

The acquisition of Sesotho nominal agreement

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Abstract The acquisition of Bantu noun class prefixes has long been an issue of theoretical interest, due in part to the large number of gender classes. In contrast, the acquisition of Bantu nominal agreement has received little attention. Given findings from other languages, one might expect the phonologically transparent system of Bantu agreement to be mastered early and easily. However, the recent discovery that Sotho languages permit null prefixes under certain grammatical conditions raises the possibility that learning nominal agreement might be more challenging than originally thought. The goal of this study was therefore to assess Sesotho-speaking 2–3-year-olds' acquisition of nominal agreement as a function of full versus reduced noun class prefixes. Although the children exhibited early phonological underspecification, they otherwise represented nominal agreement with little problem, whether the noun class prefix was produced or not. The implications for learnability, and the development of lexical representations more generally, are discussed.

Keywords Bantu · Sesotho · Noun class prefixes · Agreement · Acquisition

1 Introduction

Over the past several decades, a number of studies have examined children's acquisition of grammatical gender and agreement in Icelandic, Germanic, Slavic,

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and Romance languages (see Corbett 1991, 2006 for reviews). These studies have typically found that simple, regular cases of formal gender and agreement systems are acquired by around the age of 3. For example, Smoczyńska (1986) found that Polish-speaking children master grammatical gender as early as age 2. Furthermore, Szagun et al. (2007) found that, by 3 years, German-speaking children's errors with grammatical gender assignment (as evidenced by article usage) dropped below ten percent. This is quite remarkable given that German gender marking on articles interacts with case (e.g., masculine nominative *der* vs. masculine accusative *den*). However, the acquisition of formal gender marking in Icelandic, where there are few phonological cues to grammatical class, is much more protracted (Mulford 1985).

These findings raise many questions about how children learn formal gender classes and agreement systems, and the extent to which semantics or phonology may play a primary role. Other formal aspects of the system, such as the nature of the agreement (number vs. gender), grammatical domain over which it occurs, if it is realized in terms of a bound or free morpheme, and the extent to which it may be transparent/opaque and alliterative (Corbett 2006), could also influence the acquisition process. Unfortunately, there has been relatively little research on agreement per se, making it difficult to draw definitive conclusions. Nonetheless, the few studies that have investigated this interesting issue shed some light on how agreement systems may be learned, and the strategies learners take when the assignment of agreement is not straightforward.

Some researchers have speculated that, in languages with masculine and feminine grammatical gender, children may begin learning nouns with a natural gender, and only later extend the patterns associated with these words to nouns with no semantic link to grammatical gender. This is the case, for example, in Icelandic (Mulford 1985). However, Karmiloff-Smith (1981) found that, up to the age of 10, French-speaking children use phonological rather than semantic information when making judgments on grammatical gender. After first presenting children with pictures of clearly gendered imaginary creatures, she then assigned these creatures novel names whose endings served as typical phonological cues for grammatical gender in French (e.g. feminine *plichette* vs. masculine *chalois*). In cases in which the natural (semantic) gender and grammatical (phonological) gender cues conflicted, children used the phonological cues in choosing the appropriate definite article. For French-speaking learners, then, gender and agreement are part of a formal grammatical system.

Other researchers have also found that children are sensitive to phonological information in mastering grammatical gender and agreement, even for languages where phonological patterns are not always readily apparent. In her study of gender acquisition in German and English, Mills (1986) noted that older children paid some attention to phonological patterns when assigning gender in German. However, in cases where they did not know which article to use, they would simply omit it. Szagun et al. (2007) examined German-speaking children aged 1;4–3;8, finding that articles began to be produced between 1;5 and 1;8 years. They also found that children often assigned the wrong gender to nouns that had phonological markings

typically associated with another gender (e.g., monosyllabic nouns and polysyllabic nouns ending in *-el*, *-en* and *-er* that were not masculine).

Still others have noted that errors in gender and/or agreement tend to occur primarily in cases where there is a conflict in phonological cues. Karmiloff-Smith (1981) found that, until the age of 6, French-speaking children used word-final cues rather than article information to determine the gender of a noun. For example, given the nonce-word *un plichette* (masculine article vs. feminine ending on noun) children later referred to the object as *la plichette*, with both article and noun in the feminine. Thus, French-speaking children apparently encode the gender on the noun, and later access this information in forming agreement operations. A similar process is reported for Hebrew, where masculine nouns ending in the feminine *-ot* (rather than *-im*) are erroneously assigned feminine plural *-ot* agreement (e.g., *kir-ot lvan-im* > **kir-ot lvan-ot* ‘white walls’) (Berman 1985). However, Spanish-speaking children appear to take the opposite approach. Using a task similar to that of Karmiloff-Smith (1981), Perez-Pereira (1991) found that 4–11-year-olds who heard *un capola* were subsequently more likely to produce *el capola* (rather than *la capola*), maintaining the masculine article even though the nominal ending suggested that this is a feminine noun. Perhaps this is due to the fact that some masculine nouns in Spanish actually end in *-a* (e.g., *el mapa* ‘the map’).

In cases where the gender of the noun is unclear, children may use a ‘default’ strategy to assign agreement. Mills (1986) found that children tended to overgeneralize the high-frequency German feminine nominative/accusative article *die* when they were uncertain about the gender class to which a noun belonged. On the other hand, Szagun et al. (2007) report overgeneralization of masculine *der*. In a study of nouns with ambiguous endings in Spanish, Montrul (2004) found that one child initially regularized the article of ambiguously marked nouns to masculine (*una llave* > **un llave* ‘the key’, *una leche* > **un leche* ‘a milk’), but later regularized to the feminine (*un pez* > **una pez* ‘a fish’). Finally, feminine nouns that ended in *-o* were themselves regularized to agree with the modifier (*moto roja* > **mota roja* ‘red car’). Boloh and Ibernon (2010) also found a tendency to use masculine as a default in French. Thus, there may be individual, developmental, task-specific, and language differences in the types of agreement overgeneralization found when nouns are not clearly marked for gender class.

