marked forms in single-reference and multiple-reference trials, which corresponds to the form of non-plural gender. By contrast, in our Experiments 2a and 2b, where the proportion of trials with *–n* morpheme is higher, there should be a gain in the multiple-reference utterances for the plural gender but a reduced or no cost for masculine and feminine genders. Such results would go with the prediction of the competitive selection model rather than the noncompetitive model.

5.2. Experiment 1a: Definite noun naming

In Experiment 1a, participants named one or two target objects by producing either a single-reference definite noun or a multiple-reference definite noun. In Konso, single-reference definite nouns are gender-marked (e.g., *furaa-sini?* /key.P-DEF.P/ 'The key' vs. *kuta-si?* /dog.M-DEF.M/F/ 'The dog'), but not multiple-reference definite nouns. All multiple-reference definite nouns take *–sini?*, which corresponds to the single-reference definite suffix for nouns of plural gender, (e.g. *furaa-ɗɗaa-sini?* /key.P-MULT-DEF.P/ 'The keys' vs. *kuta-ɗɗaa-sini?* /dog.M- MULT-DEF.P/ 'The dogs').

Method

Participants

Twenty-one students, native speakers of Konso from Karat High School, Konso, Ethiopia, participated in the experiment. In all experiments described in the present study, participants were paid in exchange for their participation in the experiment. They had no known hearing deficit, and they had normal vision.

Materials

Sixteen pictures corresponding to non-derived Konso nouns were selected for naming. A single instance of a picture was presented during single-reference picture naming condition whereas two instances of a picture were presented side by side during multiple-reference picture naming condition. For instance, following the presentation of a single "key" in one trial (single-reference picture naming condition), participants instructed to produce *furasini?* 'the key' but they should produce *furaddasini?* 'the keys' when two pictures of a key were presented side by side in another trial (multiple-reference picture naming condition). The complete list of target pictures can be found in Appendix A. Pictures were simple black line drawings of everyday objects presented on a white background.

Each experimental picture occurred once in the single-reference and once in the multiple-reference picture naming condition, producing the following distribution of definite suffixes: eight occurrences of *–si?*, and 24 occurrences of *–sini?* (eight occurrences of *–sini?* from single-reference definite noun with plural gender and 16 occurrences of *–sini?* from all multiple-reference definite nouns). To equate the probability of occurrence for the two definite suffixes,

we added another eight filler items with names of non-plural gender that require *–si?* as their definite suffix. Each of these filler items occurred twice in single-reference picture naming condition. As a result, both definite suffixes occurred equally often for the whole set of items, which is 24 times each.

Design

There were two crossed variables: the two-level variable gender (plural vs. non-plural gender) and the two-level variable number (single-reference vs. multiple-reference). Both variables were tested within participants. Gender was tested between items, and number was tested within items. Each participant received each of the 16 experimental pictures exactly once in the single-reference and once in the multiple-reference picture naming condition, resulting in 32 experimental trials. The 32 experimental trials were intermixed with the filler trials. The trials were pseudo-randomized so that there were no more than three successive items from the same gender and number classes, and no subsequent items were related semantically or phonologically.

Procedure

Each participant was tested individually. The visual stimuli were presented centered on a 15.6-in. laptop computer. Viewing distance was approximately 60 cm. On each trial, a fixation point (a plus sign) appeared for 500 ms followed by the picture. Participants were informed to focus at the fixation point and to name the target picture as quickly and as accurately as possible with the appropriate definite noun in Konso. Pictures disappeared from the screen soon after a response was provided and the voice key was triggered. Then, the next trial was started instantaneously. When no response was

recorded within two seconds, the next trial was also started immediately. The response was counted as erroneous when the voice key was triggered unintentionally, when an incorrect gender-marked suffix or incorrect picture name was used, or when the response contained a speech error or it exceeded the deadline of two seconds. Erroneous responses were not included in the statistical tests of naming latencies. The E-prime software package was used for designing and presentation of trial sequences, and a voice key, which was connected to the computer via a serial response box, was used to measure the naming latencies from the onset of the picture to the first utterance. Before the main experimental session started, participants previewed and studied each picture with their intended names.

Results and discussion

Erroneous observations were discarded from the following reaction time analyses. Recall that observations were considered as erroneous when a picture was named using another label or when a non-speech sound preceded the target utterance that triggered the voice key or when a dysfluency was made or an utterance was mended. Observations with naming latencies smaller than 350 ms and longer than 1,500 ms were counted as outliers and discarded from the analyses of naming latencies. According to these criteria, 75 observations (11.2%) were marked as erroneous and 33 observations (4.9%) as outliers.

Averaged naming latencies were analyzed using analyses of variance (ANOVAs), which involved the variable number (single-reference vs. multiple-reference) and gender (plural vs. non-plural). Two separate analyses were carried out; one for participants (F1) and the other for items (F2).

Table 25 displays mean naming latencies and error rates for the experimental trials, categorized by number and gender class. Multiple-reference definite nouns were produced slower than single-reference definite nouns (922 ms vs. 900 ms). This 22 ms difference, however, was not significant (both *F*s < 2). Plural gender definite nouns were named faster than non-plural gender definite nouns (895 vs. 928 ms) and this 33 ms difference was reliable in the participant analysis of naming latencies, $F1(1, 20) = 4.76$, $p < .04$; $F2(1, 14) = 2.39$, $p < .14$.

Most important, in the analysis of naming latencies, the gender by number interaction was reliable, $F1(1, 20) = 4.76$, $p < .04$; $F2(1, 14) = 10.74$, $p < .006$. *T* tests revealed that the 81-ms naming latency difference between multiple-reference and single-reference for nouns of non-plural gender was significant in the item analysis and was marginally significant in the subject analysis, $t1(20) = 1.92$, $p < .07$; $t2(7) = 2.96$, $p < .02$. By contrast, the 36 ms difference in the opposite direction for nouns of plural gender was not significant (both *t*s < 2).

Table 25 Mean naming latencies (RTs) in ms and error rates in percentage (%e) by number and gender for definite noun naming

Number	Non-Plural		Plural		Mean	
	RTs	%e	RTs	%e	RTs	%e
Single-reference	854	4.5	946	6.8	900	5.7
Multiple-reference	936	7.7	910	3.3	922	5.5
Difference	81	3.3	-36	-3.6	22	-0.1

The significant gender by number interaction reveals that competition processes between gender-marked definite suffixes are involved in Konso. This result may support the view that the selection of gender-marked suffixes follows a competitive mechanism (Schriefers et al., 2005; Lemhöfer et al., 2006; Jescheniak et al., 2014). Before we arrive at this conclusion, we must first

establish that the shape of results is certainly caused by competition between gender-marked definite suffixes and not by other differences between the items. This is because gender comparisons are between-item comparisons. To determine this, we conducted a control experiment using the same material as Experiment 1a, in which we compared the production of bare single-reference nouns with the production of bare multiple-reference nouns. Note that this experiment does not require the selection of gender-marked suffixes. If the observed gender by number interaction in Experiment 1a resulted from competition between gender-marked definite suffixes, this effect should not be present in the bare noun production experiment.

5.3. Experiment 1b: bare noun naming

Experiment 1b compared the production of bare single-reference nouns with the production of bare multiple-reference nouns, using the same materials and the same procedure as Experiment 1a. The aim of this experiment was to decide the source of the gender by number interaction obtained in Experiment 1a. In other words, there should be no gender by number interaction in Experiment 1b if the effect in Experiment 1a was due to competition between gender-marked definite suffixes. Note that no definite suffix selection was required in Experiment 1b.

Method

Participants

Twenty-one students from Karat High School took part in the experiment.

Materials

The materials were identical to those used in Experiment 1a.

Design

The design was identical to the one used in Experiment 1a.

Procedure

The procedure was the same as the one used in Experiment 1a, with the only exception being that in this experiment participants were instructed to produce single-reference bare nouns when only one of the objects was presented, and to produce multiple-reference bare nouns when two identical objects were presented side by side.

Results and discussion

The raw data were treated as in Experiment 1a. According to these criteria, 102 observations (13.5%) were marked as erroneous and 42 observations (5.5%) as outliers.

Table 26 displays mean naming latencies and error rates for the experimental trials, categorized by number and gender class. Multiple-reference nouns were produced significantly slower than single-reference nouns (942 vs. 828 ms), $F_1(1, 20) = 9.71$, $p < .005$; $F_2(1, 14) = 26.27$, $p < .0001$. The factor gender, however, was not significant (both Fs < 2). Most important, in contrast to Experiment 1a, there was no gender by number interaction, (both Fs < 1).

Table 26 Mean naming latencies (RTs) in ms and error rates in percentage (%e) by number and gender for bare noun naming

Number	Non-Plural		Plural		Mean	
	RTs	%e	RTs	%e	RTs	%e
Single-reference	810	13.7	847	13.2	828	13.5
Multiple-reference	939	12.2	945	14.7	942	13.5
Difference	129	-1.5	98	1.5	114	0.0

The absence of gender by number interaction in Experiment 1b may indicate that the corresponding interaction effect in Experiment 1a was due to competition between the two definite suffixes. However, recall that Jescheniak et al. (2014) argue that the most crucial point for a competitive selection mechanism is the presence or the absence of multiple-reference costs in situations where single-reference and multiple-reference gender-marked items have divergent forms. In Experiment 1a, we observed a benefit of 36 ms in multiple-reference for the definite nouns with plural gender and multiple-reference cost of 81 ms for the corresponding definite noun naming with non-plural gender nouns. The multiple-reference benefit for the definite nouns with plural gender was not significant. Crucially, however, the multiple-reference cost for definite noun naming with non-plural gender was significant. Jescheniak et al. (2014) also propose that the presence or absence of a clear cost term might depend on the proportion with which the different gender-marked morphemes have to be used in the experiment. They predict that multiple-reference costs for diverging forms in single-reference and multiple-reference trials when the proportion of gender-marked forms is at least balanced in the experiment. In support of this prediction, with equal percentage of bound morphemes in Experiment 1a, we found gender by number interaction with multiple-reference costs for non-plural gender definite nouns. In non-plural gender definite nouns, *–si?* in the single-reference and *–sini?* in the multiple-reference were used as definite suffixes.

Note that in Experiment 1a, the proportion with which the gender-marked definite suffixes used was kept equal (50% each). This was done to examine the prediction that there would be multiple-reference costs for diverging single-reference and multiple-

reference gender-marked forms when the percentage of gender-marked morphemes is at least kept equal in the experiment (Jescheniak et al., 2014). With the addition of filler trials, each definite suffix occurred equally often, i.e. 24 times. The addition of filler trials to balance the frequency of occurrence of the two definite suffixes presumably affected the balance of the occurrence of single-reference and multiple-reference definite nouns. The resulting distribution of occurrence within the main and the filler trials were 66.67% for single-reference and the remaining 33.33% for multiple-reference trials. This may lead one to argue that the observed results in Experiment 1a were due to the predominance of single-reference trials. Noticeably, it is not possible to counterbalance the occurrence of gender-marked forms with that of the occurrence of single-reference and multiple-reference trials within a single experiment. As a result, we conducted Experiment 2 that controlled the proportion of single-reference and multiple-reference trials rather than the proportion of different gender-marked suffixes.

5.4. Experiment 2a: Overt subject sentence naming

In Experiment 2a, participants named one or two target objects by producing either single-reference or multiple-reference sentences with overt subject. As stated earlier, in overt subject single-reference sentences, Konso marks the three gender classes (feminine, masculine and plural gender) in the subject inflection on the verb (Orkaydo, 2013). Accordingly, feminine nouns require the same agreement form as the third person female subject, marked by the suffix *–t (*e.g. *lafta-si? i = akk-am-**t**-i* /bone-DEF.M/F 3 = show-PAS-3F-PF/ ‘The bone was shown’). Masculine nouns require the same

agreement form as the third person male subject, marked by the suffix *–ay* (e.g. *ɗoyra-si? i=akk-am-**ay*** /tree-DEF.M/F 3=show-PAS-PF.3M/ 'The tree was shown'). Plural gender nouns require the same agreement form as the third person multiple-reference subject, marked by the suffix *–n* (e.g. *kosaa-sini? i=akk-am-i-**n*** /granary-DEF.P 3=show-PAS-PF-3**P**/ 'The granary was shown'). In Konso, all multiple-reference sentences require the suffix *–n* on the verb, which corresponds to the plural gender suffix in single-reference sentences (e.g. *kuta-ɗɗaa-sini? i=akk-am-i-**n*** /dog.M-MULT-DEF.P 3=show-PAS-PF-3**P** / 'The dogs were shown').

Method

Participants

Twenty native speakers of Konso, students from Karat High School, took part in the experiment.

Materials

We used line drawings of 21 different objects that each one has unambiguous name, and an equal number of line drawings of objects that have names with masculine, feminine, and plural gender. The complete list of target pictures can be found in Appendix B.

Every picture appeared once in the single-reference and once in the multiple-reference picture naming condition, which produces 7 appearances of *–t*, 7 appearances of *–ay*, and 28 appearances of *–n* (7 appearances of *–n* from single-reference picture naming condition with plural gender nouns and 21 of *–n* from the multiple-reference picture naming condition of all).

