**Learning about noun plurals in early Palestinian Arabic***

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*Abstract*

This is a study which examines the acquisition of noun plurals in Palestinian Arabic (PA), spoken in the north of Israel. PA has a minority of regular "sound" plurals, which are formed by the attachment of a suffix to the singular stem; and a majority of so-called "broken" irregular plurals, which are formed by internal changes in the singular stem. 48 children aged 2-6 were presented with a set of singular nouns and were asked to provide the corresponding sound or broken plural forms. The results indicate a growing number of correct plurals, with the following juvenile strategies: an initial overregularization towards the regular sound plurals, which is supplanted by erroneous responses taking the form of broken plurals. Feminine sound plurals are preferred over masculine ones. The results are discussed in the framework of two models of the acquisition of inflectional morphology: A *dual-route model* in which two distinct processing systems handle regular and irregular forms - symbolic rule application and rote learning; and a *single-route (connectionist) model* which explains acquisition by associative memory.

1.0     Introduction

        The acquisition of inflectional morphology has been the subject of numerous studies since Berko (1958) first demonstrated that children could produce nonce past tense and plural forms by rule. Inflectional morphology is, on the one hand, rule-bound, semantically predictable, obligatory and generally applicable (Bybee, 1985), and is therefore marked early on in child language (Brown, 1973). However, inflectional systems such as the German noun plural marking are fraught with irregularities which prevents their early mastery (Clahsen, Rothweiler, Woest & Marcus, 1992; Kuczaj, 1977). Studies of the route that children take in acquiring such systems shows a superficially U-shaped curve (Strauss, 1982): the child first produces both inflected and uninflected forms learned by rote (e.g., *break, broke*), then starts producing both correctly inflected forms as well as mistakes of overrgeneralization in both directions (*break / breaked* and *drag / drug*) (Bybee & Slobin, 1982; Marcus, Pinker, Ullman, Hollander, Rosen & Xu, 1992; Pinker & Prince, 1988) and finally masters both regular and irregular inflection successfully (Plunkett & Marchman, 1991).

        The current study describes an experiment involving the acquisition of a particular inflectional class, noun plurals, in a dialect of Palestinian Arabic (PA) spoken in the north of Israel. Since Arabic pluralization takes two distinct forms, regular linear suffixation and irregular non-linear affixation, both of which occur in the input to young children, the opportunity is provided to trace children's strategies in learning this complex system in view of current theories of morphological acquisition.

        *1.1 Models of processing and acquiring inflectional morphology.* Two contrasting models of representation of regular and irregular morphology and of its acquisition provide different accounts for this U-shaped learning. A *dual-route model* assumes the existence of two distinct processing systems to handle the two facets of morphology: a rote-learning mechanism stores both regular and irregular forms at the onset of acquisition so that the child appears to use them correctly. This is supplanted by a mechanism that applies a concatenation rule to all forms (N stem + plural suffix, V stem + past tense suffix) resulting in overregularization (e.g., *mans, knowed*). Finally, a mature morphology contains two systems: One handles regular inflection by abstract, symbolic rule that can be extended to nonce forms, and another stores irregular forms by lexical memory whose retrieval blocks the application of the rule

(Halle & Mohanan, 1985; Jaeger, Lockwood, Kemmerer, Van Valin, Murphy, & Khalak, 1996). Pinker and his associates further suggest that irregular forms are handled by an associative network of subregularities that clusters together minor patterns such as *drink / drank, sing / sang* and may cause occasional mistakes such as *bring / brang* under experimental conditions even in adults (Pinker & Prince, 1994; Prasada & Pinker, 1993).

A second account of the acquisition of regular and irregular forms and of its processing in an adult system denies a split in processing mechanisms, and proposes *single-route models* to handle both types of inflectional morphology. One type of these are listing models, in which all forms are listed in the lexicon and related by phonological and semantic features of various strengths (Bybee 1988, 1995; Stemberger & MacWhinney, 1988; Stemberger, 1994). Another type of single mechanism is an associative memory system (connectionist model) which regards each entry as a set of features that are shared by many other entries that overlap in their representation. Learning consists of strengthening or weakening connections between the features and is strongly affected by factors of similarity, consistency and frequency. The network learns to compute the most probable inflected form for any input string by using learning algorithms that capture the statistical regularities between input and output strings. The system can generalize automatically to both regular and irregular new forms that resemble forms it already knows since the same mechanism computes predictable, minor-class, and exceptional forms (Daugherty & Seidenberg, 1994; Plunkett & Marchman, 1991, 1993; Rumelhart & McClelland, 1986).

