Regularization or Probability-Matching?
Acquisition of Inconsistent Gender Marking in Fering-Speaking Children

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1.0 Introduction

Research has shown that while adults are able to learn probabilities associated with inconsistently occurring forms in a language, children often regularize inconsistently produced forms (Austin & Newport, 2011; Hudson Kam & Newport, 2005). That is, when children are exposed to input in which linguistic forms appear unpredictably, they tend to regularize these forms, such as using one morphological form in all or no contexts, rather than matching their own production to the probabilities present in their input. Yet, sociolinguistic research often demonstrates that children replicate the probabilistic structure of their caregivers' variable patterns, when such patterns are based on predictable variation determined by linguistic and/or extra-linguistic constraints (Foulkes, et al., 2005; Labov, 2007; Smith, et al., 2007, 2009; Miller, 2013). Both sets of studies focus on the acquisition of probabilistic input; they differ in that the former set of studies use artificial language methods to test acquisition of unpredictable variation, while the latter examine the acquisition of predictable variation in a naturalistic setting. Artificial language studies use short exposure times of about two hours, which may be sufficient for learning consistently produced features, but may not be for learning inconsistently produced features. Studying the acquisition of inconsistent forms in a natural language setting is one way to explore whether children are able to acquire inconsistent forms when exposed to a large quantity of input. To date, there are no studies examining the acquisition of inconsistent features in naturalistic settings. The present experimental study investigates children's acquisition of inconsistent gender marking in Fering, a dialect of North Frisian. Grammatical gender is produced inconsistently in Fering, meaning that adults use both masculine and common gender interchangeably and often do not agree as to the grammatical gender of a given noun. Thus, the children in the study– all German-Fering bilinguals–were exposed to inconsistent grammatical gender marking. The children differ, however, in the quantity of Fering they have access to. That is, one group of children had Fering input from both parents at home, while the other group had Fering input from only one parent. In this paper we ask the following research questions:

1. Do 6-10 year old children regularize grammatical gender in the context of inconsistent input?
2. Does the amount of linguistic input impact children's behavior?
3. When do children show adult-like inconsistent production of grammatical gender?

1.1 Fering grammatical gender

Fering gender is marked on the determiner (*de* 'the.MASC', *det* 'the.COM'[1]) and not on the noun itself. Therefore, the learner must determine which determiner is associated with a given

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[1] Fering also has a series of A-articles (*a* 'the.MASC', *at* 'the.COM'). Traditionally, the A-articles are used to indicate general reference, while D-Articles (*de* 'the.MASC', *det* 'the.COM') are used for more specific references (Ebert, 1998). As this distinction has largely been lost in modern Fering, we collapse both series of articles in this paper.

noun in the course of acquiring the language. Plural forms are not marked for grammatical gender. Table 1 summarizes the modern grammatical gender system in Fering.

Table 1.
Modern Fering grammatical gender

	Singular	Plural
Masculine	*de boosel* 'the.MASC table'	*dön boosl-er* 'the.PL tables'
Common	*det wel* 'the.COM bike'	*dön wel-en* 'the.PL bikes'

Due to on-going language change, Fering grammatical gender is produced inconsistently by adult speakers (Ebert, 1998; Hendricks, under review; Parker, 1993) and is characterized by both intra-speaker and inter-speaker inconsistency. That is, adults do not consistently produce the same grammatical gender with a given noun, and adults do not always agree as to the gender of a given noun. In this paper, we focus on acquisition in the context of inter-speaker inconsistency. For example, in an online survey of adult use of gender marking, Hendricks (under review) found that about 60% of adult speakers use masculine gender for the noun *skreep* 'purse'.

(1) a. *de skreep* 'the.MASC purse'
    b. *det skreep* 'the.COM purse'

However, the same adults showed more consistency with other nouns, such as *de tuun* 'the.MASC fence' where they used the same determiner 95% of the time (Hendricks, under review). While grammatical gender is not predictable from linguistic or extra-linguistic factors, it is lexically determined. That is, some nouns are more likely to appear with masculine gender or common gender than others.