The rate of acquisition of gender and agreement may also be influenced by relative phonological transparency. For example, Smoczyńska (1986) suggests that gender and agreement are acquired earlier in Polish compared with Russian due in part to the phonological transparency of gender marking on Polish diminutives. For example, the Polish masculine noun for ‘rabbit’ (*zajac*) is diminutivized as *zajaczek*. In both cases, the word ends in a consonant — the phonological marker for a masculine noun. In contrast, the Russian masculine word for ‘rabbit’ (*zayats*) is diminutivized as *zayka*, with a final (feminine) vowel. The Russian situation presents conflicting gender cues for the child, and slows acquisition of the gender/agreement system compared to the more phonologically regular and transparent situation in Polish.

1.1 Implications for learning gender and agreement in Bantu languages

The issues discussed above are highly relevant for making predictions regarding the acquisition of nominal gender class agreement in Bantu languages. Although Bantu noun class prefixes have an historical foundation in semantics, as shown in (1) (cf. Richardson 1967; Welmers 1973; Corbett 1991), this is largely non-productive today.¹ This is evidenced through the phonological rather than semantic incorporation of most loanwords in the southern Bantu language Sesotho, spoken in Lesotho and adjacent parts of South Africa (cf. Demuth 2000; Rose and Demuth 2006).

(1) Proto-Bantu Noun Class Meanings

<i>Noun Class</i>	<i>Meanings</i>
1/2	humans, other animates
1a/2a	kinship terms, proper names
3/4	trees, plants, non-paired body parts, other inanimates
5/6	fruits, paired body parts, natural phenomena
6	liquid masses
7/8	manner
9/10	animals, inanimates
11	long thin objects, abstract nouns
12/13	diminutives
14	abstract nouns, mass nouns
15	infinitive
16,17,18	locatives (near, remote, inside)
19	diminutive
20/22	augmentive (diminutive)
21	augmentive pejorative

Furthermore, unlike Indo-European systems that have two or three gender classes (masculine, feminine, and sometimes neuter), Bantu languages have up to 23 nominal genders, depending on the language. This is shown in (2), where the Proto-Bantu reconstructed forms (Meeussen 1967) are presented along with modern-day Kiswahili, IsiZulu, Setswana and Sesotho. Note that even for the latter two languages, which are part of the closely related Sotho cluster of languages, Sesotho has lost more noun classes. Note also that IsiZulu, an Nguni language, has pre-prefixes (i.e. V–CV).

¹ Some derivational processes, with concomitant semantics, remain (Doke and Mofokeng 1985). Examples from Sesotho include agentive nouns taking human class 1/2 prefixes (*ho-pheha* 'to cook' > *mo-phehi* 'cook'), attributive nouns taking class 7/8 prefixes (*ho-bina* 'to sing' > *se-bini* 'professional singer'), and abstract nouns taking class 14 prefixes (*ho-phela* 'to live' > *bo-phelo* 'life') (cf. Demuth 2000).

(2) Comparative Bantu Noun Class Prefixes

	<i>*ProtoBantu</i>	<i>Kiswahili</i>	<i>IsiZulu</i>	<i>Setswana</i>	<i>Sesotho</i>
1	mo-	m-	umu-	mo-	mo-
1a	∅		u-	∅	∅
2	βa-	wa-	aba-	ba-	ba-
2a	βò-		o-	bo-	bo-
3	mo-	m-	umu-	mo-	mo-
4	me-	mi-	imi-	me-	me-
5	le-	∅/ji-	i(li)-	le-	le-
6	ma-	ma-	ama	ma-	ma-
7	ke-	ki-	isi	se-	se-
8	βi-/di	vi-	izi	di-	di-
9	n-	∅/n-	in-	N-	(N)-
10	di-n-	∅/n-	izin-	diN-	di(N)-
11	lo-	u-	u(lu)-	lo-	
12	ka-				
13	to-				
14	βo-	u-	ubu	bo-	bo-
15	ko-	ku-	uku-	yo-	ho-
16	pa-	pa-		fa-	
17	ko-	ku-		yo-	ho-
18	mo-	m-		mo-	
19	pi-				
20	yo				
21	yi				
22	ya				
23	ye				

Given the large number of gender classes, we might expect that children learning a Bantu noun class system would proceed slowly and be prone to error. However, several studies show that these systems are typically in place by around the age of 3 (see Demuth (2003) for review). Less is known about the acquisition of agreement.

Consider examples (3a) and (3b) below from Sesotho. In most Bantu languages the unmarked word order in main clauses is SVO. Nouns and modifiers agree in gender/number. Thus, in (3a) the class 2 subject noun *ba-shanyana* ‘boys’ agrees with the following demonstrative *ba-ne* ‘those’.² As predicted by Greenberg (1963) in his Universals, the same features are marked in subject-verb agreement, realized as the class 2 subject marker *ba-*. Bantu languages are also null subject languages. The lexical subject can therefore be dropped, and the verb retains the class 2 subject marked *ba-*, as shown in (3b). If the object is pronominalized, the object marker

² Glosses are as follows: ADJ = adjective, CAUS = causative, COP = copula, DEM = demonstrative, FV = final vowel, LOC = locative, NEG = negation, OM = object marker, PR = preposition, PRF = perfect, POSS = possessive, PRES = present tense, SM = subject marker; numbers = noun class.

di-, which occurs before the verb, similarly takes the class of the object noun to which it refers (e.g. *di-perekisi* ‘peaches’).