Design

There were two crossed variables: the three-level variable gender (feminine vs. masculine vs. plural gender) and the two-level variable number (single-reference vs. multiple-reference). Both variables were tested within participants. Gender was tested between items, and number was tested within items. Each participant received each of the 21 experimental pictures exactly once in the single-reference picture naming condition and once in the multiple-reference picture naming condition, resulting in 42 experimental trials. Moreover, successive repetitions of an object were avoided by intervening trials; semantically or phonologically related objects did not appear in continuous trials; and no more than three trials from the same gender or number class appeared in a row.

Procedure

The procedure was the same as the one used in Experiment 1a with the exception of utterance format. In Experiment 2a, participants were instructed to respond to a picture by producing a sentence with overt subject (subject [name of the picture] + a verb with a gender-marked suffix [*iakkam*-M/F/P suffix] 'was/were shown'). For example, participants would produce *irrootasi? iakkamti* 'The mountain was shown' when a picture of a mountain appears on the screen in the single-reference picture naming condition. However, they would produce *irrootad͡dasini? iakkamin* 'The mountains were shown' when two identical pictures of a mountain were presented side by side in the multiple-reference picture naming condition.

Results and discussion

To analyze the raw data, similar criteria as the one used in Experiment 1a were employed. Thus, 155 observations (18.4%) were

marked as erroneous, and 12 observations (1.4%) were marked as outliers in Experiment 2a.

Table 27 displays mean naming latencies and error rates, categorized by number and gender. Participants were faster in the multiple-reference condition (869 ms) than in the single-reference condition (893 ms). This effect of number on naming latencies did not reach significance, $F_1(1, 19) = .69$, $p < .42$; $F_2(1, 18) = 3.08$, $p < .096$. However, the single-reference condition (7.9%) yielded a significantly higher error rate than did the multiple-reference condition (4.4%), $F_1(1, 19) = 21.81$, $p < .0001$; $F_2(1, 18) = 9.45$, $p < .007$. The effect of gender class on naming latencies was significance, $F_1(2, 38) = 7.74$, $p < .002$; $F_2(2, 18) = 12.24$, $p < .0001$. The effect of gender class on error rates was significant in the participant analysis, $F_1(2, 38) = 11.03$, $p < .0001$ but not significant in the item analysis, $F_2(2, 18) = 1.66$, $p < .22$. Most important, as in Experiment 1a, the gender by number interaction was significant both in the analyses of naming latencies, $F_1(2, 38) = 7.06$, $p < .002$; $F_2(2, 18) = 15.32$, $p < .0001$; and in the analyses of error rates, $F_1(2, 38) = 14.15$, $p < .0001$; $F_2(2, 18) = 4.15$, $p < .033$. *T* tests were computed to further analyze these interactions. For plural gender nouns, the 131 ms decrease in the multiple-reference was reliable, $t_1(19) = -3.11$, $p < .006$; $t_2(6) = -4.51$, $p < .004$. In the error rate analyses, the 7.9% decrease in the multiple-reference was also reliable $t_1(19) = -6.77$, $p < .0001$; $t_2(6) = -3.31$, $p < .016$. None of the other effects were reliable.

Table 27 Mean naming latencies (RTs) in ms and error rates in percentage (%e) by number and gender for overt subject sentence naming

Number	Feminine		Masculine		Plural		Mean	
	RTs	%e	RTs	%e	RTs	%e	RTs	%e
Single-reference	829	7.6	850	3.8	1001	12.1	893	7.9
Multiple-reference	872	5.7	865	3.3	870	4.3	869	4.4
Difference	43	-1.9	16	-0.5	-131	-7.9	-24	-3.4

Thus, having a higher proportion of responses with the suffix *–n* led to a multiple-reference gain for converging form and no multiple-reference costs in the diverging single-reference and multiple-reference gender-marked forms. There was a significant 131 ms gain and 7.9% fewer errors in the multiple-reference trials with the converging form, *–n* morpheme, which corresponds to the plural gender class. There were insignificant costs in the multiple-reference trials for the diverging single-reference and multiple-reference forms (*–ay* for masculine single-reference trials, *–t* for feminine single-reference trials and *–n* for all multiple-reference trials). Compared to the significant 81 ms multiple-reference cost for diverging forms in Experiment 1a, multiple-reference cost in Experiment 2a was reduced by 52 ms on average. The results of Experiment 2a confirm the prediction that with a higher proportion of gender-marked forms (the form that is also used in multiple-reference utterances), there would be a multiple-reference gain for converging gender-marked form, and a reduced multiple-reference cost in the diverging single-reference and multiple-reference forms (Jescheniak et al., 2014).

5.5. Experiment 2b: Null subject sentence naming

Experiment 2b was a replication of Experiment 2a with a different utterance format. In Experiment 2b, native Konso participants were asked to name a picture by producing sentence with null subject (only a verb with gender-marked suffixes [*iakkam*-M/F/P suffix] 'was/were shown'). In Konso, omitting the overt subject is allowed

and it can be understood from the gender agreement markers on the verb (Orkaydo, 2013, p. 60). For example, *i=akk-am-**t**-i* /3=show-PAS-3F-PF/ 'She was shown'; *i=akk-am-**ay*** /3=show-PAS-PF.3M/ 'he was shown'; *i=akk-am-i-**n*** /3=show-PAS-PF-3**P**/ 'They were shown'. As mentioned above, all multiple-reference sentences require the suffix *–n* on the verb, which corresponds to the plural gender suffix in single-reference sentences (e.g. *i=akk-am-i-**n*** /3=show-PAS-PF-3**P**/ 'They were shown'). Similar to the previous experiments, pictures could either appear as a single object (single-reference condition) or as two identical objects (multiple-reference condition).

Method

Participants

Eighteen students from the Karat High School took part in the experiment.

Materials and design

The materials and the design were identical to those used in Experiment 2a.

Procedure

The procedure were similar to those used in Experiment 2a with the exception of utterance format. In Experiment 2b, participants were requested to name pictures by producing a sentence with null subject rather than by producing a sentence with overt subject. For example, participants would produce *iakkam**ay*** 'He was shown' in response to the presentation of a picture of a single dog. However, they would produce *iakkam**in*** 'They were shown' when two identical pictures of a dog were presented on a different trial.

Results and discussion

The raw data were treated the same as in Experiment 1a. According to these criteria, 118 observations (15.6%) were marked as erroneous and all observations were between the naming latencies of 350 ms and 1,500 ms.

Table 28 displays mean naming latencies and error rates, categorized by number and gender class. Participants were faster in the multiple-reference condition (747 ms) than in the single-reference condition (766 ms). This effect of number on naming latencies did not reach significance ($F1(1, 17) = 1.39$, $p < .26$; $F2(1, 18) = 3.60$, $p < .07$). However, the single-reference condition (7.4%) yielded a significantly higher error rate than did the multiple-reference condition (3.0%), $F1(1, 17) = 26.50$, $p < .0001$; $F2(1, 18) = 17.82$, $p < .001$. This could be due to the fact that selecting between three suffixes in the single-reference trials might induce more errors than in the multiple-reference trials, which required only one suffix for all utterances. The effect of gender class on naming latencies was significant only in the item analysis, $F1(2, 34) = .92$, $p < .41$; $F2(2, 18) = 5.04$, $p < .02$. The effect of gender class on error rates was significance, $F1(2, 34) = 24.80$, $p < .0001$; $F2(2, 18) = 8.22$, $p < .003$. Most important, as in Experiment 2a, the gender by number interaction effect was significant both in the analyses of naming latencies, $F1(2, 34) = 10.44$, $p < .0001$; $F1(2, 18) = 17.08$, $p < .0001$; and in the analyses of error rates, $F1(2, 34) = 22.79$, $p < .0001$; $F2(2, 18) = 21.60$, $p < .001$. *T* tests were computed to further analyze these interactions. For plural gender trials, the 100 ms decrease in the multiple-reference was reliable, $t1(17) = -3.12$, $p < .006$; $t2(6) = -3.68$, $p < .010$. In the error rate analyses, the 14.0%

decrease in the multiple-reference was also reliable, $t_1(17) = -6.20$, $p < .0001$; $t_2(6) = -6.96$, $p < .0001$. For masculine nouns, the 33 ms increase in the multiple-reference was reliable, $t_1(17) = 2.31$, $p < .03$; $t_2(6) = 3.37$, $p < .02$. None of the other effects were reliable.

Table 28 Mean naming latencies (RTs) in ms and error rates in percentage (%e) by number and gender for null subject sentence naming.

Number	Feminine		Masculine		Plural		Mean	
	RTs	%e	RTs	%e	RTs	%e	RTs	%e
Single-reference	742	4.5	733	2.1	825	15.6	766	7.4
Multiple-reference	750	6.1	766	1.3	725	1.6	747	3.0
Difference	8	1.6	33	-0.8	-100	-14.0	-20	-4.4

Similar to the results of Experiment 2a, having a large percentage of responses with the suffix *–n* led to a multiple-reference gain for converging form. There was a significant 100 ms gain in the multiple-reference trials with the converging form in single-reference and multiple-reference trials, *–n* morpheme, corresponds to the plural gender class. Unlike Experiment 2a, however, there was a significant multiple-reference cost for only one of the diverging forms in single-reference and multiple-reference, namely for masculine gender trials. Still, multiple-reference cost for diverging forms in Experiment 2b were reduced by 61 ms on average compared to the significant 81 ms multiple-reference cost in Experiment 1a. Once again, the results of Experiment 2b support the prediction that there may be a multiple-reference gain for converging gender-marked form and a reduced multiple-reference cost for diverging forms in single-reference and multiple-reference trails when there is higher percentage of a form that is also used in multiple-reference trials (Jescheniak et al., 2014). Hence, results of Experiment 2b demonstrated that the effects observed in Experiment 2a were replicable even when picture name

was not uttered. Thus, these results showed the robustness of the effect in different utterance formats.

However, we have not yet established that the shape of results in Experiments 2a and 2b is indeed due to competition between gender-marked suffixes and not just due to other differences between trials with feminine, masculine, and plural gender. To this end, in Experiment 2c, using the same materials and the same procedures as Experiments 2a and 2b, we compared the production of bare single-reference nouns with the production of bare multiple-reference nouns.

5.6. Experiment 2c: bare noun naming

In Experiment 2c, participants were instructed to respond to pictures by producing either bare single-reference nouns or bare multiple-reference nouns. The same materials and the same procedure as Experiments 2a and 2b were used. In this experiment, no gender-marked suffix selection was required. Hence, the aim was to test whether the gender by number interactions obtained in Experiments 2a and 2b was due to competition between gender-marked suffixes.

Method

Participants

Twenty-one students from Karat High School took part in the experiment.

Materials

The materials were identical to those used in Experiments 2a and 2b.

Design

The design was identical to the one used in Experiments 2a and 2b.

Procedure

The procedure was the same as the one used in Experiments 2a and 2b, with the only exception being that in Experiment 2c, participants were instructed to produce single-reference bare nouns when only one of the objects was presented and to produce multiple-reference bare nouns when two identical objects were presented side by side.

Results and discussion

The raw data were treated as in Experiment 1a. According to these criteria, 120 observations (12.8%) were marked as erroneous and 62 observations (6.4%) as outliers.

Table 29 displays mean naming latencies and error rates for the experimental trials, categorized by number and gender class. Multiple-reference nouns were produced significantly slower than single-reference nouns (955 vs. 849 ms), $F1(1, 20) = 9.16$, $p < .007$; $F2(1, 18) = 33.93$, $p < .0001$. The factor Gender, however, was not significant (both Fs < 2). Most important, in contrast to Experiments 2a and 2b, there was no gender by number interaction, (both Fs < 1).

Table 29 Mean naming latencies (RTs) in ms and error rates in percentage (%e) by number and gender for bare-noun naming.

Number	Masculine		Feminine		Plural		Mean	
	RTs	%e	RTs	%e	RTs	%e	RTs	%e
Single-reference	846	10.9	862	14.3	839	10.7	849	12.0
Multiple-reference	944	12.2	978	10.1	944	16.1	955	12.8
Difference	98	1.3	116	-4.2	105	5.4	106	0.8

The absence of a gender by number interaction in Experiment 2c indicates that the corresponding interactions in Experiments 2a and 2b were due to gender-marked suffix competition.

5.7. General discussion

This study examined how bound gender-marked morphemes (such as gender-marked suffixes) are processed during speech production. As we have noted in the introduction that the literature on the selection processes of bound gender-marked morphemes is small in number (involving only a few European languages, mainly German and Dutch) and even these few studies provide contradictory evidence. Most of the evidence comes from picture-word interference (PWI) paradigm that focuses on gender congruency effect and simple picture naming (SPN) tasks that focus on a gender by number interaction. In the present study, we employed the SPN task to address the question whether bound gender-marked morphemes are selected competitively in Konso, a Cushitic language of Ethiopia for which most of gender-marked elements are bound morphemes.

In Experiment 1a, definite noun naming (noun + gender-marked definite suffix), we found gender by number interaction and this effect was absent in the corresponding bare noun naming (Experiment 1b), serving as an independent control experiment. Similarly, gender by number interaction was observed in Experiment 2a, in overt subject sentence naming (subject [name of the picture] + a verb with a gender-marked suffix [*iakkam*-M/F/P suffix] 'was/were shown'), and in Experiment 2b, null subject sentence naming (only a verb with a gender-marked suffix [*iakkam*-M/F/P suffix] 'was/were shown'). This interaction effect was absent in Experiment 2c, the control bare noun naming experiment. Moreover, the type of interaction was a cost-type for diverging gender-marked forms in Experiment 1 whereas it was a benefit-type for the converging single-reference and multiple-reference forms in Experiment 2. Note that the percentages of occurrences of gender-marked bound

morphemes were equal in Experiment 1 while there were a higher percentage (66.67%) of trials for converging forms in Experiment 2.