The current project investigates whether school-age children with different amounts of Fering input have acquired the adult-like grammatical gender system. Children who have acquired the adult-like gender system would be expected to not only produce grammatical gender inconsistently, but also produce gender following the same probabilities as the adult speakers. The lexically determined by-item pattern of inconsistency allows for distinguishing between three acquisition outcomes: (i) regularization, (ii) random inconsistency, or (iii) adult-like inconsistency.

2.0 Method

2.1 Participants

Twenty-eight children (ages 6-10) from two rural elementary schools on the island of Föhr in Northern Germany and 13 adult native-speaker controls from the same community completed a grammatical gender elicitation task. Children were divided into two input quantity groups (High-Input and Middle-Input) based on a subset of the Utrecht Bilingualism Exposure Calculator (UBiLEC) (Unsworth, 2010). The UBiLEC is administered as an interview that asks questions about who has contact with the child, which languages are spoken with the child, and the percentage of time those languages are spoken with the child. High-Input children ($N = 20$) heard Fering more than 75% of the time at home, while Middle-Input ($N = 8$) children heard Fering between 25% and 75% of the time at home. Four additional Middle-Input children produced the target Frisian word for fewer than half of the items and were therefore removed

from this analysis due to low vocabulary accuracy. No High-Input children or adult native speakers were removed due to low vocabulary accuracy. Most often the children in the Middle-Input group received predominately Fering input from one parent at home and predominately German input from the other parent. All children learned some Frisian at home, and were receiving four hours per week of Fering instruction in school. Thus, the children differed primarily in the percentage of Fering exposure at home.

2.2 Materials

Twenty-four items were selected from the abovementioned online survey of Fering grammatical gender. In this previous study (see Hendricks under review for more details), adult native speakers reported how often they would use either common or masculine grammatical gender with a given noun using a 7-point Likert scale. The items for the current study were separated into four categories based on the level of agreement in the adult online survey: high-consensus masculine (88-96% of speakers agreed that these nouns occur with masculine determiners), low-consensus masculine (48-68% agreement), high-consensus common (68-79% agreement), and low-consensus common (50-67% agreement).

2.3 Procedure

In the grammatical gender elicitation task children were asked to help the first author of this paper learn Fering by describing pictures presented on a computer monitor. All instructions were provided by a native German-Fering bilingual research assistant from the same local area as the children. The experimental display presented two clipart images, one of which was circled (see Figure 1) and the research assistant followed the script in (2). In this manner, the both indefinite and definite articles were elicited from children.

(2) a. Experimenter: *Wat schochst dü heer?*   'What do you see here?'
     b. Child: *een stäär an een fask*   'a star and a fish'
     c. E: *Sai Alison, wat heer umkreisert as.*   'Tell Alison what is circled.'
     d. C: *Alison, **de fask** as umkreisert.*   'Alison, the.MASC fish is circled.'

All children were tested individually in a quiet room at school. Adult participants served as a control group and were tested individually in a quiet location, most often in their homes.
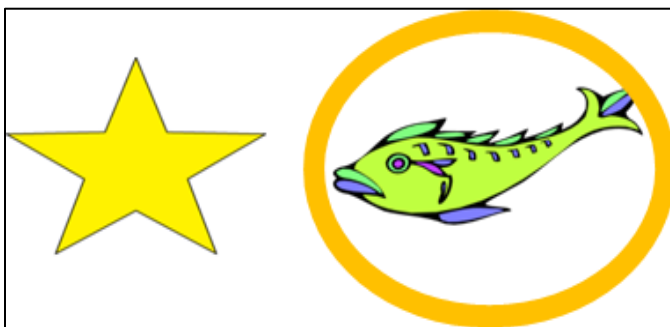

Figure 1. Sample stimulus for grammatical gender elicitation task

3.0 Results

3.1 Regularization

In order to investigate whether school-age children regularize grammatical gender in the context of inconsistent input, the number of children who regularized grammatical gender were

counted. Regularization was determined by counting the number of masculine gender responses and common gender responses. All responses with a Frisian masculine determiner (*de*, *a*) were counted as masculine gender responses and all responses with a Frisian common gender determiner (*det*, *at*) were counted as common gender responses. Following Hudson Kam and Newport (2005), we followed a strict criterion for regularization, in which participants who produced the same grammatical gender for all or all but one item were considered to have regularized grammatical gender. Table 2 shows the number of speakers in each group who regularized grammatical gender.