- (3) a. Ba-shanyana ba-ne ba-fuman-e di-perekisi
 2-boys 2DEM-those 2SM-found-PRF/FV 10-peaches
 tse-monate
 10ADJ-good
 ‘Those boys found some tasty peaches’
- b. Ba-di-fuman-e
 2SM-10OM-found-PRF/FV
 ‘They found them’

Since the gender class relationship between nouns/pronouns and agreement is systematic, alliterative and phonologically transparent, we might expect that learning Bantu nominal agreement would be early and error free. However, around the age of 2, children learning Bantu languages often produce bare nominal stems, omitting the noun class prefix. This raises the possibility that the prefix is being omitted because children do not know the gender class to which it belongs. If this were the case, we might expect to find errors of nominal agreement. Previous studies provide anecdotal evidence that this is not the case (Connelly 1984). However, there has been no systematic investigation of this issue.

The purpose of this paper was therefore to conduct an exhaustive analysis of the Demuth Sesotho Corpus (Demuth 1992), examining children’s use of nominal agreement as a function of noun class prefix use. Before moving to the study itself, we first review what is known about the acquisition of Bantu noun class prefixes and agreement, and then outline the Sesotho noun class and agreement system.

2 The acquisition of Bantu noun class prefixes and agreement

Most of the studies of Bantu noun class acquisition have examined southern Bantu languages from the Nguni and Sotho groups, both part of the S zone (see Guthrie 1969–1971 for classification of Bantu languages). The only such study outside southern Africa examines the Gabonese language Isangu (B.42) (Idiata 1998).

With respect to Nguni languages, Kunene (1979) conducted the first study of the acquisition of nominal morphology, focusing on SiSwati noun class prefixes and nominal agreement (possessives and demonstratives). Data were drawn from spontaneous speech samples and informal elicitation sessions with two children aged 2;0–3;6, and an experimental *wug* task study (Berko 1958) with three children aged 4;6–6;0 years. The Zulu acquisition data were drawn from longitudinal spontaneous interactions from three children between 1;10–3;5 years (Suzman 1991). Recent work on Xhosa has examined cross-sectional data from six children between the ages of 1;10 and 3;3 during interactions with an experimenter (Gxilishe et al. 2009).

The remainder of the work on noun class prefixes and agreement has been conducted on the Sotho languages Setswana and Sesotho. Tsonope (1987)

conducted a longitudinal study of two Tswana-speaking children in Botswana aged 1;11–2;6 years and 2;5–3 years, focusing on the noun class system and nominal agreement with possessives and demonstratives. Connelly's (1984) semi-longitudinal study of Sesotho noun class prefixes examined four children in Lesotho aged 1;6–4;2 years. Demuth's (1992) longitudinal spontaneous production study of four children in Lesotho (aged 2;1–3;0, 2;1–3;2, 2;4–3;3 and 3;8–4;7 years) provides the database for much of the noun class and agreement system work discussed below (Demuth 1988, 2000; Ziesler and Demuth 1995).

All the studies of Bantu noun class prefixes report very similar findings: First, both singular and plural noun class prefixes are segmented as separate morphemes early on; there are no cases of plural morphemes being added to singular stems, nor of noun class prefixes being incorrectly added to nouns that have no prefix (Kunene 1979; Suzman 1980, 1982, 1991, 1996; Connelly 1984; Tsonope 1987; Demuth 1988; Idiata 1998). Monosyllabic stems provide the only evidence that children might be acquiring the prefix and stem as a unit (Kunene 1979; Tsonope 1987; Idiata 1998), though there are prosodic explanations for this finding — i.e. that children are better at producing noun class prefixes that can be prosodified as part of a disyllabic foot (Demuth 1996; Demuth and Ellis 2009). Finally, although singulars are more frequent than plurals in everyday discourse, there is no evidence that the acquisition of plural noun class prefixes is delayed.

All studies of the acquisition of Bantu noun class prefixes report three partially overlapping stages of development from 2 to 3 years. These are outlined in (4) with examples from Sesotho.

(4) The development of noun class prefixes

- | | | |
|----|---------------------------|---|
| a. | \emptyset -tulo 'chair' | No prefixes (full or partial noun stems) |
| b. | e-tulo | Filler syllable (vowel) or nasal prefixes |
| c. | se-tulo | Full phonologically appropriate noun class prefixes |

Noun class prefixes were generally used in their correct form by 2;6–2;8 years in Siswati and Sesotho (Kunene 1979; Connelly 1984, p. 80, Demuth 1988, p. 310). Suzman (1980) reports the appearance of noun class prefixes somewhat earlier in IsiZulu, suggesting that the pre-prefix may facilitate earlier emergence of noun class prefixes. However, in Xhosa, which also has pre-prefixes, children were still only producing noun class prefixes in 70% of contexts by 3;3 (Gxilishe et al. 2009). It is not yet clear why the acquisition patterns in these two closely related languages might differ. Tsonope (1987) and Suzman (1980) suggest that the phonological shape of the filler syllable might actually be the overgeneralization of noun class 9 *e-* for Sesotho and Setswana, and either the 'human class' 1a *u-* or 'default' class 5 *i-* in IsiZulu. More research is needed to determine if children's use of these filler syllables indicates an attempt to lump nouns into one 'class', or is merely a morphological place holder, the phonological shape of which is yet to be fully determined (Peters 1997).

Once full noun class prefixes begin to be produced there is no evidence of semantic overgeneralizations, paradigm regularization, or plural overgeneralization

in spontaneous speech [though Kunene (1979) reports some overgeneralization in experimental tasks with older children involving novel words (see Demuth 2003 for review)]. The only reported ‘error’ in spontaneous speech was from a 1;9-year-old who produced the more common class 10 plural prefix for a class 9/6 noun. By 1;11 years the correct class 6 plural was used (Connelly 1984, p. 81).