The types of interaction observed in both experiments was crucial for determining whether the naming of bound gender-marked morphemes involve competitive processing mechanism (Jescheniak et al., 2014). In Experiment 1a, when the occurrence of the proportion of gender-marked morphemes was equally 50%, we observed gender by number interaction with multiple-reference costs of 81 ms for diverging gender-marked forms in single-reference and multiple-reference trials. These diverging forms correspond to the non-plural gender class, where *-si?* was used in the single-reference and *-sini?* was used in the multiple-reference trials. In the multiple-reference non-plural gender definite noun naming, increased competition was produced during bound morpheme selection due to the activation of different gender-marked definite suffixes (i.e. *–si?* vs, *–sini?*) and hence a cost effect was observed in this condition.

In Experiments 2a and 2b, where a higher percentage (66.67%) of responses required the converging form in the single-reference and multiple-reference trials, there were multiple-reference benefits for this converging form (131 ms in Experiment 2a and 100 ms in Experiment 2b). This converging form, *–n* morpheme, corresponds to the plural gender class in the single-reference trials. The benefit in the multiple-reference trials for plural gender may be due to the fact that the single-reference trial and its multiple-reference form gave combined activation to the same multiple-reference gender-marked form, which made selecting the correct gender suffix simpler. This benefit effect was not observed in Experiment 1a, where the proportion of occurrence of converging forms in single-reference and multiple-reference trial was 50%. Thus, increasing the proportion of

the converging form in single-reference and multiple-reference trials to 66.67% in Experiments 2a and 2b may lead to increasing the activation of this suffix. This increased activation in turn could weaken the competition of other single-reference suffixes with this suffix in the multiple-reference trials, which decreased the multiple-reference cost. By contrast, the convergence of the single-reference suffix with this suffix led to a benefit effect for trials with plural gender.

In summary, the results of our study showed a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ. This was the case when the occurrence of the proportion of gender-marked morphemes was balanced. When responses with the converging forms in the single-reference and multiple-reference trials increased to two thirds of the trials, this cost effect inclined to reduce and replaced by a benefit effect for multiple-reference trials for which single-reference and multiple-reference suffixes are identical. These patterns of results suggest that bound gender-marked morphemes in Konso are selected in a competitive fashion. This is in accordance with theories of language production that assume gender-marked elements are selected following a competitive mechanism (Schriefers, 1993; Schriefers et al., 2005; Lemhöfer et al., 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014).

In the present study, we considered two major models that account for the selection mechanism of gender-marked morpheme during speech production: competitive and noncompetitive selection models. The major assumption of the noncompetitive model is that the selection times of a target utterance depend only on the activation level of the target itself, and the activation of other competitors plays

no role (Janssen et al., 2014). The competitive model, on the other hand, assumes that the activation of target utterances also activates competitors, and the activation of these competitors affects the selection times of the target utterance (Jescheniak et al., 2014). Accordingly, competitive and noncompetitive models predict different types of gender by number interactions in the production of utterances with gender-marked morphemes in SPN tasks. The noncompetitive model predicts a gender by number interaction with a benefit in the production of multiple-reference trials with converging forms in the single-reference and multiple-reference, i.e. a benefit-type interaction (Janssen et al., 2014). The competitive model predicts a gender by number interaction with an additional cost in the production of multiple-reference trials with divergent forms in the single-reference and multiple-reference (i.e. a cost-type interaction) when the proportion of gender-marked morphemes is at least balanced in the experiment (Jescheniak et al., 2014). The finding of multiple-reference costs for diverging single-reference and multiple-reference gender-marked definite nouns in our Experiment 1a fits the prediction of competitive model but not the noncompetitive model.

Moreover, the results of the present study do not contradict studies that examined the production of bound gender-marked morphemes in SPN tasks such as Schriefers et al. (2005) in German and Lemhöfer et al. (2006) in Dutch. Schriefers et al. (2005) and Lemhöfer et al. (2006) reported gender by number interactions of the benefit-types during bound morpheme production with a higher percentage (66% in Schriefers et al., 2005; 75% in Lemhöfer et al., 2006) of responses with the converging form in the single-reference and multiple-reference trials. This corresponds with a benefit effect we observed in Experiments 2a and 2b, where two thirds of the

responses required the converging form in the single-reference and multiple-reference trials. The new finding in the present study was that keeping the proportion of bound gender-marked morphemes equal resulted in a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ. This is new empirical evidence for the competitive model that predict a cost-type interaction when the proportion of gender-marked morphemes is at least balanced in the experiment (Jescheniak et al., 2014).

To the best of our knowledge, the empirical basis of most studies that propose a noncompetitive processing mechanism for bound gender-marked morphemes is the gender congruency effect in PWI tasks (Costa et al., 2003; Schiller & Caramazza, 2003; Schiller & Costa, 2006). These studies reported an absence of gender congruency effect in bound morpheme production. Note, however, that there is also counter evidence against such position (Schriefers, 1993; Bordag & Pechmann, 2008). Moreover, there is a growing consensus among researchers in the field that the gender congruency effect in PWI tasks may not provide a direct evidence to resolve between competitive and noncompetitive models since both models can account for this effect (Jescheniak et al., 2014; Janssen et al., 2014). Thus, according to competitive model, competition between different gender-marked forms in the gender-incongruent condition may cause prolonged naming latencies in this condition (Jescheniak et al., 2014). According to the noncompetitive model, however, coinciding between convergent gender-marked forms in the gender-congruent condition may produce faster naming latencies in this condition (Janssen et al., 2014).

Besides, it is also possible that the observed effect in Konso bound morpheme production might be due to language-specific properties. Konso is presumably different from Dutch and German, languages investigated in the relevant studies. These differences may be indicated in terms of the function of gender suffixes on nouns and verbs, the nature of bound gender-marked morphemes, and the function of gender agreement and its intricate relation with number agreement. The experiments reported in the present chapter made use of the definite suffixes *–si?*$_{M/F}$ and *–sini?*$_{P}$, and the verb inflections *–ay*$_{M}$, *–t*$_{F}$ and *–n*$_{P}$, which are bound morphemes in Konso. For instance, no independent word can come between *–si?*$_{M/F}$/*–sini?*$_{P}$ and the noun; and they cannot be used as freestanding morphemes. Moreover, in contrast to the Dutch adjectival inflection *–e*, the definite suffixes *–si?*$_{M/F}$ and *–sini?*$_{P}$ in Konso are not pure (automatic) agreement features; rather they express value (definiteness) and they are not obligatory. The verb endings *–ay*$_{M}$, *–t*$_{F}$ and *–n*$_{P}$ are inflectional agreements when there is an explicit subject but when there is no explicit subject, there is no agreement because Konso is a pro-drop language.

Taken together, our study not only replicated the finding of gender by number interactions in bound morpheme naming (Schriefers et al., 2005; Lemhöfer et al., 2006) but also offered new empirical evidence in support of the view that the production of bound gender-marked morphemes is subject to competitive processes. The present study, therefore, extended the findings by Schriefers et al. (2005) and Lemhöfer et al. (2006) to a geographically and genetically distinct language, Konso. This provides additional cross-linguistic data on the processing mechanism of bound gender-marked morphemes.

Table 30 Appendix A: Experiment 1: definite noun naming

Target picture name	Meaning	Gender
akataa	sugar cane	plural
filaa	comb	plural
furaa	key	plural
kiʔsaa	cricket	plural
rika	a tooth brush	plural
siinnaa	nose	plural
ukukkaa	egg	plural
uwwaa	dress	plural
kuta	dog	non-plural
mottooʛʛaa	car	non-plural
parʄuma	stool/chair	non-plural
ʛupitta	finger	non-plural
karma	lion	non-plural
farta	horse	non-plural
oχinta	fence	non-plural
tika	house	non-plural

Table 31 Appendix B: Experiments 2a and 2b: Sentence naming

Target picture name	Meaning	Gender
akataa	sugar cane	plural
filaa	comb	plural
furaa	key	plural
kiʔsaa	cricket	plural
siinnaa	nose	plural
ukukkaa	egg	plural
uwwaa	dress	plural
arpa	elephant	masculine
karma	lion	masculine
kuta	dog	masculine
mottooɗɗaa	car	masculine
parʄuma	stool/chair	masculine
tuuma	onion	masculine
tuyyuuraa	air plane	masculine
farta	horse	feminine
irroota	mountain	feminine
kaawwata	glass	feminine
kaharta	ewe	feminine
lafta	bone	feminine
oχinta	fence	feminine
tika	house	feminine

CHAPTER 6

6. General discussion

6.1. Introduction

This dissertation examined the psycholinguistic state of the so-called plural gender class in Cushitic languages and the selection mechanism of bound gender-marked morphemes during speech production. Some Cushitic languages are characterized by an uncommon mixing of gender and number features, which is reflected in the behavior of the third agreement class apart from masculine and feminine genders. This third agreement class represents a group of nouns that trigger plural agreement form irrespective of their number values, either single-reference or multiple-reference. The studies presented here provide evidence for the analysis of this plural agreement class as a value of gender and not number in Cushitic languages by applying picture-word interference paradigm to Konso, a Lowland East Cushitic language of Ethiopia. The present findings also show that bound gender-marked morphemes are selected competitively while some studies have taken the noncompetitive account to be the underlying processing mechanism for selecting bound morphemes. The first experimental study (Chapter 2) provided the basis for the follow-up studies. This chapter established the prospect for conducting psycholinguistic investigation in under-studied languages in less-resourced rural areas and provided some indication for the presence of gender congruency effect in Konso. Chapter 3 demonstrated that the so-called plural gender is processed in the same way as masculine and feminine genders, which are categorical gender values across all Cushitic languages. Measurements of response times revealed that plural gender produced similar congruency effect as feminine and masculine genders, which provides support for the analysis of plural as a value of gender in the language. Chapter 4 further investigated whether the

pattern of the effect observed in Chapter 3 can be replicated in a different experimental scenario whereby regular multiple-reference nouns were used both as targets and distractors. Chapter 4 indicated that plural gender nouns are processed similarly as feminine and masculine single-reference nouns, and different from regular multiple-reference nouns. Recall that all gender-marked elements in the experiments reported in the present dissertation were bound morphemes that are suffixed as definite markers on nouns or as subject inflection on verbs. This demonstrates that gender congruency effects can be obtained during bound morpheme production in Konso. Importantly, Chapter 5 addressed one of the current discussions in the speech production literature regarding the selection mechanism of bound gender-marked morphemes. Chapter 5 employed the simple picture naming task; evidently an appropriate task for examining whether selecting bound morphemes follows competitive or rather non-competitive mechanisms. It was shown that, with equal proportions of gender-marked suffixes, producing multiple-reference definite nouns was characterized by reaction time costs for non-plural gender trials, for which the suffixes of single-reference and multiple-reference were different. On the other hand, uttering multiple-reference sentences was correlated with benefits for plural gender trials when two thirds of trials required *–n* (the suffix used in all multiple-reference and for plural gender in the single-reference). These results are consistent with the view that selection of bound morphemes follows competitive processes.

Altogether, the studies reported in the present dissertation have shown that plural is indeed a value of gender and not number in Konso. Moreover, bound gender-marked morphemes, such as definite suffixes and verb inflections of Konso, involve competitive rather

than non-competitive selection mechanisms. The studies presented in this dissertation also played a vital role in extending the psycholinguistic investigation of gender beyond Indo-European languages and in introducing experimental approaches into the study of Cushitic gender.

In what follows, we shall first discuss the evidence on the processing of plural as a value of gender in Konso. Then we look at the evidence that show bound gender-marked morphemes follow competitive selection processes. Finally, a reflection on undertaking psycholinguistic behavioral studies in the rural area of southwest Ethiopia will be presented.

6.2. The processing of plural as a gender in Cushitic languages

Mention was made that Konso and some other related Cushitic languages have the property that the third value of gender, beside masculine and feminine, is "plural." This plural gender refers to a class of nouns that take plural agreement form even when they represent single entities. Two different linguistic analyses have been proposed to analyze the status of the so-called plural gender in Cushitic languages: *plural-as-a-number feature* only (Corbett & Hayward, 1987; Corbett, 1991, 2005, 2012) versus *plural-as-a-gender feature* as well (e.g. Hayward, 1979; Savà, 2005; Mous, 1993, 2008; Orkaydo, 2013).

In this dissertation, Chapter 3 addressed the question of whether processing of plural gender during speech production produces a similar pattern of congruency effects as masculine and feminine gender in Konso. Masculine and feminine are the accepted gender classes in Konso and other Cushitic languages. As it has been shown

in the results of the two experiments in Chapter 3 that plural gender nouns show gender congruency effects like masculine and feminine nouns. This indicates that plural is processed like masculine and feminine genders, which supports the analysis that the so-called "plural" gender is part of the system of gender values in Konso.

