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

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CHAPTER 3

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

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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	ʄooɗɗita	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