It is quite remarkable that the acquisition of noun class prefixes should be so similar across Bantu languages. Kunene (1979, pp. 76–81) suggested that children have morphologized nouns early on, producing the more semantically contentful stem first. She also reports that Siswati-speaking adults never omit noun class prefixes, and that children therefore never hear input with prefixless nouns. In contrast, Tsonope (1987) argued that child-directed prefixless nominal input provides Tswana-speaking children with a disyllabic template, and that this is the source of children’s early prefixless nouns. Ziesler and Demuth (1995) also noted that Sesotho-speaking adults occasionally omit noun class prefixes in child-directed speech. However, this does not explain why Siswati-speaking children also tend to produce disyllabic prefixless nouns at early stages of acquisition.

Bantu languages exhibit penultimate lengthening. This is illustrated by the shift in lengthening when an additional syllable (in this case a syllabic nasal) is added to the word: *dume:la* ‘hello’ versus *dumela:ng* ‘hello, pl.’. This phenomenon is sometimes referred to as penultimate ‘stress’, though it is realized only by duration. This results in phrase-final words in Sesotho (and many other Bantu languages) having a final Strong-weak ‘trochaic’ foot. Allen and Hawkins (1980) suggest that children have a tendency to produce trochaic feet and omit pre-stressed (unfooted) syllables, and this persists in English until around 2;6 (e.g., *banana* > *nana*). Indeed, many studies have shown that, when children truncate words, they tend to preserve stressed syllables, and syllables that form a prosodic unit with them, if any. Demuth (1992, 1994, 1996) therefore proposed that children’s early omission of Bantu noun class prefixes is due to prosodic constraints on output forms. Since most Bantu noun stems are disyllabic, this means that many noun class prefixes will be omitted until around 2;6, consistent with the Bantu acquisition data. This proposal also predicts that children’s first noun class prefixes would be found with monosyllabic stems, as reported by both Connelly (1984) and Tsonope (1987). Further investigation of this issue in Sesotho confirmed that this is indeed the case: young Sesotho-speaking children are significantly more likely to include the noun class prefix when it can be prosodified as part of a disyllabic foot with a monosyllabic stem (e.g. *mo-tho* ‘person’), and this persists until around 2;3–2;6 (Demuth and Ellis 2009).

To summarize, Bantu noun class prefixes appear to be learned with relative ease, and are largely in place by 2;6–3;0, with little confusion regarding class assignment. Early omission of noun classes, or production of a filler syllable, is probably due to phonological rather than morpho-syntactic constraints. However, a true test of this hypothesis would require a more systematic analysis of children’s use of nominal agreement. Since many of the most common agreement forms (e.g. possessives, demonstratives) occur as part of a disyllabic foot, they should not be subject to phonological constraints (e.g. *se-tulo sa-ka* ‘my chair’, *le-mati le-na* ‘that door’).

Preliminary study of the acquisition of Bantu nominal agreement again shows remarkable cross-linguistic uniformity, sharing the partially overlapping ‘stages’ of development shown in (5) (Demuth 1988).

- (5) The acquisition of nominal agreement
- a. Filler syllable
 - b. Well-formed morphemes

As shown in (6), the appropriate marking of agreement is typically in place by at least 2;4–2;6, even before nouns are consistently marked with a full prefix (e.g., note the filler syllable –e- prefix in (6b) (Connelly 1984, p. 102).

- (6) a. Child: kwena a-ka (1;11)
 Target: ma-kwenya a-ka
 6-fat-cakes 6POSS-my
 ‘My fat-cakes’
- b. Child: ekausi tsa-ka (2;3)
 Target: di-kausi tsa-ka
 10-socks 10POSS-my
 ‘My socks’

Kunene (1979, pp. 99–103) does report a Siswati-speaking child at 2;2 years using the class 7 possessive agreement form *sa-* instead of the plural class 8 *ta-* to refer to *ti-cathulo* ‘shoes’, and there are occasional examples of other possible ‘errors’, where a class 1 possessive agreement marker *wa-* is used instead of class 9 *ya-*. Note, however, that the latter both involve glides, and may therefore be phonologically challenging for children of this age.

In sum, the acquisition of Bantu noun class systems is largely in place by the age of 3, showing no systematic semantic or morpho-phonological overgeneralizations. However, there has been no systematic investigation of how Bantu agreement is acquired. We outline the structure of the Sesotho noun class and agreement systems below, and then examine the acquisition of Sesotho agreement.

3 The Sesotho noun class and agreement system

The Sesotho noun class system is presented in (7) with the corresponding singular/plural pairs (class 6 is also a collective plural for class 9— e.g. *di-tichere* ‘teachers’, *ma-tichere* ‘types of teachers’). Class 9 is the ‘default’ class for most loan words that cannot be phonologically incorporated into another noun class. It is therefore also the class with the highest number of nouns.

(7) Sesotho singular and plural noun classes

	<i>Singular</i>	<i>Plural</i>	
1	mo-tho	2	ba-tho 'person'
1a	∅-rakhadi	2a	bo-rakhadi 'aunt'
3	mo-se	4	me-se 'dress'
5	le-tsatsi	6	ma-tsatsi 'day/sun'
7	se-fate	8	di-fate 'tree'
9	∅-pere	10	di-pere 'dog'
14	bo-phelo		'health'
15	ho-phela		'life'

The Sesotho agreement morphemes and pronominals are presented in (8). Note the systematic, phonologically transparent forms within a given noun class.