The fact that plural gender nouns require the same agreement as third person plural subject on the verb triggered the use of the term "plural" as a value of gender in Konso. Moreover, there are extra connections between the plural gender and multiplicity of number. First, coordinated nouns require plural agreement on the verb regardless of the gender values of the coordinated nouns. For instance, the coordinated noun phrase combining a masculine and feminine word requires plural agreement in Konso as can be seen in the sentence. *ɠartaaynu iʃuʔ inantaaynu tikupa ikalin* /*ɠarta-aynu iʃuʔ inanta-aynu tika-opa i=kal-i-n/* elder.brother.M-1SG.POSS.M/F and girl.F-1SG.POSS.M/F house-to 3=return.home-PF-P/ 'My elder brother and my sister returned home' (Orkaydo, personal communication). Second, number is a derivational category in Konso, i.e. some nouns derive a multiple-reference number form from a non-derived single-reference, others derive a single-reference from a non-derived multiple-reference, and many other patterns (Orkaydo, 2013, pp. 80-89). There are seven different multiple-reference formations in Konso, and the one to be uttered is lexically decided. All these multiple-reference formations inflict plural gender onto the noun.

The category of number in Konso has a number of properties that make it of a different nature than the category of gender. In Konso and other Cushitic languages, the main domain of number agreement is the adjective. An adjective will agree in number with

the head noun. However, the agreement is semantic in nature: using a single-reference adjective modifying a multiple-reference head noun is acceptable and renders the reference of that noun as collective, thus semantically as single-reference. Moreover, number is a category that is not obligatorily expressed. This means that to refer to multiple objects, a speaker has to choose between the use of a non-derived base noun or a derived noun marked for multiple-reference depending on how crucial the speaker considers information on number in a given context. The results from Chapter 3 show the necessity of further empirical investigations on the category of number in Konso and other Cushitic languages. With the aim of addressing this necessity, Chapter 4 investigated the production of gender and number in Konso.

In Chapter 4, we found a congruency effect only in the single-object picture naming condition, where there were different forms for different genders. This may have been the case because so-called plural gender produces a similar pattern of interference/facilitatory effects from distractor words as feminine and masculine genders in Konso. The absence of a reliable effect of congruency in the multiple-object picture naming condition indicates that plural gender produces a different effect from the regular multiple-reference (plural number) nouns. These results suggest that plural is processed as a gender feature rather than a number feature in Konso.

As discussed in the previous chapters, however, treating plural as part of gender feature is said to be challenging for the general linguistic claim of Exclusiveness — values belong to one feature only (Corbett, 2012). According to this claim, values such as ‘singular’ and ‘plural’ belong only to the number feature and thus gender cannot use plural as its value. Corbett (2012), see also Corbett

and Hayward (1987), identified only eleven nouns that require plural agreement form for single-reference (unit reference) in Bayso, another Lowland East Cushitic language. Corbett analysed them as typically occurring in pairs or representing non-count nouns. His conclusion was that these nouns should be lexically marked as taking plural agreement when they are in single-reference similar to *pluralia tantum* nouns and thus plural should be removed from the values of gender. This analysis might serve to tackle seemingly non-standard structures in the system at the price of marking only small number of nouns as exceptions.

In Bayso, Haywards's (1979) list of nouns that take plural agreement is small in number and indeed could be treated as exceptions. However, one can notice that the word list of Hayward (1979) contains not more than a hundred nouns altogether and we may need a much larger list of words to see the actual distributions of nouns into different gender classes in Bayso. Orkaydo (2013) provides relatively larger list of words for Konso. In contrast to Bayso, Konso's plural gender nouns are too many to be treated as exceptional. There are 96 nouns with plural gender against 135 of feminine and 245 of masculine nouns.

Moreover, there is additional linguistic evidence that supports the treatment of plural as a value of gender in Konso. Namely, gender and number represent two independent agreement systems and adjectives show agreement for both categories independently in Konso (Mous, 2008; Orkaydo, 2013). Thus, an adjective agrees in number with the head noun by reduplication of initial CV(C) of its root for multiple-reference nouns (Orkaydo, 2013). In the example, *waakkaa-ɗaa-sini? i=ɗeɗ~ɗer-i* /wooden statue-MULT-DEF.P 3=RDP-be.tall-PF/ 'The wooden statues are tall', the initial CVC of

the adjective root *ɗer-* 'to be long' is reduplicated because the subject *waakkaa-ɗaa-sini?* 'the wooden statues' is a multiple-reference noun. However, in the example *waakkaa-sini? i=ɗer-i* /wooden statue-DEF.P 3=be.tall-PF/ 'The wooden statue is tall', the initial CVC of the adjective root *ɗer–* is not reduplicated because the subject *waakkaa-sini?* 'the wooden statue' is a single-reference noun.

In Konso, gender is also marked on adjectives when they are used as attributes (Orkaydo, 2013). The suffix *–a* is used to mark masculine and feminine genders, and *–aa* is used for plural gender (Orkaydo, 2013). For instance, *waakkaa-sini? ɗer-aa* /wooden statue-DEF.P SG.tall-P/ 'The tall wooden statue'. According to the treatment of plural as a number feature (multiple-reference), we would have two conflicting values of number on the two agreement places of the adjective (single-reference at the beginning of the adjective vs. multiple-reference marked by the suffix *–aa*) in agreement with one and the same head noun. Such a treatment could also lead into inconsistent classification of nouns; one group of nouns would be classified according to gender based on the agreement on the definite marker on nouns, and the other group would be classified according to number on the basis of the final suffix on the adjective. This kind of challenge would not be present in Bayso, since it does not show independent number agreement. Thus, the treatment of plural as a value of gender and not number is an appropriate one in Konso. Importantly, the studies in the present dissertation showed that the so-called plural gender behaved as a gender type rather than a number type.

According to theories of language production that discuss the lexical-syntactic properties, gender and number belong to two different feature categories (Levelt, Roelofs, & Meyer, 1999). The

former, gender, belongs to fixed syntactic features that are said to be idiosyncratic where there is no clear semantic and phonological cue with regard to its value. For instance, the definite marker suffix has to agree in gender with the head noun in Konso definite nouns (*innaa-sini?* /boy.P-DEF.P/ 'the boy' vs. *oχinta-si?* /fence.F-DEF.M/F/ 'the fence'). Yet, there is no conceptual motivation for *innaa* 'boy' to have plural gender whereas *oχinta* 'fence' has feminine gender in Konso. Number, on the other hand, belongs to variable syntactic features, which are not word-specific and its value is based on a conceptual situation.

Whether plural gender behaved as a gender in other Cushitic languages that have a similar feature is an issue for future research. As stated earlier, about one-third of Cushitic languages are said to have this third value of gender. Let us look at the analysis of grammatical gender and number in Bayso, another Cushitic language on which the relevant studies were undertaken. Bayso belongs to Lowland East Cushitic branch and it is spoken in the southwest of Ethiopia. The review of Bayso is based on the works of Hayward (1979), Corbett and Hayward (1987), and Corbett (2012). Readers are referred to those references for the original analyses, further discussions and additional examples.

Hayward (1979) has analyzed the gender and number system of Bayso and separated gender from number. He identified three gender values, which are derived from the agreement patterns of the subject on the verb, agreement in associative particle and agreement in demonstratives. Each of these agreeing elements has three separate forms that are labeled as masculine (M), feminine (F) and plural (P) gender based on comparable criteria.

Agreement at clause level distinguishes three forms, in which masculine, feminine and plural nouns require third person masculine, third person feminine and third person plural subject markers on the verb, respectively, as shown in the following examples:

Bayso subject gender agreement on the verb (Hayward, 1979, p. 101)

(28) lúban gira
lion is.M
'There is a lion'

(29) kimbir gitta
bird is.F
'There is a bird'

(30) ilkoo giran
tooth/teeth are.P
'There is a tooth/ are teeth'

In addition to *lúban* 'lion', the verb form *gira* agrees with *ódo* 'father' and *abbi* 'brother', and the nouns requiring this form are called masculine gender. Similarly, the verb form *gitta* agrees with nouns such as *kimbir* 'bird', *aa/aayo* 'mother', *abba* 'sister', and such nouns are said to be feminine gender. The form *girran*, however, agrees with nouns that are semantically mass or non-count/non-singular and it is referred to as a plural agreement form, nouns that require this agreement form are called plural gender nouns. Not all non-count nouns take this form. For example, *igg* 'blood' and *ess* 'grass' require masculine agreement form while count nouns such as *ilkoo* 'tooth/teeth', *iloo* 'eye' require plural agreement form. This, according to Hayward (1979), shows the relative arbitrariness of the assignment of nouns to the plural gender.

Agreement in the associative particle (PRT) also distinguishes three markers, *ka* for masculine, *ta* for feminine and *o* for plural gender nouns, as shown in the examples below:

Bayso gender agreement forms in the associative particles (Hayward, 1979, p. 102)

(31) ani ka dee lúban…
I PRT.M saw lion
'the lion which I saw…'

(32) ani ta dee kimbir…
I PRT.F saw bird
'the bird which I saw…'

(33) ani o dee ilkoo…
I PRT.P saw tooth/teeth
'the tooth/teeth which I saw…'

According to similar criteria as the other two agreeing elements, three forms are identified by demonstratives occurring with or without a noun. Masculine nouns agree with a demonstrative that incorporate *–kk–*, feminine nouns agree with *–tt–* and plural nouns agree with the element *–n–*, as illustrated by the following examples:

Bayso gender agreement forms in demonstratives (Hayward, 1979, p. 102)

(34) hikki lúban
this.M lion
'this lion'

(35) hitti kimbir
this.F bird
'this bird'

(36) hini ilkoo
this.P tooth/ these teeth
'this tooth/ these teeth'

The agreement pattern of the subject on the verb, agreement in associative particle and agreement in demonstratives, therefore, identifies three different forms individually. Although these forms are not phonologically similar, their division follows the same criteria and termed as masculine, feminine and plural agreement form and nouns that require these agreement forms are said to be masculine, feminine and plural gender, respectively.

Number is the other feature that Hayward (1979) analyzed in relation to gender in Bayso. He identified four values for number: unit reference, multiple reference, paucal reference, and singulative reference. The unit reference form is marked by a zero suffix and

represents an individual member or the class of the referent. The multiple reference form is marked by different suffixes and represents the multiplicity of individual members or items. The paucal reference form is also marked and represents a handful (from two to six) of individuals. The marked singulative reference form, however, represents a particular member only. The following example in Table 32 illustrates these forms:

Table 32 Bayso number system (Hayward, 1979, p. 102)

unit reference	lúban	'a lion/lion'
multiple reference	lúbanjool	'lions'
paucal reference	lubanjaa	'a few lions / some lions'
singulative reference	lubántitti	'a/the particular lion'

As can be seen above, Hayward (1979) analyzes gender and number as independent features in Bayso. The main reason is that gender is not a constant property for nouns; instead, it changes with the number feature. The correlation between gender and number in Bayso, however, leaves the following clear generalizations: all paucal reference forms are plural; singulative reference forms do not take plural gender, rather they keep the same gender as their unit reference form; and all regular multiple reference forms are masculine.

Corbett and Hayward (1987) reanalyze the gender and number system of Bayso based on the work of Hayward (1979). In contrast to previous work, which recognized three gender values, they argue that only two genders (i.e. masculine and feminine) should be recognized in Bayso (taking mainly the small membership in the other class into account).

To this end, they first collected all the nouns that take plural agreement in their unit reference form from Hayward's word list and characterized them as referring to items appearing in pairs (e.g. *kalal*

'kidney', *lukkaa* 'feet', and *iloo* 'eye'). The majority of the remaining nouns in this set are mass nouns (e.g. *eenoo* 'milk', *ongorroo* 'hair', *soo* 'meat' and *udú* 'faeces'). Corbett and Hayward (1987) labeled nouns that take plural agreement for unit reference as lexical exceptions and rule out the concept of "plural" gender in Bayso.

Moreover, they challenge the view that gender is not a constant property but changes with number in Bayso, a position taken by Hayward (1979). Following the labeling of nouns that take plural agreement for unit reference as lexical exceptions, for any other noun (masculine or feminine), the agreement with unit reference (non-derived single-reference) and singulative reference (derived single-reference) are identical since the latter is derived from the former. Nouns that take plural agreement for unit reference cannot derive singulative reference forms, and multiple reference words are automatically masculine in gender.

Note that there was an attempt to extend the psycholinguistic investigation of plural gender to Bayso. This attempt was not fully materialized due to inadequacy of stimuli and participants. Using the available stimuli and participants, however, we carried out a couple of experiments in Bayso that examined the presence of gender congruency in the production of bare noun and gender-marked demonstratives plus noun. Note that these experiments did not include nouns in the plural gender class, as they were small in number. In bare noun naming, no effect of gender congruency was observed. In demonstrative and noun naming, however, participants were slower in the gender-incongruent compared to gender-congruent condition. These results are in line with a previous study in Dutch that showed congruency effects only when gender information is required for selecting correct utterance forms (La Heij, Mak, Sander

& Willeboordse, 1998). This provides further evidence for the presence of a gender congruency effect in non-Indo-European languages. To be able to examine the status of plural gender in Bayso, it is necessary to collect additional words in the language and to work with the community for selecting proficient speakers of the language who are able to do the tasks.

6.3. The competitive nature of selecting bound morphemes

In addition to the status of plural gender in Konso, the studies reported in the present dissertation examined how bound gender-marked morphemes (such as gender-marked suffixes) are processed during speech production. As we have noted in the introduction, the literature on the selection processes of bound gender-marked morphemes is small in number (involving only a few European languages, mainly German & Dutch) and even these few studies provide contradictory evidence. Most of these studies employed picture-word interference tasks that focus on the gender congruency effect and simple picture naming tasks that focus on a gender by number interaction. To examine the retrieval mechanism of bound morphemes in Konso, Chapters 3 and 4 of the present dissertation employed the picture-word interference task and Chapter 5 made use of the simple picture naming task. The experiments in Chapters 3 and 4 investigated whether the gender congruency effect can be obtained in gender-marked bound morpheme production. The experiments in Chapter 5, on the other hand, examined the type and pattern of gender by number interaction effect in the production of bound gender-marked morphemes in Konso.