Table 2.
Number of regularized speakers by group

Group	Regularized Masculine Gender	Regularized Common Gender	Inconsistent Gender Use
Middle-Input $N = 8$	6 (75%)	0 (0%)	2 (25%)
High-Input $N = 20$	7 (35%)	1 (5%)	12 (60%)
Adult $N = 13$	0 (0%)	0 (0%)	13 (100%)

   Regularization was most common among children in the Middle-Input group, with 75% of children producing masculine gender for all or all but one item. Some of the children in the High-Input group regularized grammatical gender. However, fewer High-Input children regularized grammatical gender, as compared to the Middle-Input children. In line with previous studies (Ebert, 1998; Parker, 1993), all of the adult participants produced grammatical gender inconsistently.

3.2 Correlations
   In order to distinguish between adult-like inconsistency and random inconsistency, the production of grammatical gender in each group was correlated by item. If children produce grammatical gender in an adult-like way, if about 60% of adults use masculine gender for *skreep* 'purse', we would expect about 60% of children also to produce masculine gender for *skreep*. To test this, correlations were conducted to determine whether groups of children produced the same percentage of masculine gender with each noun as adults. The percentage of speakers in each group who used masculine gender with each noun was calculated, and then Spearman's Rho correlations were conducted, comparing each child group to the adult speakers. The results indicate that the High-Input children's responses match the adult probabilities ($r_s = .613$, $p = .002$), as illustrated in the scatterplot in Figure 2. In contrast, the Middle-Input children regularized grammatical gender and do not match the adult probabilities ($r_s = .377$, $p = .102$), as illustrated in Figure 3.
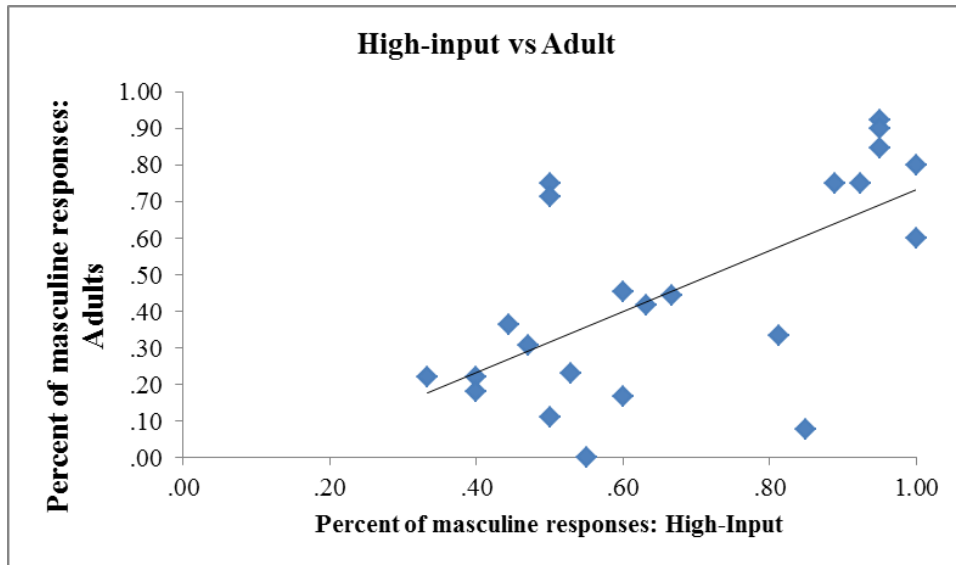
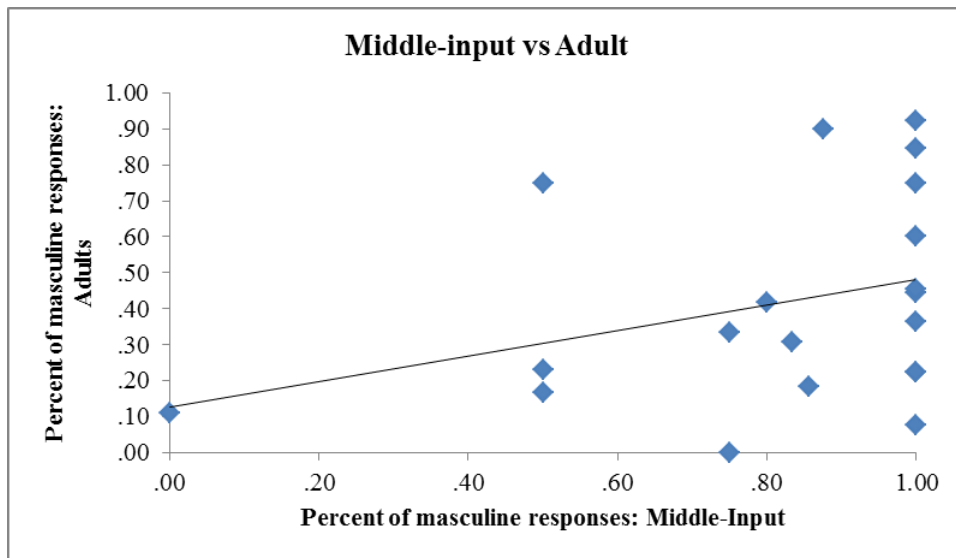Figure 2. Scatterplot of Adult and High-Input children masculine gender responses