(8) Sesotho agreement morphemes and pronominals

Class	Prefix	Possessive	Demonstrative	Adjective	Copula	Numerals
1	mo-	wa-	enwa	e-mo-	ya	a-le-, ya
1a	–	wa-	enwa	e-mo-	ya	a-le-, ya
2	ba-	ba-	bana	ba-ba-	ba	ba-(ba-)
2a	bo-	ba-	bana	ba-ba-	ba	ba-(ba-)
3	mo-	wa-	ona	o-mo-	o	o-le
4	me-	ya-	ena	e-me-	e	e-(me-)
5	le-	la-	lena	le-le-	le	le-le-
6	ma-	a-	ana	a-ma-	a	a-(ma-)
7	se-	sa-	sena	se-se-	se	se-le
8	di-	tša-	tšena	tše-N	tše	tše-(N-)
9	–/(N)-	ya-	ena	e-N-	e	e-le
10	di/(N)-	tša-	tšena	tše-N-	tše	tše-(N-)
14	bo-	ba-	bona	bo-bo-	ba	bo-le-
15	ho-	ha-	hona	ho-ho-	ho	ho-le-

As mentioned above, Ziesler and Demuth (1995) observed that Sesotho-speaking adults occasionally drop noun class prefixes in their speech to children. Further research has revealed that this is a more widespread characteristic of adult speech that affects only those classes that begin with a coronal consonant (classes 5, 7, 8, 10) (and sometimes class 14). But these prefixes can only be realized as null when the noun is followed by some sort of agreement and has been previously mentioned (or is salient) in the discourse context (Machobane et al. 2007; Demuth et al. 2009). That is, null prefixes are licensed under 'unmarked' phonological, syntactic and discourse conditions. As far as we can determine, this is restricted to languages in the Sotho group (Sesotho, Setswana, Sepedi).

Recall that, until around 2;6 years, children learning Bantu languages tend to drop noun class prefixes that cannot be prosodified as part of a disyllabic foot. However, the fact that Sotho languages further permit null prefixes under

appropriate licensing conditions increases the possibility that children produce null prefixes past the age of 2;6. This is especially interesting as it provides additional contexts for examining children's marking of agreement when the prefix on the noun is missing. This allows us a unique opportunity to examine what children know about the gender class of the noun, and how this is influenced by the presence or absence of the noun class prefix.

4 The study

The primary goal of this study was to determine when Sesotho-speaking children acquire nominal agreement, and if this is affected by their production of the nominal prefix. In particular, we were interested to know if children would ever omit agreement or use the wrong form of agreement in cases where they omitted the noun class prefix. If children do not make errors in the context of a missing prefix, this would indicate that they know the grammatical class of the noun. Given the previous anecdotal findings, and the fact that Sesotho agreement is phonologically transparent, we expected that children would not make agreement overgeneralization errors. If apparent 'errors' occurred, we expected they would most likely be phonologically reduced filler syllables. Furthermore, if children happened to produce the noun with the wrong prefix we expected they would generalize this to the agreement morpheme as well, thereby indicating that they had misclassified the noun.

4.1 Subjects

To examine the issue of how nominal agreement (henceforth AGR) was acquired we consulted data from the three younger children in the Demuth Sesotho Corpus (Demuth 1992) (see CHILDES database (MacWhinney 2000; <http://childes.psy.cmu.edu/>). This included spontaneous speech data from one boy (Hlobohang 2;1–3;0) and two girls (Litlhare 2;1–3;2, and 'Neuoe 2;5–3;3) during interactions with parents, peers, and other family members in Lesotho. The corpus consisted of three hours of speech interactions per child during ten sessions (six for 'Neuoe), collected at approximately monthly intervals.

4.2 Data preparation

We first identified all child utterances containing a noun plus agreeing modifier. Because we wanted to examine AGR as a function of the variable presence of the noun class prefix, we excluded prefixless class 1a and class 9, as well as the few nouns of class 1 (*ngwana* 'child') and class 6 (*metsi* 'water') which have irregular prefixes that are fused with the nominal stem. Nouns from these classes are extremely frequent in everyday speech, and include many high-frequency coalesced modifiers in adult discourse that may be lexicalized in child speech. Examples are given in (9).

- (9) Noun + AGR high-frequency lexicalized forms.
- a. Child: nthwena
 Target: ntho e-na
 9thing 9-DEM
 ‘This thing’
- b. Child: ntatao
 Target: ntate wa-hau
 1afather 1aPOSS-your
 ‘Your father’

Other questionable utterances were also excluded from the analysis. These were phrases that were routinized as part of a song (Hlobohang, 13 tokens), or any ambiguous utterances. The latter included non-systematic segmental errors on the noun, modifier, or both, where the phonetic match was so far from that of the target that an accurate judgment about the child’s prefix/AGR could not be made (Hlobohang, 7 tokens; Litlhare, 24 tokens). This resulted in a total of 898 remaining AGRs that were then coded and analyzed (see Table 1 for a breakdown by child and age).

4.3 Coding

Once the final data set was identified, each item was coded for several factors. As a first pass we filtered out possible systematic phonological problems that were not due to morphology. For example, some children have difficulty producing /l/. In Sesotho, /l/ and /d/ are allophones of one another, with /d/ appearing before high vowels. All three children sometimes produced /l/ for /d/. However, because they made the same error in non-morphemic contexts, it was clear that this was due to phonological, rather than morpho-syntactic difficulties. Hlobohang also tended to produce /l/ as a glide, resulting in *ya-ka* instead of *la-ka* (5-my) ‘my’. Since this also appeared to be a systematic phonological error, it was not treated as an AGR error. Similarly, Hlobohang called his cousin Mololo *Bololo*. His substitution of *bo-llo* for the class 3 noun class prefix *mo-llo* ‘matches’ was therefore not considered to be a misclassification to class 14.

We then wanted to know what effect, if any, the presence or absence of the full noun class prefix would have for AGR realization. Although a reduced (filler syllable) prefix indicates some knowledge that a prefix should be present, such ‘protomorphemes’ lack the detailed phonological information needed to assess noun class assignment. Prefixes on the nouns were therefore coded for class, and if the prefix was realized as Full (CV-) or Reduced (null or a filler syllable—i.e. phonologically impoverished information). There were nine cases where a noun was used with the wrong CV- prefix. These were coded as Incorrect and treated separately. If the prefix or AGR contained the target consonant but the wrong vowel, it was considered as Correct (e.g., *la-pei* for *le-pei* (5-marble) ‘marble’). AGRs were coded as Correct (CV-) versus Incorrect (filler vowel, wrong CV-, or null). An example of a filler vowel AGR is given in (10) and an example of AGR with the wrong CV- is given in (11).