The results reported in Chapters 3 and 4 have shown that the gender congruency effect can be obtained during the production of bound gender-marked morphemes in Konso. Previous studies do not provide consistent evidence as to whether a congruency effect is observed in the production of bound gender-marked morphemes. In some studies, a gender congruency effect is observed only in the production of gender-marked freestanding morphemes but not in the production of gender-marked bound morphemes (e.g. Schiller & Caramazza, 2003, in German and Dutch; Costa Kovacic, Fedorenko, & Caramazza, 2003, in Croatian; Schiller & Costa, 2006, in German). As a result, these authors concluded that bound gender-marked morpheme production involves a non-competitive processing mechanism while gender-marked freestanding morphemes involve selection-by-competition processes. In other studies, a gender congruency effect was found for bound gender-marked morpheme production as well (e.g. Bordag & Pechmann, 2008, in Czech; Schriefers, 1993, in Dutch). Thus, these authors concluded that bound gender-marked morpheme production involves selection-by-competition processes like that of freestanding morphemes. Similar to Schriefers (1993), as well as Bordag and Pechmann (2008), the results reported in Chapters 3 and 4 reveal the presence of a gender congruency effect in the production of bound gender-marked morphemes.

However, gender congruency effects in picture-word tasks may be ambiguous between competitive and non-competitive selection processes (Jescheniak, Schriefers, & Lemhöfer, 2014; Janssen, Schiller, & Alario, 2014). The reason is that the effect of gender congruency can be accounted by both competitive and non-competitive selection models. The competitive selection model

assumes that the prolonged response times in the gender-incongruent condition resulted from competition between different gender-marked forms. The non-competitive selection model assumes that the faster response times in the gender-congruent condition resulted from priming between convergent gender-marked forms. To disentangle between competitive and non-competitive models, the simple picture naming task seems to be a better paradigm compare to the picture-word task (Jescheniak, et. al., 2014; Janssen, et al., 2014).

In Chapter 5, we employed the simple picture naming task to address whether bound gender-marked morphemes are selected competitively in Konso, for which most of gender-marked elements are bound morphemes. Bound gender-marked morphemes in Konso include *-si?* and *-sini?* on definite nouns, and *–t*, *–ay* and *–n* on verbs. These morphemes are identical for one gender class in the single-reference and multiple-reference, but differ for the other gender classes. Thus, Konso has two different definite markers in the single-reference definite nouns (*–sini?* for plural gender, and *–si?* for non-plural gender). By contrast, there is only one form for all multiple-reference definite nouns (i.e, *–sini?*), which corresponds to the form of plural gender in the single-reference definite nouns. In the subject agreement on the verb, Konso has three different gender-marking suffixes in the single-reference: *–t* for feminine, *–ay* for masculine, and *–n* for plural gender. However, there is only one verb ending (*–n*) for all in the multiple-reference trials, which corresponds with that of plural gender of the single-reference. In Chapter 5, participants named pictures of one or two objects by producing a single-reference or a multiple-reference gender-marked utterance (Definite noun in Experiment 1a, overt subject sentence in Experiment 2a, and null subject sentence in Experiment 2b) and a bare noun (control

experiment). In these experiments, the proportions with which gender-marked elements occur were manipulated. In Experiment 1a, the occurrence of the two gender-marked definite morphemes was kept equal, half (50%) of responses required *–si?* and the other half required *–sini?* as their definite suffix. In Experiments 2a and 2b, on the other hand, two thirds of the responses required *–n* morpheme, the converging form in the single-reference and multiple-reference trials.

In Experiment 1a, when the occurrence of the proportion of gender-marked morphemes was equally 50%, we observed gender by number interaction with multiple-reference costs of 81 ms for diverging gender-marked forms in single-reference and multiple-reference trials. These diverging forms correspond to the non-plural gender class, where *–si?* was used in the single-reference and *–sini?* was used in the multiple-reference trials. In the multiple-reference non-plural gender definite noun naming, increased competition was produced during bound morpheme selection due to the activation of different gender-marked definite suffixes (i.e. *–si?* vs. *–sini?*) and hence a cost effect was observed in this condition.

In Experiments 2a and 2b, where a higher percentage (66.67%) of responses required the converging form in the single-reference and multiple-reference trials (*–n*), there were multiple-reference benefits for this converging form (131 ms in Experiment 2a and 100 ms in Experiment 2b). This converging form, an *–n* morpheme, corresponds to the plural gender class in the single-reference trials. The benefit in the multiple-reference trials for plural gender may be due to the fact that the single-reference trial and its multiple-reference form gave combined activation to the same multiple-reference gender-marked form, which facilitated the selection of the

correct gender suffix. This benefit effect was not observed in Experiment 1a, where the proportion of occurrence of converging forms in single-reference and multiple-reference trial was 50%. Thus, increasing the proportion of the converging form in single-reference and multiple-reference trials to 66.67% in Experiments 2a and 2b may have increased the activation of this suffix. This increased activation in turn could weaken the competition of other single-reference suffixes with this suffix in the multiple-reference trials, which decreased the multiple-reference cost. By contrast, the convergence of the single-reference suffix with this suffix led to a benefit effect for trials containing a plural gender suffix.

In summary, the results of the study presented in Chapter 5 showed a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ. This was the case when the occurrence of the proportion of gender-marked morphemes was balanced. When responses with the converging forms in the single-reference and multiple-reference trials increased to 66.67%, this cost effect inclined to reduce and substituted by a benefit effect for multiple-reference trials for which single-reference and multiple-reference suffixes were identical. These patterns of results suggest that bound gender-marked morphemes in Konso are selected in competitive fashion. This is in accordance with theories of language production that assume gender-marked morphemes are selected competitively (Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak, et al., 2014).

In Chapter 5, we considered two major models that account for the selection mechanism of gender-marked morpheme during speech production: competitive and non-competitive selection models. The

major assumption of the non-competitive model is that the selection times of a target utterance depend only on the activation level of the target itself, and the activation of other competitors plays no role (Janssen et al., 2014). The competitive model, on the other hand, assumes that the activation of target utterances also activates competitors, and the activation of these competitors affects the selection times of the target utterance (Jescheniak et al., 2014). Accordingly, competitive and non-competitive models predict different types of gender by number interactions in the production of utterances with gender-marked morphemes in naming tasks. The non-competitive model predicts a gender by number interaction where there is a benefit in the production of multiple-reference trials with converging forms in the single-reference and multiple-reference, a benefit-type interaction (Janssen et al., 2014). The competitive model predicts a gender by number interaction where there is an additional cost in the production of multiple-reference trials with divergent forms in the single-reference and multiple-reference (a cost-type interaction) when the proportion of gender-marked morphemes is at least balanced in the experiment (Jescheniak et al., 2014). The finding of multiple-reference costs for diverging single-reference and multiple-reference gender-marked definite nouns of Experiment 1a in Chapter 5 is in line with the prediction of competitive models but not with non-competitive models.

Moreover, the finding of Chapter 5 is line with simple picture naming studies that propose competitive selection mechanism for the production of bound gender-marked morphemes, such as Schriefers et al. (2005) in German and Lemhöfer et al. (2006) in Dutch. Schriefers et al. and Lemhöfer et al. reported gender by number interactions of the benefit type during bound morpheme production

with a higher percentage (66% in Schriefers et al., 2005; and 75% in Lemhöfer et al., 2006) of responses with the converging form in the single-reference and multiple-reference trials. This corresponds with the benefit effect we observed in Experiments 2a and 2b, where 66.67% of responses required the converging form in the single-reference and multiple-reference trials. The new finding in Chapter 5 was that keeping the proportion of bound gender-marked morphemes equal resulted in a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ.

To the best of our knowledge, the empirical basis of most studies that propose a non-competitive processing mechanism for bound gender-marked morphemes is the gender congruency effect in picture-word tasks (Costa et al., 2003; Schiller & Caramazza, 2003; Schiller & Costa, 2006). These studies reported the absence of gender congruency effects in bound morpheme production. Note that there is counter evidence against such a position (Schriefers, 1993; Bordag & Pechmann, 2008). Moreover, the studies reported in Chapters 3 and 4 of the present dissertation show that a gender congruency effect could be obtained with bound morphemes. However, it should be noted that the status of the bound morphemes might differ between studies (see below). As also stated earlier, there is a growing consensus among researchers in the field that the gender congruency effect in picture-word tasks may not provide direct evidence to resolve the choice between competitive and non-competitive models since both models can account for this effect (Jescheniak et al., 2014; Janssen et al., 2014).

Besides, it is also possible that the observed effect in Konso bound morpheme production might be due to language-specific

properties. Konso is presumably different from Dutch and German, i.e. the languages investigated in the relevant studies. These differences may be indicated in terms of the function of gender suffixes on nouns and verbs, the nature of bound gender-marked morphemes, and the function of gender agreement and its intricate relation with number agreement. The definite suffixes *–si?*$_{M/F}$ and *–sini?*$_{P}$, and the verb inflections *–ay*$_{M}$, *–t*$_{F}$ and *–n*$_{P}$ were gender-marked morphemes, which were used in the Konso experiments that are reported in the present dissertation. These and other closed class functional morphemes are bound and may occur at the end of an utterance in Konso. For instance, no independent word can come between *–si?*$_{M/F}$/*–sini?*$_{P}$ and the noun; and they cannot be used as freestanding morphemes. If *–si?*$_{M/F}$ and *–sini?*$_{P}$ are used independently, they have to change into demonstrative pronouns (*ini?*$_{M/F}$ 'this one' and *ossini?*$_{P}$ 'this thing', Orkaydo, 2013, p. 129). Moreover, unlike the Dutch adjectival inflection *–e*, the definite suffixes *–si?*$_{M/F}$ and *–sini?*$_{P}$ in Konso are not pure (automatic) agreement features; rather they express value (definiteness) and they are not obligatory. The verb endings in Konso (*–ay*$_{M}$, *–t*$_{F}$ and *–n*$_{P}$) are inflectional agreements when we have an explicit subject but when there is no explicit subject, there is no agreement because Konso is a pro-drop language.

Therefore, our study not only replicated the finding of gender by number interactions in bound morpheme naming (Schriefers et al., 2005; & Lemhöfer et al., 2006) but also offered new empirical evidence in support of the view that the production of bound gender-marked morphemes are subject to competitive process. The present study, therefore, extended the findings by Schriefers et al. (2005) and Lemhöfer et al. (2006) to a geographically and genetically distinct

language, Konso. This provides additional cross-linguistic data on the processing mechanism of bound gender-marked morphemes.

6.4. Aspects of field-based psycholinguistics

Mention was made that the psycholinguistic investigations of gender are restricted to a limited number of Germanic and Romance languages. The studies reported in the present dissertation played an important role in extending the psycholinguistic investigation of grammatical gender beyond Indo-European languages. Another issue investigated here was whether it is feasible to apply standard experimental methods to under-represented languages within the field of psycholinguistics in rural areas. Psycholinguistic experiments are often carried out as lab research that requires ingenious experimental designs, advanced lab equipment such as eye-trackers, electroencephalography or even functional magnetic resonance imaging, large groups of experimental participants, and detailed statistical analyses. Our study has shown that it is indeed possible to conduct experiments in the fieldwork context although this has some challenges in comparison with running experiments in a standardized lab as will be shown later. In this regard, the current study uniquely examined the status of plural gender in Konso using behavioral methods, which also provides additional empirical and cross-linguistic evidence as far as bound gender-marked morpheme processing is concerned.

This section presents some of the issues encountered while conducting psycholinguistic behavioral studies in the rural area, outside of the standard lab in under-resourced remote area of East Africa specifically in southwest Ethiopia. The language we investigate is Konso; which belong to the Lowland East Cushitic

branch. In this and other Cushitic languages of the area, there is an interesting linguistic feature that nouns are classified into three gender classes and the third one (besides masculine & feminine) is arguably called plural gender. We employed a series of picture-word interference experiments to examine whether nouns in the plural gender group follow similar processing mechanism as nouns in the already accepted gender groups (masculine and feminine).

Conducting experiments on under-studied languages poses a number of challenges one needs to tackle. From designing up to running the experiments, there have been several challenges that I encountered during my fieldwork in Konso area. In what follows, a detailed discussion of some of these challenges and experiences of dealing with them will be presented hoping that such a discussion would help researchers who plan to undertake experiments on less-studied languages in rural areas. These include: the challenges of finding adequate number of monolingual speakers who are capable of doing computerized tasks; the remoteness of the area from the research institutions; and the challenges related to finding adequate stimulus materials and issues related with the development level of the languages investigated.