Figure 3. Scatterplot of Adult and Middle-Input children masculine gender responses

4.0 Discussion and Conclusion

This paper set out to address the three research questions listed below. We will address each of them in turn.

1. *Do 6-10 year old children regularize grammatical gender in the context of inconsistent input?*

Previous research by Hudson Kam and Newport (2005, 2009) indicated that children regularize inconsistent input, perhaps indicating that apply a rule that was not present in their input. The present study, carried out in a naturalistic setting, supports their finding in that we also find that children regularize inconsistently produced forms when the quantity of input is low. On the other hand, when input quantity is high, we find that children replicate adult patterns of inconsistency.

This new finding suggests that children may start out regularizing inconsistent gender marking but once exposed to a sufficient amount of input, are able to match adult probabilities.

    2. *Does the amount of Fering input impact children's behavior?*

Yes. We found that input quantity influenced how likely children were to regularize grammatical gender, as seen in the difference in how many children with high levels of input regularized gender as compared to those with lower levels of input. Although both groups of children in this study have been acquiring Fering at home since birth, the difference in the amount of Fering input influenced their production of inconsistently produced grammatical features, such as grammatical gender. This highlights the importance of accounting for not only the type but also the quantity of linguistic input children receive, particularly when considering the acquisition of inconsistent features.

    3. *When do children show adult-like inconsistent production of grammatical gender?*

Again, this depends on how much input Fering children were exposed to. Those who were exposed to large amounts of input had acquired adult-like production by ten years of age. Those with lower quantities of input had not fully acquired adult-like patterns of inconsistent gender use by age ten. From these data, however, it is not possible to determine whether children with lower levels of input are able to ultimately acquire inconsistent gender at an older age or whether their input is insufficient to ever acquire adult-like patterns of inconsistent gender use. This underscores the fact that acquisition is dependent on both consistency of linguistic forms and input quantity. More broadly, this research shows that minority languages and bilingual populations are a fruitful source of information for investigating how the quantity and type of linguistic input (e.g. (in)consistent, variable) influence language acquisition and language change (Miller & Hendricks 2014).

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