- (10) Incorrect (filler vowel) AGR
 Child: a-na a-ka (Hlobohang 2;5)
 Target: ba-na ba-ka
 2-child 2POSS-my
 'My children'
- (11) Incorrect (wrong CV-) AGR (apparently class 5 *la-*)
 Child: i-tso la la tle (Litlhare 2;10)
 Target: di-jo tse-n-tle
 8-food 8ADJ-8ADJ-good
 'Good food'

However, AGR was coded as Correct in cases where adults would be likely to coalesce the (glide and) vowel of the AGR with the final vowel of the noun. This is shown in the examples in (12).

- (12) Correct: Coalescence of Noun + AGR
- a. Child: molla hao (Hlobohang 2;5)
 Target: mo-llo wa-hao
 3-fire 3POSS-your
 'Your match'
- b. Child: khapetla ka (‘Neuoe 2;4)
 Target: ma-khapetla a-ka
 6-peel 6POSS-my
 'My (orange) peels'

A total of 898 AGRs were coded and analyzed (Table 1). This is shown in (13) as a function of modifier type, with an example of each from class 7/8. The majority of children's modifiers were possessives and demonstratives. Bantu languages have few adjectives (color terms, plus *tall*, *thin*, *big*, etc.), accounting for the smaller number of tokens in this category. There were also a few agreeing copulas and numerals. Children occasionally used more than one modifier per noun (usually a demonstrative + possessive). All but the clausal copula forms occur at the level of the noun/determiner phrase.

(13) Number of different modifier/AGR types analyzed

	<i>Agreement Type</i>	<i>Tokens</i>	<i>Example</i>	<i>Gloss</i>
a.	Demonstratives	415	<i>se-kolo se-na</i>	'that school'
b.	Possessives	359	<i>se-kolo sa-ka</i>	'my school'
c.	Copulas	68	<i>se-kolo se kae?</i>	'where is the school?'
d.	Adjectives	44	<i>se-kolo se-se-holo</i>	'big school'
e.	Numerals	12	<i>di-kolo tse-pedi</i>	'two schools'

Table 1 Number/total (percent) of correct AGR out of total AGR context

Age	Hlobohang	Litlhare	Neuoe
2;1	7/10 (70)	14/20 (70)	–
2;2	11/14 (79)	27/30 (90)	–
2;3	18/20 (90)	–	–
2;4	–	17/27 (63)	–
2;5	15/15 (100)	15/21 (71)	7/8 (88)
2;6	15/17 (88)	27/28 (96)	14/14 (100)
2;7	25/28 (89)	43/45 (96)	–
2;8	44/47 (94)	–	48/53 (91)
2;9	52/57 (91)	66/71 (93)	36/36 (100)
2;10	48/49 (98)	26/29 (90)	–
2;11	–	33/35 (94)	31/31 (100)
3;0	50/51 (98)	–	–
3;1	–	–	26/28 (93)
3;2	–	82/86 (95)	–
3;3	–	–	28/28 (100)
Total	285/308 (93)	350/392 (89)	190/198 (96)

5. Results

Recall that the data for this study begin when Hlobohang and Litlhare are 2;1, and ‘Neuoe is 2;4. At this point in development they already know much about the structure of their language, despite the fact that most noun class prefixes are realized as null. However, as shown in Table 1, children’s overall rates of Correct AGR are extremely high (Hlobohang 93%, Litlhare 89%, ‘Neuoe 96%). Litlhare’s slightly lower overall rate of Correct AGR was partly due to her greater tendency to truncate words in general before the age of 2;6. This probably also resulted in a developmental trend for the younger two children, where lower overall rates of Correct AGR occurred until 2;3 for Hlobohang and until 2;6 and Litlhare. One might therefore expect that the correct use of AGR would be lower for children below the age of 2.

Tables 2, 3 and 4 show the three children’s production of Correct AGR as a function of their use of Full versus Reduced noun class prefix. Note that Hlobohang showed a tendency to produce AGR less accurately with Reduced noun class prefixes. The results of a χ^2 test show that this tendency was significant. Overall, Hlobohang produced Correct AGR in 95% of utterances with Full noun prefixes compared to 88% of utterances with Reduced noun prefixes ($\chi^2 = 5.20$, $df = 1$, $p = 0.023$). Thus, at least for some children, it appears that access to AGR features is somewhat diminished in the context of a reduced noun class prefix.

Table 2 Hlobohang's number/total (percent) of correct AGR as a function of Full versus. Reduced noun class prefix

Age	Full Prefix	Reduced Prefix
2;1	3/3 (100)	4/7 (57)
2;2	3/4 (75)	8/10 (80)
2;3	5/5 (100)	13/15 (87)
2;5	14/14 (100)	1/1 (100)
2;6	6/7 (86)	9/10 (90)
2;7	19/21 (90)	6/7 (86)
2;8	18/20 (90)	26/27 (96)
2;9	43/45 (96)	9/12 (75)
2;10	42/43 (98)	6/6 (100)
3;0	38/39 (97)	12/12 (100)
Total	191/201 (95)	94/107 (88)

Table 3 Litlhare's number/total (percent) of correct AGR as a function of Full versus. Reduced noun class prefix

Age	Full prefix	Reduced prefix
2;1	3/5 (60)	11/15 (73)
2;2	6/7 (86)	21/23 (91)
2;4	8/11 (73)	9/16 (56)
2;5	6/11 (55)	9/10 (90)
2;6	17/18 (94)	10/10 (100)
2;7	29/31 (94)	14/14 (100)
2;9	51/55 (93)	15/16 (94)
2;10	17/19 (89)	9/10 (90)
2;11	20/21 (95)	13/14 (93)
3;2	56/60 (93)	26/26 (100)
Total	213/238 (90)	137/154 (89)