Coping with less accessible and less conducive environments

The fieldwork setting is different from the experimental lab where most of behavioral psycholinguistic experiments are typically undertaken. Most field-based psycholinguistic experiments are carried out in a remote area where there is no access to electricity and other facilities, and may be in a hotel room or a classroom where there is high humidity and external noise interference. Not to

mention that field-based psycholinguistics does involve travelling to rural areas where the languages are spoken. In most cases, these areas are located far from the research institutions. Konso, the language that are investigated in the present dissertation, are located over 7,000 kilometers away from Leiden University, where the research institute is located. This posed a challenge on designing the experiments and running pilot experiments since native speakers of Konso were not available near to the research institute. To run experiments, it required transporting the researcher and research equipment to these areas, in which there was no access to suitable experimental rooms and nor to electricity and Internet services. This means that when planning experiments on less-studied languages in rural areas, one needs to be aware of these circumstances and be prepared for tackling them in advance.

Konso speakers live in the remote area of southwest of Ethiopia. Konso people inhabit Konso Woreda6. Karat town is the center of Konso Woreda administration, where the experiments reported in the present dissertation were conducted. Karat is located about 600 kilometers south of Addis Ababa. Travelling to Karat from Addis Ababa takes one and half days by bus. Karat had limited access to electricity and Internet services, and there were no ventilated soundproof experimental rooms. The experiments were undertaken in relatively quiet rooms at a Konso High School. Regarding electricity, diesel power generators that belonged to the school was used.

6 Woreda is the smallest administrative unit besides Kebele in Ethiopia

Working with small number of participants

In many standardized psycholinguistic experiments that investigate grammatical gender/number processing, participants are usually university students who have tremendous experience in doing such experiments. These students are familiar with various experimental paradigms, arrangements, procedures, and apparatus and stimuli. This may make it easier and faster to run experiments with these participants though these practices have been criticized lately for creating opportunistic samples instead of random samples, as it should be. Moreover, they are easily accessible and willing to participate in the studies in exchange for course credits or some monetary compensation. Participants from less-studied languages, on the other hand, tend to be small in number with varied age and education levels with little or no experience of participating in psycholinguistic experiments. This may make it challenging to undertake experiments with such participants as it may require more time to access, select and train them in the field.

Absence of adequate number of suitable participants is one of the methodological challenges in working with less-studied languages. The speakers of the language, which are studied in the present dissertation, are small in number. According to the census of Central Statistical Agency of Ethiopia in 2007, Konso Woreda has a total population of 235,087. In Konso Woreda, Konso is the largest ethnic group (87.01%) and their language, Konso, was spoken as a first language by 86.64% of the inhabitants (Central Statistical Agency of Ethiopia, 1994). However, only 8.14% of the population was considered literate in Konso Woreda, of whom only 0.94% was in high school (Central Statistical Agency of Ethiopia, 1994). Although the experiments did not necessary require literacy skills,

participants of the experiments on Konso were recruited from high school students, which represented less than 1% of the population of Konso. The reason for choosing high school students was to have participants with comparable education level and age group that are able to take part in computerized experiments with little training. Although small percentages of native speakers of Konso are studying at high school level, it did not affect recruiting adequate number of Konso speakers. This is because, in Karat High School, where the participants of Konso experiments were recruited, there were more than 2,000 students, of whom the majority was from the Konso ethnic group. Although recruiting an adequate number of suitable candidates seemed to be challenging while working with less studied languages, going to the center of their village could help.

Moreover, although the majority of the students had not been exposed to linguistic experimentation and had no prior exposure to the tools used for the experiment, they had received very basic computer literacy and had some theoretical information as to how behavioral studies are administered. Introducing participants with tools was not a problem. Introducing participants with tasks was rather challenging and some of the participants often failed to follow the instructions. This posed a challenge during my first fieldwork, in which I had the standard procedure to follow. According to this procedure, first participants were presented with all the target pictures along with their intended names twice, in which participants were familiarized with pictures and encouraged to use the intended name of each picture. Then, each target picture was put on a screen for 350 ms. Here the presentation of pictures were accompanied by pink noise to acquaint participants with distractor elements. Finally, in the test phase proper, participants were requested to name pictures

as quickly and as accurately as possible using specific utterance formats such as bare noun or definite noun. They were also instructed to ignore simultaneously presented auditorily distractor words, which had the same or different gender as the target. The instructions were written in English and often interpreted in Amharic (a lingua franca) by the experimenter. Although participants could understand both English and Amharic, processing three languages at the same time might affect their performance and the results of the experiments. The absence of experience on the part of the participants was reflected in their struggle to disregard the distractor words. Some of the participants seemed to follow a strategy whereby they first listen to the distractor word and then start producing the target, which contributed to the overall slow naming latency as shown in Chapter 2. A few went on commenting, in the middle of the task, that there was a difference between the picture names and the audio they heard. All these factors indicate that the need to train participants more using a similar task as the test proper and the need to use oral instruction only in the target language throughout the experiment. This was what I did during my second and third fieldworks and there was a big difference as shown in Chapters 3, 4 and 5.

Dealing with the high level of bilingualism in the area is another important issue as far as the nature of participants is concerned. Bilingualism is the norm rather than an exception in a multilingual country such as Ethiopia. Konso is not an exception. In Konso, for example, although some people in the village are said to be monolingual, the vast majority either speaks or undestands more than one language. At Karat High School, like many other high schools across the country, English is the official language of education

whereas Amharic and Konso are the languages of interaction in and out of the school. Students use Konso natively at home and at school with family, with friends, and with Konso native speaker teachers. Combined, Konso is the dominant language in the school environment though frequent code switching with Amharic and occasional code mixing with some English words is not uncommon.

In a standard psycholinguistic experiment in the lab, participants are said to be native speakers (and even sometimes claimed to be monolinguals). We all are exposed to languages other than our native tongue in one or the other way in our life. In this sense, it is not easy to recruit pure monolingual speakers. The same holds for Konso speakers, most people know more than their native tongues. This could also be the case even for those speakers in remote Konso villages who speak only Konso all the time but may go to the market and trade with Amharic or other language speakers. These so-called monolingual speakers are in effect exposed to other languages of the area and/or Amharic (the lingua-franca), and even understand and speak them to some extent whenever they had no other option but speak the other language so as to content with the communicative demands of themselves and others. The question, then, is whether the selected students speak Konso natively and primarily? In other words, was Konso their dominant language?

In order to address the aforementioned questions, let us explain how the selection of participants was carried out. Although, we observed that almost all students speak Konso, their level of proficiency varied depending on possibly the frequency of their language use and where they come from (e.g. rural vs. urban areas). We learnt that some of them who had lived in the urban areas for many years tend to use more and more Amharic. Sometimes, some of

these students speak Konso with several Amharic words. In order to select participants who predominantly and actively speak Konso, the selection was first made by the school director and student coordinator, who themselves are native speakers of Konso. We also administered a quick test of naming basic vocabulary items afterwards. Those students who are selected by the school director and student coordinator, and who have passed the quick test of naming basic vocabulary items were selected to participate in the experiments. Their hearing and vision were intact. The main reason for the relatively careful selection procedure was that some students who did not speak the language superbly still wanted to participate in the experiments due to possibly the exoticness of the experimental paradigm and eagerness to be tested, to see what was going on during the experimentation, and due to the monetary compensation. Thus, one needs to be cautious when selecting participants for experiment in a multilingual setting similar to Konso area. From the perspective of the language proficiency, not everyone who speaks the language is eligible to participate in experiments. They should have relatively high level of mastery and they should use the language as their primary means of communication. This is one of the possible challenges researchers of under-studied languages could face. Speakers of less-studied languages tend to speak several languages in addition to their native-tongue and sometimes they speak the other language more frequently/actively than the target language.

Dealing with scarcity of stimulus materials

In relation to language and stimuli, the absence of standardized writing system, corpus data and normative data could pose a challenge during designing experiments in less studied languages.

Cultural difference with the Western world may also reduce the possibility of borrowing from the standardized pool of stimulus materials developed for other languages.

Konso does not have standardized writing systems and hence we employed auditory distractors instead of written distractors. During the first fieldwork to the Konso area, the written instruction of the experiments was provided in English since English is the language of education, and communication with experimenter was carried out in Amharic (the national lingua franca). This means that students had to process these two languages in addition to the target language while doing the experiment, which may affect their performance and the results of the experiment (see Chapter 2 of this dissertation). In the second and third fieldworks, some measures were taken to minimize the interference of other languages except the language being investigated. These measures include the use of a native speaker assistant; the use of written experimental instruction in a language they fully understand, i.e. Amharic instead of English; the use of auditory instruction in the target language rather than written instruction in other languages; and the use of other languages during the experiment were minimized. These measures along with other manipulations contributed in detecting the effects observed in Chapters 3, 4 and 5.

The other issue regarding the factor language and stimuli is that the absence of linguistic corpus data in most of less-studied languages. In Konso, the language investigated in the present dissertation, no corpus data were available to determine, for example, how frequently words occur in the language. To fill the gap of corpus data, native speakers were requested to rate the stimulus materials for frequency, familiarity, imageability and so on. In Konso, *A grammar*

of Konso (Orkaydo, 2013) and *Konso Dictionary* (Black & Shako, 1973, the printed version of this manuscript was prepared by Mous in 2005) were used as sources for stimuli. Orkaydo, a native speaker and linguist, participated in selecting stimulus materials in Konso as well. Attempts were made to use the word list from Iraqw so as to find additional stimulus material in Konso. Lack of adequate stimulus materials, being one of the challenges for undertaking experimental works in less-studied languages, can be tackled by using the corpus data from related languages, doing linguistic fieldwork ahead to collect additional linguistic data, and working with linguists and consultants of the language.

The cultural difference between the speakers of less-studied languages and well-studied languages of the Western world may not allow to borrow stimuli from the standardized stimulus materials, which are developed based on the culture of the Western world. The culture of Konso speakers are different from the culture of the Western world in many ways, and daily materials used by Konso people are not the same as most of the Western world. This means that words and the concepts used in their daily life are different in the two cultures. This means that researchers, who work on less-studied languages, have to make sure that the stimuli they use reflect the culture of the speakers of the language being investigated. This can be achieved by learning the culture of the speakers of the language and by using the intuition of speakers themselves. In my experience, working on Konso, I tried to familiarize myself with the culture of the people by paying attention to the daily objects that were used by the Konso people and taking pictures of them, by visiting their cultural museums, and by asking native speakers to check whether stimuli were part of their daily life and replacing

those stimuli that were less appropriate by pictures taken from daily objects in the area.

Despite the challenges, we believe it is worth undertaking psycholinguistic experiments in less-studied languages as they shed more light in understanding human language processing better. In this respect, we shed more light into the evolving discipline of field-based psycholinguistics. Thus, we promote the expansion of field-based psycholinguistic investigations in less-studied languages as they provide additional empirical and cross-linguistic evidence and expand our knowledge of language processing mechanisms.

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8. Summary

This thesis presents evidence obtained through a variety of picture naming tasks to investigate how native speakers of Konso process grammatical gender and number features. Gender and number features are characterized by an unusual overlapping in Konso and some other Cushitic languages. This intriguing property of gender and number is reflected on the behavior of the third agreement class, often called plural gender, in addition to masculine and feminine gender. This third agreement class (plural gender) refers to a class of nouns that require plural agreement forms even when they represent single entities. An ongoing debate in the linguistic literature concerns the status of this plural gender class for those languages that have this feature. Currently two basic hypotheses are contrasted. The *plural-as-a-number* feature hypothesis proposes that there is no need of postulating a third gender class for nouns taking plural agreement when they have single-reference as they can be analyzed as a number value with features indicating irregularity in number agreement. By contrast, the *plural-as-a-gender* feature hypothesis proposes that plural constitutes a gender feature of its own right since gender and number are two independent agreement systems and adjectives show separate agreement for both categories. This thesis provides psycholinguistic evidence for the analysis of this plural agreement class as a value of gender and not number by applying the picture-word interference paradigm to Konso, a Lowland East Cushitic language. While most psycholinguistic studies on the process of grammatical gender and number features have been limited to a handful of European languages in well-equipped laboratories, this

thesis has extended the study onto Cushitic languages in under-resourced semi-rural areas of Ethiopia. One of the main focuses of this dissertation is the role of field-based psycholinguistics for cross-linguistic investigation of gender and number features during speech production. Importantly, the thesis provides additional evidence as to how bound gender-marked morphemes are processed, one of the contentious issues in the current literature on theories of speech production.

Chapter 2 employed the picture-word interference task to examine how grammatical gender is processed during speech production in Konso. Previous studies in gender-marking languages have repeatedly demonstrated that grammatical gender could affect language processing. For example, in a picture-word interference task, where participants are requested to name pictures while ignoring distractor words accompanying the pictures, German and Dutch speakers were slower to produce a picture when the picture and the distractor have a different gender compare to when they have the same gender (see Schriefers, 1993; Caramazza et al., 2001; Schiller & Caramazza, 2003; Schiller & Costa, 2006; Schriefers & Teruel, 2000). This effect, where naming times of a picture are faster when the name of the picture and a distractor has the same gender, often called a gender congruency effect. Schriefers (1993) was the first to report the gender congruency effect in Dutch noun phrase production.

In Konso, nouns are said to be classified into three gender classes, the third being plural gender besides masculine and feminine (Orkaydo, 2013). As stated earlier, it is unclear whether plural behaves as a gender or as a number feature and how plural gender nouns are processed online during speech production. Chapter 2

presents two picture-word interference experiments, which examined whether or not nouns that have this third value, plural, show the same pattern of effect from gender-congruent/-incongruent distractor words that we see in Dutch and German. In the first experiment, participants named pictures by producing a bare noun while ignoring a simultaneously presented distractor noun. An overall congruency effect of 19 milliseconds (ms) was found (gender-congruent condition faster than gender-incongruent), which was significant only in the subject analysis of the target gender. In the second experiment, participants produced nouns with a gender-marked definite marker suffix. A non-significant 13 ms overall congruency effect was observed. The results of the two experiments fail to reach significance and hence it was impossible to draw strong conclusions.

Two possibilities are conceivable for the failure to obtain significant congruency effects in Konso. One possibility is that although all possible precautions were taken in the absence of norms in the language to control for factors such as word frequency, familiarity, typicality and age of acquisition, it could be the case that the effect of congruency is masked due to some methodological flaws in connection with the choice of stimuli and the design of experiments. The fact that the overall naming latency in both experiments was very slow (above 1,000 ms on average, which is much longer than most previous studies) may have masked the effect of congruency. Participants also performed very slowly in naming certain nouns irrespective of their distractor conditions possibly due to semantic interference within different target pictures and/or different distractor words, and the absence of clarity in the pictures used. Also, in Experiment 1 (bare noun naming), the number of distractors in the incongruent condition was twice the number of

distractors in the congruent condition as there were three gender types in the experiment. The motivation for this was to examine the effect of plural gender nouns independently as targets and as distractors vis-à-vis the other gender classes, which are recognized as values of genders. This might have caused the unintended impact of masking the effect of congruency in the experiment since the total number of distractors in the congruent condition was half the number of distractors in the incongruent condition. Similarly, in Experiment 2 (definite noun naming), distractor words were presented with their gender-marked definite suffixes, which might have an impact on the participants' responses as it may have led them to focus on form similarity between the target and the distractor.

The other possibility is that there is no congruency effect either in bare noun naming and/or in bound gender-marked morpheme production. Previous studies in Dutch demonstrated that there is no congruency effect in bare noun naming (see La Heij, Mak, Sander, & Willeboordse, 1998) as the gender feature is selected only when needed for production (see Levelt, Roelofs, & Meyer, 1999). With respect to the absence or the presence of gender congruency effect in bound gender-marked production, the evidence accumulated this far is rather mixed and inconclusive. On the one hand, congruency effect is limited to the production of noun phrases with gender-marked freestanding morphemes and not to the production of noun phrases with gender-marked bound morphemes (see Schiller & Caramazza, 2003; Costa, Kovacic, Fedorenko, & Caramazza, 2003; Schiller & Costa, 2006). On the other hand, the congruency effect is observed in the production of noun phrases with gender-marked freestanding morphemes as well as in the production of noun phrases with gender-marked bound morphemes (see Schriefers, 1993; Bordag &

Pechmann, 2008). This means that whether there is no gender congruency effect in the language or the effect of congruency may have been masked, and whether plural gender is a proper gender value or a value inherent to the number feature requires additional experiments. Additional experiments were undertaken in Konso with necessary modifications that involve avoiding and/or replacing defect stimuli (e.g. semantically related pictures and/or distractors, and less clear pictures), using gender-marked elements only for target utterances and bare nouns for distractors, utilizing equal number of distractors between congruent and incongruent conditions, additional training for participants to improve their performance. The results of these additional experiments are reported in Chapter 3.

In Chapter 3, two picture-word interference experiments were reported. In Experiment 1, Konso speakers produced nouns with gender-marked definite suffixes while ignoring auditory distractor words. Naming latencies were significantly shorter when targets and distractor words matched in gender, compared to when they did not. In Experiment 2, participants responded to target pictures by producing one of two sentence types with gender-marked inflections, either with or without overt subject. Overall, compared to the gender-congruent condition, gender-incongruent distractor words slowed down the naming latencies of the target pictures significantly. The fact that this gender congruency effect was also observed for the production of plural gender nouns provides evidence that plural gender is processed similarly to masculine and feminine. This supports the analysis of plural as a value of gender. The results also demonstrate that a congruency effect can be obtained in the production of bound gender-marked morphemes, which is consistent

with the competition hypothesis for the selection processes of bound morphemes.

Chapter 4 broadened the investigation of the status of plural gender with the inclusion of regular multiple-reference number into the experiments. In other words, Chapter 4 investigates whether the so-called plural gender is processed in the same as the other genders (masculine or feminine), which are recognized as values of gender, or in the same way as regular multiple-reference number in picture-word tasks. To investigate whether plural is processed as gender or number using picture-word tasks; pictures of one or two objects were presented with a single-reference or a multiple-reference distractor that has the same or different gender as the targets. In Experiment 1, participants responded to the pictures using gender-marked definite nouns; and in Experiments 2 and 3, they responded by producing a sentence with overt subject and null subject, respectively. Significant effects of gender congruency were observed in the single-object picture naming condition where the selection of gender suffixes is determined by the target's gender, but not in the multiple-object picture naming condition where the gender-marked suffixes are identical for all. The overall results suggest that plural gender nouns are processed similarly to feminine and masculine single-reference nouns, and differently from regular multiple-reference nouns. This supports the analysis of plural as a gender but not as a number feature in Konso. It also indicates that the gender congruency effect occurs at the phonological encoding level, and the selection of gender-marked suffixes involves competitive processes.

As stated earlier, whether the selection of bound gender-marked morphemes involves competitive processes is an ongoing debate in the speech production literature (see, Jescheniak, Schriefers, &

Lemhöfer, 2014; Janssen, Schiller, & Alario, 2014). The results reported in Chapters 3 and 4 reveal the presence of a gender congruency effect in the production of bound gender-marked morphemes. This does not necessarily indicate that bound morphemes are selected competitively. This is because the effect of congruency can be accounted by both competitive (competition between varied gender-marked forms in the incongruent condition delays response times) and noncompetitive (priming between convergent gender-marked forms in the congruent condition speeds up response times) selection models. In this respect, a simple picture naming task, which does not involve distractors, is the preferred paradigm for determining whether bound morphemes are selected competitively.

Chapter 5 employed a simple picture naming task to examine whether bound gender-marked morphemes are selected competitively in Konso, in which most of gender-marked elements are bound morphemes. In two experiments in Konso, participants named pictures of one or two objects by producing a single-reference or a multiple-reference gender-marked utterance and a bare noun (control experiment). In these experiments, the proportions with which gender-marked elements occur were manipulated. In Experiment 1a, the occurrence of gender-marked morphemes was equally often whereas in Experiments 2a and 2b two-thirds of the responses required the converging form (the suffix *–n*) in the single-reference and multiple-reference trials. The results of the study presented in Chapter 5 showed a cost effect for multiple-reference trials when single-reference and multiple-reference gender-marked suffixes differ. This was the case when the occurrence of the proportion of gender-marked morphemes was balanced (Experiment 1a). When the

proportion of responses with the converging forms in the single-reference and multiple-reference trials increased to two-thirds (Experiments 2a & 2b), this cost effect disappeared and turned into a benefit effect for multiple-reference trials for which single-reference and multiple-reference suffixes were identical. The finding of multiple-reference costs for diverging single-reference and multiple-reference gender-marked definite nouns of Experiment 1a in Chapter 5 goes with the prediction of the competitive model, which predicts a gender by number interaction where there is an additional cost in the production of multiple-reference trials with divergent forms in the single-reference and multiple-reference (a cost-type interaction) when the proportion of gender-marked morphemes is at least balanced in the experiment (see Jescheniak et al., 2014). These patterns of results suggest that bound gender-marked morphemes in Konso are selected in a competitive fashion. This is in accordance with theories of language production that assume gender-marked morphemes are selected competitively (see, Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014).

Another issue investigated in this thesis was whether it is feasible to apply standard experimental methods to under-represented languages within the field of psycholinguistics in rural areas. Psycholinguistic experiments are often conducted as lab research that requires ingenious experimental designs, advanced lab equipment such as eye-trackers, electroencephalography or even functional magnetic resonance imaging, large groups of experimental participants, and detailed statistical analyses. Our study has shown that it is indeed possible to conduct experiments in the fieldwork context although it has some challenges compared to running

experiments in a standardized lab. Conducting experiments on under-studied languages in rural areas requires, among other things, coping with less accessible and less conducive environments, working with small numbers of participants, and dealing with scarcity of stimulus materials.

Overall, the studies reported in the present dissertation have shown that plural is indeed a value of gender and not number in Konso. Moreover, bound gender-marked morphemes, such as definite suffixes and verb inflections of Konso, involve competitive rather than noncompetitive selection mechanism. The studies presented in the dissertation also played a vital role in extending the psycholinguistic investigation of gender beyond Indo-European languages and in introducing experimental approaches into the study of Cushitic gender.

9. Nederlandse samenvatting

In dit proefschrift onderzoek ik hoe moedertaalsprekers van het Konso grammaticaal geslacht en getal verwerken. Ik presenteer bewijs dat is verkregen door verschillende experimenten waarbij proefpersonen plaatjes benoemden. In het Konso en in sommige andere Koesjitische talen is er een ongebruikelijke overlap van geslacht en getal. Dit interessante verschijnsel behelst een derde congruentieklasse, veelal 'plural gender' genoemd, bovenop mannelijk en vrouwelijk geslacht. Deze derde congruentieklasse ('plural gender') refereert naar een groep naamwoorden die in meervoud congrueren, zelfs als zij naar een entiteit refereren die enkelvoudig is. Een lopend debat in de taalwetenschappelijke literatuur gaat over de status van de 'plural gender' klasse in talen waarin men deze klasse vindt. Er zijn twee basishypotheses die met elkaar in contrast staan. De 'plural-as-a-number feature' hypothese beweert dat het niet nodig is om een derde geslachtsklasse voor naamwoorden die in meervoud congrueren aan te nemen wanneer die een enkelvoudige referent hebben, omdat dit geanalyseerd kan worden als een waarde van getal met kenmerken die wijzen op onregelmatigheid in de meervoudscongruentie. De 'plural-as-a-gender feature' hypothese daarentegen beweert dat meervoud een kenmerk van geslacht is, omdat geslacht en getal twee onafhankelijke congruentiesystemen hebben en omdat adjectieven voor beide categorieën congrueren maar op een verschillende wijze. Dit proefschrift verschaft psycholinguïstisch bewijs voor de analyse van de meervoudscongruentieklasse als een waarde van geslacht en niet van getal door het 'plaatje-woord interferentie' paradigma toe te passen op Konso, een Laagland Oost Koesjitische taal. Terwijl de

meeste psycholinguïstische studies over het verwerken van kenmerken van grammaticaal geslacht en getal beperkt zijn tot een aantal Europese talen in goed uitgeruste laboratoria, heeft dit proefschrift de studie uitgebreid naar Koesjitische talen gesproken in semi-landelijke gebieden in Ethiopië met weinig middelen. Eén van de aandachtspunten van dit proefschrift is de rol van op veldwerk gebaseerde psycholinguïstiek voor cross-linguïstisch onderzoek naar kenmerken van geslacht en getal tijdens spraakproductie. Een ander belangrijk punt is dat dit proefschrift aanvullend bewijs verstrekt over hoe gebonden geslachtsgemarkeerde morfemen worden verwerkt, één van de twistpunten in de huidige literatuur over theorieën over spraakproductie.

Hoofdstuk 2 gebruikt de plaatje-woord interferentie taak om te bepalen hoe grammaticaal geslacht verwerkt wordt tijdens spraakproductie in het Konso. Voorgaande studies over talen met grammaticaal geslacht hebben telkens laten zien dat grammaticaal geslacht invloed kan hebben op de spraakverwerking. Bijvoorbeeld, in een plaatje-woord interferentie taak, waarbij proefpersonen worden gevraagd om plaatjes te benoemen terwijl zij de bijkomende afleiderwoorden negeren, waren sprekers van het Duits en het Nederlands langzamer in de productie bij een plaatje als het naamwoord van dat plaatje en de afleider een verschillend geslacht hadden dan wanneer ze hetzelfde geslacht hadden (zie Caramazza et al., 2001; Schiller & Caramazza, 2003; Schiller & Costa, 2006; Schriefers, 1993; Schriefers & Teruel, 2000). Dit effect, waarbij het benoemen van een plaatje sneller gaat als het naamwoord op het plaatje en de afleider hetzelfde geslacht hebben wordt vaak het geslachtscongruentieëffect genoemd. Schriefers (1993) was de eerste

die schreef over het geslachtscongruentieëffect in de productie van naamwoordsgroepen in het Nederlands.

Van het Konso zegt men dat naamwoorden geclassificeerd kunnen worden in drie klassen van geslacht, waarvan het derde het meervoudsgeslacht is, bovenop mannelijk en vrouwelijk geslacht (Orkaydo, 2013). Zoals eerder genoemd is het onduidelijk of het meervoud zich als geslacht of getal gedraagt in de verwerking van spraak en ook hoe naamwoorden met meervoud als geslacht verwerkt worden tijdens de spraakproductie. Hoofdstuk 2 presenteert twee plaatje-woord interferentie experimenten die onderzochten of naamwoorden met deze derde waarde van geslacht, meervoud, hetzelfde verwerkingspatroon laten zien ten aanzien van geslachtscongruente en geslachtsincongruente afleiderwoorden zoals we dat zien in het Nederlands en het Duits. In het eerste experiment benoemden de proefpersonen plaatjes door middel van naamwoorden daarbij het afleidernaamwoord dat tegelijkertijd gepresenteerd werd negerend. Er was een algeheel congruentieëffect van 19 milliseconden (ms) (de geslachtscongruente conditie was sneller dan de geslachtsincongruente conditie), maar dit effect was alleen significant in de subject analyse van het geslacht als doel. In het tweede experiment benoemden de proefpersonen plaatjes door middel van een naamwoord met een geslachtsmarkerend lidwoord (gemarkeerd door een suffix). Er werd een algeheel niet-significant congruentieëffect van 13 ms gevonden. Omdat de twee experimenten geen significant resultaat opleverden was het niet mogelijk om duidelijke conclusies te trekken.