Table 4 'Neuoe's number/total (percent) of correct AGR as a function of Full versus. Reduced noun class prefix

Age	Full Prefix	Reduced Prefix
2;5	2/3 (67)	5/5 (100)
2;6	10/10 (100)	4/4 (100)
2;8	27/27 (100)	21/26 (81)
2;9	33/33 (100)	3/3 (100)
2;11	12/12 (100)	19/19 (100)
3;1	18/20 (95)	8/8 (100)
3;3	25/25 (100)	3/3 (100)
Total	127/130 (98)	63/68 (93)

However, further pair-wise comparisons indicated that this tendency was only significant during one session. At 2;9, Hlobohang used Correct AGR in 96% of utterances with Full prefixes, but was only correct in 75% of AGR contexts when he produced a Reduced noun class prefix ($\chi^2 = 5.00$, $df = 1$, $p = 0.025$). Note, however, that the number of data points is small overall. This, and the fact that the other two children did not show such a pattern, suggests that this is not a robust effect. Thus, consistent with previous reports, Sesotho-speaking children appear to know the noun class to which a noun belongs, even when they produce it without a noun class prefix. Evidence of this knowledge comes from their correct use of AGR on the nominal modifiers they produce. However, there are a few cases of apparent AGR errors. These are discussed below.

5.1 Analysis of AGR errors

There were only 10 clear cases of AGR errors for Hlobohang, 6 for Litlhare, and 1 for 'Neuoe. Some occurred with ill-formed noun class prefixes and involved a strange or missing AGR. This is shown in (14a) and (14b), respectively.

- (14) a. Child: ieta hao (Hlobohang 2;1)
 Target: di-eta tsa-hao
 8-shoe 8POSS-my
 'My shoes'
- b. Child: tekhate seo waka (Litlhare 2;10)
 Target: se-fate se-o sa-ka
 7-tree 7-DEM 7POSS-my
 'That tree of mine'

In some cases with a null prefix, AGR was inaccurate, though some of these are also consistent with morphophonological underspecification (i.e. a phonological rather than syntactic problem). This is shown in (15).

- (15) a. Child: Kolo ka yane (Litlhare 2;1)
 Target: se-kolo ke sa-ne
 7-school COP 7-DEM
 'The school is there'
- b. Child: e ranta e hlano (Litlhare 2;2)
 Target: ke di-ranta tse-hlano
 COP 10-rand 10-five
 'It's five rands'
- c. Child: ese yaka (Litlhare 2;4)
 Target: le-bese la-ka
 5-milk 5-POSS-my
 'My milk'

In most other cases, however, nouns produced with a null prefix were used with appropriate AGR, even for Hlobohang. This is illustrated in (16a,b) below, where the class 10 noun (*di*)*ntho* ‘things’ in (16a) is typically produced with a null prefix by adults when followed by a modifier. Such constructions would therefore be frequently encountered in the input children hear (cf. Demuth and Ellis 2009; Demuth et al. 2009). On the other hand, (*le*)*shodu* ‘thief’ is a much less common word, yet it is also produced with the appropriate AGR in (16b).

- (16) a. Child: ke ntho tsaka (Hlobohang 2;2)
 Target: ke di-ntho tsa-ka
 COP 10-thing 10POSS-my
 ‘They are my things’
- b. Child: shodu lena (Litlhare 2;5)
 Target: le-shodu le-na
 5-thief 5-DEM
 ‘This thief’

There were only two cases where a Full prefix was accompanied by an Incorrect AGR. These are shown in (17).

- (17) a. Child: ke dierekisi ee (‘Neuoe 2;5)
 Target: ke di-erekisi tse-e
 COP 10-pea 10-DEM
 ‘These are peas’
- b. Child: sepepa ke ena (Litlhare 2;5)
 Target: se-sepa ke se-na
 7-soap COP 7-DEM
 ‘Here is the soap’

Thus, although there were various types of AGR errors, they were few, and many could be attributed to poor early phonological skills. Interestingly, however, there were also a few cases of misclassified nouns. In the following section we examine the use of AGR with these misclassifications.

5.2 Analysis of AGR with misclassified nouns

‘Neuoe produced approximately 35% of her prefixable nouns with a null prefix. Nonetheless, her use of AGR was almost always correct. In the case of one lexical item, however, she appears to have misclassified a noun. This is shown in (18), where she uses the noun *le-kotikoti* ‘tin can’ (class 5) with class 9 AGR. In this set of examples ‘Neuoe appears to have reassigned the singular noun to the prefixless class 9, and used class 9 AGR accordingly (18a–c). However, she also uses it with the appropriate class 6 plural (18d). It therefore appears that she has misclassified this noun as class 9/6, rather than 5/6. Recall that class 6 is a possible plural for class

9. Thus, this is a principled, not random, error, similar to one previously reported by Connolly (1984).

(18) 'Neuoe's misclassification of *le-kotikoti* 'tin can' (class 5) as class 9 (Neuoe 2;8)

- a. Child: ke kotikoti ya-hao ena
Target: ke le-kotikoti la-hao le-na
COP 5-tin can 5POSS-your 5-DEM
'It is your tin can, this'
- b. Child: kotikoti e-na
Target: le-kotikoti le-na
5-tin can 5-DEM
'This tin can'
- c. Child: kotikoti e-e
Target: le-kotikoti le-e
5-tin can 5-DEM
'This tin can'
- d. Child: nke kotikoti ya-hao e teng ka mona
Target: nk-a le-kotikoti la-hao le teng ka mona
take-FV 5-tin can 5POSS-your 5COP LOC PR LOC
'Take you tin can, it's over there'

Data from Hlobohang provide further evidence that children do occasionally misclassify nouns. This is shown in (19), where his use of AGR is always consistent with the (erroneous) noun class prefix he has selected.