Er zijn twee mogelijkheden voor het niet behalen van significante congruentieëffecten voor het Konso. De eerste mogelijkheid is dat ondanks alle voorzorgmaatregelen die waren

genomen wat betreft factoren zoals woordfrequentie, vertrouwdheid van het begrip, en de leeftijd van taalverwerving van de proefpersoon, het mogelijk is dat het congruentieëffect gemaskeerd werd door methodologische tekortkomingen gerelateerd aan de keuze van de stimuli en het ontwerp van de experimenten. Het feit dat de algehele latentietijd in beide experimenten erg traag was (gemiddeld langer dan 1,000 ms, veel langer dan in de meeste voorgaande studies) kan het congruentieëffect hebben gemaskeerd. De proefpersonen waren ook erg traag in het benoemen van bepaalde naamwoorden ongeacht de condities van de afleider, mogelijk door semantische interferentie tussen verschillende plaatjes en/of verschillende afleiderwoorden, en het gebruik van minder duidelijke of vertrouwde plaatjes. Daarbij komt dat in Experiment 1 (benoemen van bare nouns), het aantal afleiders in de incongruente conditie twee keer zo hoog was als het aantal afleiders in de congruente conditie omdat er drie types van geslacht waren in het experiment. De reden hiervoor was dat om het effect van naamwoorden met meervoud als geslacht onafhankelijk als targets en als afleiders te bestuderen, tegenover de andere twee geslachten, vrouwelijk en mannelijk, die onomstreden als waardes van geslacht beschouwd worden. Dit kan onbedoeld een maskerende impact hebben gehad op het congruentieëffect in het experiment omdat het totale aantal afleiders in de congruente conditie de helft was van het aantal afleiders in de incongruente conditie. In Experiment 2 (het benoemen met definiete naamwoorden), werden de afleiderwoorden gepresenteerd met geslachtsmarkerende definiete suffixen, die invloed gehad kunnen hebben op de antwoorden van de proefpersonen omdat dit de focus gelegd kan hebben op gelijkenis in vorm van target en afleider.

Een andere mogelijkheid is dat er geen congruentieëffect is, noch in het benoemen van alleen de naamwoorden zonder lidwoord, zogenaamde bare nouns, noch in de productie van gebonden geslachtsmarkerende morfemen. Eerdere studies over het Nederlands hebben laten zien dat er geen congruentieëffect is voor het benoemen van bare nouns (zie La Heij, Sander & Willeboordse, 1998) omdat het geslacht alleen geselecteerd wordt wanneer het nodig is voor de productie (zie Levelt, Roelofs & Meyer, 1999). Wat betreft de afwezigheid of aanwezigheid van een geslachtscongruentieëffect in de productie van gebonden morfemen met geslachtskenmerken zijn de bewijzen tot dusver tegenstrijdig en niet doorslaggevend. Aan de ene kant is het congruentieëffect beperkt tot de productie van naamwoordsgroepen met zelfstandige geslachtsmarkerende morfemen en behelst niet de productie van naamwoordsgroepen met gebonden geslachtsmarkerende morfemen (zie Costa, Kovacic, Fedorenko & Caramazza, 2003; Schiller & Caramazza, 2003; Schiller & Costa, 2006). Andere studies vinden het congruentieëffect zowel in de productie van naamwoordsgroepen met zelfstandige geslachtsmarkerende morfemen alsook in de productie van naamwoordsgroepen met gebonden geslachtsmarkerende morfemen (zie Bordag & Pechmann, 2008; Schriefers, 1993). De conclusies uit Hoofdstuk 2 zijn dat er óf geen congruentieëffect bestaat in de taal óf dat het effect gemaskeerd is. De onderzoeksvraag of meervoud een waarde van geslacht is of een waarde inherent aan getal kan alleen beantwoord worden met verdere experimenten. Vervolgexperimenten werden uitgevoerd in Konso met noodzakelijke aanpassingen zoals het mijden en/of vervangen van bepaalde stimuli (e.g. semantisch gerelateerde plaatjes en/of afleiders en de minder duidelijke plaatjes), het gebruik van geslachtsmarkerende elementen alleen voor target

uitingen en bare nouns voor afleiders, het gebruik van gelijke aantallen afleiders voor de congruente en de incongruente condities, en extra training van de proefpersonen om hun prestaties te verbeteren. De resultaten van de extra experimenten worden besproken in Hoofdstuk 3.

In Hoofdstuk 3 wordt over twee plaatje-woord interferentie experimenten gerapporteerd. In Experiment 1 produceerden sprekers van het Konso naamwoorden met een geslachtsmarkerend definiet suffix waarbij zij een auditief afleiderwoord moesten negeren. De benoemingslatenties waren significant korter wanneer de targets en de afleiderwoorden hetzelfde geslacht hadden, in vergelijking tot wanneer dit niet het geval was. In Experiment 2 moesten proefpersonen antwoorden op target plaatjes door één van twee zinstypes met gendermarkerende inflecties te produceren, met of zonder een overt onderwerp. Over het geheel, vergeleken met de geslachtscongruente conditie remden de geslachtsincongruente afleiderwoorden de benoemingslatenties significant af. Het feit dat het geslachtscongruentieëffect ook gevonden werd voor de productie van meervoudsnaamwoorden bewijst dat meervoud op dezelfde manier wordt verwerkt als mannelijk en vrouwelijk. Dit ondersteunt de analyse van meervoud als een waarde van geslacht. De resultaten laten ook zien dat een congruentieëffect verkregen kan worden in de productie van gebonden geslachtsmarkerende morfemen. Dit is consistent met de competitiehypothese over selectieprocessen van gebonden morfemen.

Hoofdstuk 4 verbreedt het onderzoek naar de status van het meervoudsgeslacht door het toevoegen van meervoudigheid in getal aan de experimenten. Met andere woorden, Hoofdstuk 4 onderzoekt of het zogenaamde meervoudsgeslacht op dezelfde manier verwerkt

wordt als de andere geslachten (mannelijk en vrouwelijk), die al erkend zijn als waardes van geslacht, of op dezelfde manier als meervoudig (multiple-reference) getal in plaatje-woord taken. Om dit te onderzoeken met een plaatje-woord taak, worden plaatjes van één of twee objecten gepresenteerd met een single-reference of een multiple-reference afleider met hetzelfde geslacht als de targets. In Experiment 1 moesten de proefpersonen antwoorden op plaatjes met geslachtsmarkerende definiete naamwoorden; in Experimenten 2 en 3 moesten zij antwoorden door een zin te produceren met respectievelijk een uitgesproken onderwerp en een verondersteld onderwerp. Er werden significante effecten van geslachtscongruentie gevonden in de conditie waarbij één plaatje benoemd werd en waarbij de selectie van de geslachtsuffixen afhangt van het geslacht van de target, maar niet in de multiple-object picture naming conditie waarbij de geslachtsmarkerende suffixen altijd hetzelfde zijn. Het resultaat suggereert dat naamwoorden met meervoud als geslacht op dezelfde manier verwerkt worden als vrouwelijke en mannelijke single-reference naamwoorden, en anders dan multiple-reference naamwoorden. Dit ondersteunt een analyse van meervoud als geslacht en niet als getal in Konso. Het geeft ook aan dat het geslachtscongruentieëffect zich voordoet op het niveau van fonologische codering, en dat de selectie van geslachtsmarkerende suffixen competitieve processen met zich meebrengt.

Of de selectie van gebonden geslachtsmarkerende morfemen competitieve processen met zich meebrengt is een voortdurend debat in de literatuur over spraakproductie, zoals eerder vermeld (zie Janssen, Schiller & Alario, 2014l; Jescheniak, Schriefers & Lemhöfer, 2014). De resultaten in Hoofdstuk 3 en 4 tonen de aanwezigheid van een geslachtscongruentieëffect in de productie van

gebonden geslachtsmarkerende morfemen aan. Dit betekent niet per se dat gebonden morfemen competitief geselecteerd worden. Dit is zo omdat het effect van congruentie uitgelegd kan worden door zowel competitieve (competitie tussen verschillende geslachtsmarkerende vormen in de incongruente conditie vertraagt de reactietijden) en niet competitieve (priming tussen convergerende geslachtsmarkerende vormen in de congruente conditie versnelt de reactietijden) selectiemodellen. In dit opzicht is een 'simple picture naming' taak, zonder afleiders, het geprefereerde paradigma om te bepalen of gebonden morfemen competitief geselecteerd worden.

Hoofdstuk 5 wendt een simple picture naming task aan om te onderzoeken of gebonden geslachtsmarkerende morfemen competitief geselecteerd worden in het Konso (waarin de meeste geslachtsmarkerende elementen gebonden morfemen zijn). In twee experimenten in het Konso benoemden de proefpersonen plaatjes van één of twee objecten met een zin met een single-reference of een multiple-reference geslachtsmarkerend werkwoord of met een bare noun (controle experiment). In deze experimenten werden de proporties waarmee geslachtsmarkerende elementen voorkomen gemanipuleerd. In Experiment 1a was de proportie van geslachtsmarkerende morfemen gelijk, maar in Experimenten 2a en 2b vereiste tweederde van de antwoorden de convergerende vorm (vrouwelijk of mannelijk) voor de single-reference en multiple-reference trials. De resultaten van de studie in Hoofdstuk 5 lieten een kosteneffect zien voor multiple-reference trials als de geslachtsmarkerende suffixen van single-reference en multiple-reference van elkaar verschilden. Dit was het geval bij de gebalanceerde proporties van geslachtsmarkerende morfemen (Experiment 1a). Wanneer de proportie van antwoorden met de

convergerende vormen in de single-reference en de multiple-reference trials verhoogd werd tot tweederde (Experimenten 2a & 2b), verdween het kosteneffect en werd het een bateneffect voor de multiple-reference trials waarvoor de single-reference en de multiple-reference suffixen identiek waren. Het resultaat van multiple-reference kosten voor de divergerende single-reference en multiple-reference geslachtsmarkerende definiete naamwoorden van Experiment 1a in Hoofdstuk 5 ondersteunt de voorspelling van het competitieve model, dat een interactie van geslacht en getal voorspelt met extra kosten in de productie van multiple-reference trials met divergerende vormen in de single-reference en de multiple-reference (een kosten-type interactie) als de proportie van geslachtsmarkerende morfemen tenminste gebalanceerd is in het experiment (zie Jescheniak et al., 2014). Deze patronen van resultaten suggereren dat gebonden geslachtsmarkerende morfemen in Konso competitief geselecteerd worden. Dit is in lijn met theorieën over spraakproductie die aannemen dat geslachtsmarkerende morfemen competitief geselecteerd worden (zie Schriefers, 1993; Schriefers, Jescheniak, & Hantsch, 2005; Lemhöfer, Schriefers, & Jescheniak, 2006; Bordag & Pechmann, 2008; Jescheniak et al., 2014).

Psycholinguïstische experimenten worden vaak uitgevoerd in laboratoria en vereisen een ingenieuze experimentele opzet, geavanceerde laboratoriumapparatuur zoals eye-trackers, elektro-encefalografie of zelfs functional magnetic resonance imaging, en grote groepen proefpersonen. Onze studie heeft aangetoond dat het mogelijk is om experimenten uit te voeren in een veldwerkcontext; ondanks de uitdagingen die er zijn. Wanneer men experimenten uitvoert op weinig bestudeerde talen in landelijke gebieden moet men onder andere omgaan met een minder toegankelijke en een minder

gunstige omgeving, werken met kleinere aantallen proefpersonen en omgaan met het gebrek aan passend stimulusmateriaal.

Globaal genomen laten de studies in dit proefschrift zien dat meervoud in het Konso een waarde van geslacht is en niet van getal. Bovendien ligt aan gebonden geslachtsmarkerende morfemen zoals definiete suffixen en werkwoordinflecties in het Konso een competitief selectiemechanisme ten grondslag. Dit proefschrift speelt daarnaast een essentiële rol in het uitbreiden van psycholinguïstisch onderzoek naar geslacht naar meer dan alleen Westerse talen en in de introductie van een experimentele benadering van het bestuderen van geslacht in Koesjitische talen.

10. Curriculum vitae

Mulugeta Tarekegne Tsegaye was born on 11 November 1977 in Gondar, Ethiopia. He completed his high school education in 1998 at Azezo Senior Secondary High School (with Great Distinction). In the same year, he joined Addis Ababa Univesity and graduated in July 2003 with a Bachelor of Arts in Foreign Languages and Literature (English). From Feburary 2005 to August 2006, he was employed as a graduate assistant at Mekele University, Ethiopia. After graduating from Addis Ababa University with a Master of Arts in Linguistics in 2008, he took up an Erasmus Mundus scholarship to attend a consortium European Masters Programme at universities of Groningen, Joensuu and Potsdam, and graduated with a Master of Science in Clinical Linguistics in 2010. In June 2010, he was employed as a lecturer at the Department of Linguistics in Addis Ababa University. From February 2011 to January 2015, he was employed as a PhD candidate at Leiden University Center for Linguistics (LUCL). Mulugeta is married and has a son.