(19) Hlobohang's misclassification of both noun + AGR

- a. Misclassification of class 7/8 > 5/6
- i. Child: u-bola-il-e le-rurubele (Hlobohang 2;7)
Target: o-bola-il-e se-rurubele
1SM-kill-PRF-FV 7-moth
'You killed the moth'
- ii. Child: le-rurubele la-ne ha le-yo
Target: se-rurubele sa-ne ha se-yo
7-moth 7-DEM NEG 7COP-LOC
'That moth over there is gone'
- iii. Child: he ma-bubulele
Target: ke di-rurubele
COP 8-moth
'It's the moths'

b. Misclassification of class 6>8/10

Child:	di-pei	di-di-ngata	(Hlobohang 2;9)
Target:	ma-pei	a-ma-ngata	
	6-marble	6ADJ-6ADJ-a lot	
	'A lot of marbles'		

c. Misclassification of class 5 > 7

Child:	se-nkotomane	she-se-holo	(Hlobohang 3;0)
Target:	le-kotomane	le-le-holo	
	5-peanut	5ADJ-5ADJ-big	
	'A big peanut'		

One might wonder if these are low frequency nouns, and Hlobohang simply does not know the class to which they belong. This might be the case for *lekotomane* 'peanut', since this is his only use of this word in the entire corpus. However, he is inconsistent in his use of noun class prefix for the other nouns. *Serurubele* 'moth' is used correctly twice and misclassified 3 times, all on the same day. Similarly, *mapei* 'marbles' is used correctly 47 times, but misclassified once. Note, however, that all these noun class prefix errors come from those classes that can occur with a null prefix (classes 5, 7, 8, 10). Thus, it is possible that these nouns and their prefixes are less fully specified in children's lexicons compared to nouns that never occur in the input without a prefix. If so, we might expect such overgeneralization errors to occur more often in the Sotho languages (where null noun class prefixes are permitted) as compared to Bantu languages (where noun class prefixes cannot be omitted). In this regard, some nouns may be underspecified with respect to noun class, at least in terms of children's lexical access during spontaneous production. Importantly, however, there are no random overgeneralizations to other classes, suggesting that the process is also grammatically constrained. Critically, given the class selected, the use of AGR was well formed, even being generalized to the 'correct' plural (see (19a)). This indicates that children have a robust understanding of AGR relations, and mark this appropriately on the noun once noun class gender is determined.

In sum, all three children in this study performed near or above 90% accuracy on AGR by the age of 2;6. In addition, AGR errors were few, and many could be due to phonological, rather than morphological problems. In a very few cases the noun was misclassified. Interestingly, this occurred only with nouns that can take a null prefix, suggesting that variability in the Sesotho noun class prefix input may influence the robustness of children's lexical representations. However, when misclassification occurred, the error generalized to AGR as well. Thus, Sesotho-speaking 2–3-year-olds appear to have a good understanding of agreement relations, and once they determine that a noun belongs to a particular gender class, agreement follows.

6 Discussion

This study provided a comprehensive investigation of the acquisition of nominal agreement in the southern Bantu language Sesotho, examining the spontaneous speech productions of three 2–3-year-olds. Given findings from other languages, where the acquisition of agreement was facilitated under conditions of phonological transparency, it was predicted that the acquisition of the phonologically transparent, systematic and alliterative Bantu nominal agreement system would be relatively early and error free. This study provides support for this position: Sesotho-speaking children have a high overall command of nominal agreement by the age of 2;6. Further analysis found that one child showed a tendency for less accurate agreement when the noun class prefix was not fully produced. However, many of the agreement ‘errors’ could also be attributed to phonological, rather than morphological underspecification. Thus, some of the apparent agreement ‘errors’ may be due to children’s non-adult like phonological abilities, rather than due to problems with morpho-syntax. Further support for this position comes from the few cases of nominal misclassification, where the class of the noun appears to drive the form of agreement selected. It therefore appears that Sesotho-speaking children access the noun complete with gender features, and that this determines the form of agreement they use, even when the noun class prefix happens to be realized as null. Thus, although Bantu languages have many more nominal gender classes than most other languages, the phonological transparency, regularity and pervasiveness of the system appears to facilitate the early acquisition of nominal agreement in these languages.

The fact that some errors of nominal gender class were made, and that these tended to occur on nouns from the classes where null prefixes are permitted, raises certain questions regarding the robustness of children’s lexical representations for these forms. In particular, it suggests that lower frequency lexical items may not be fully encoded with their prefix, giving rise to potential ambiguity as to which class they might belong to. Although the corpus data discussed here show no such lexical frequency effect (cf. Demuth and Ellis 2009; Demuth et al. 2009), this could be more succinctly addressed in a series of controlled experiments, where novel words of various classes could be taught with different amounts of exposure to examine how much of what types of information would be needed for encoding class features, and generalizing this to agreement. Such a study could also be carried out with somewhat younger children to determine the age at which such generalization begins to take place.

Although the Sotho languages present an interesting case of variable prefix use in certain classes, the fact that children supply AGR with little difficulty suggests that the prefix is not essential for agreement relations to be learned. This is perhaps not surprising given that most Bantu languages have a few noun classes that exhibit null prefixes. In these cases language learners have presumably also learned the class that the bare noun belongs to, supplying the appropriate AGR forms. Although this study did not exam AGR in these classes (1a and 9 for Sesotho), we suspect that there are few AGR errors. This could be due to the fact that these noun classes have many lexical types, as well as some types that have very high token frequency (e.g.

class 1 a: *mother, father*, class 9: *dog, house, thing*, etc.). This suggests that future investigation of the acquisition of agreement could benefit from examining the learning process as a function of both types and tokens, in both behavioral and modeling experiments. The Sesotho acquisition results presented here, combined with previous findings on agreement in other languages, provide a rich basis for beginning to explore these issues more fully.

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