The two models may not have the same explanatory power for inflectional systems based on different principles since the notions "frequent" and "regular" are not necessarily synonymous. English past-tense verbs and noun plurals constitute a case where speakers are exposed to both a default regular, highly frequent suffix (-*ed,* -s) that may be perceived as the rule, as well as to a much smaller number of true exceptions (e.g., *mouse / mice, do / did*), suppletive forms (*go / went*), and minor patterns with clusters of forms (*blow / blew, grow / grew, know / knew,* etc.). Such systems can be accounted for by both models: dual-route models assume a default rule that applies everywhere unless blocked by idiosyncratic rote-learned items or by items from minor morphophonological classes; while connectionist models attribute more

weight to the highly frequent forms in the language. However, there are other cases, such as the German plural, where "default" does not mean "highly frequent", since irregular forms are more frequent than the regular plural suffix: five irregular plural classes constitute almost 90% of the plural inflection types in German, whereas the "regular" -*s* plural does not reach 5% (Nakisa & Hahn, 1996). Yet studies reveal that German-speaking children do overregularize, using the default suffix -*s*. Clahsen et al (1992) take this as evidence for children's inherent separation of irregular from regular morphology, and as support for the symbolic or dual-route model: the class of regular, rule-bound forms does not have to be the largest in order to serve as the default form with rote learning of irregular exceptions. Connectionist models may be challenged by such an inflectional system, since a single-route model is not likely to select a regular default form in response to a novel form but rather an irregular one from larger classes that have a higher frequency in the language. This challenge was taken up by Hare, Elman & Daugherty (1995) who claim that the existence of hidden units may change the internal representation of input patterns so that that patterns that look the same at the input level may have different "underlying" forms that affect their association with output forms. According to Nakisa, Plunkett & Hahn (in press), regular forms may still be highly productive despite their smaller frequency in languages such as German or Arabic depending on their wide distribution in phonological space outside clusters of irregulars: in the case of such "distributional defaults" the system will tend to select a regular pattern in response to an arbitrary novel form despite the numerical inferiority of the regular class. In other words, where there is no dominant inflectional class as in German and Arabic, the distribution of free stem forms is more important for learning their inflected plurals than their frequency statistics. This paper describes the route taken by young speakers of Palestinian Arabic in Israel in learning to pluralize nouns, in view of the two models.

*1.2 Noun plurals in Modern Standard Arabic.* Modern Standard Arabic (MSA) demonstrates a psychological disassociation of the notion "highly frequent" from "regular" in its noun plural system (Pinker and Prince, 1994). MSA is the written variety of the language, common to all literate Arabic speakers in the world, used in the media, in literature, at school, and for all literate activities, and almost exclusively used in its spoken form in the electronic media. It is a unified, codified pan-Arab variety of Arabic, the modern descendant of Classical Arabic (Holes, 1995). Plural

(non-dual) formation in MSA takes two paths: Linear suffixation of a stem with masculine *-u:n* (or *-i:n*) and feminine *-a:t*, though regular, is restricted to a short list of atypical nouns (and adjectives) such as proper names, transparently derived forms and names of the letters of the alphabet. The second type of pluralization is the widespread phenomenon referred to as *broken* plurals which involves an internal modification of the singular stem, in a sense, nonlinear formation, e.g., *kaleb / kila:b* 'dog / s'. There are four shape-defined categories in MSA, including 31 subtypes of broken plurals, formed on literally every canonical noun type in MSA (Hammond, 1988; McCarthy & Prince, 1990).

1.3 *Arabic diglossia.* MSA is not the spoken language acquired by children: Arabic constitutes the classical case of diglossia, which involves a highly divergent and often grammatically more complex literary variety, usually older than the spoken variety, learnt by formal education and used for formal, mostly written purposes (Ferguson, 1959). Arabic-speaking children acquire the local dialect at home, and learn MSA in school (Omar, 1973), though MSA constitutes a constant alternative to the indigenous vernacular and a source of linguistic information due to its status and omnipresence in all kinds of media and literacy activities (Badry, 1983; Holes, 1995). The focus of our discussion here is the acquisition of noun plurals in a Palestinian Arabic dialect spoken in the north of Israel (Levin, 1994). To the best of our knowledge, this is the first developmental study conducted on this dialect.

*1.4 Noun plurals in Palestinian Arabic.* Sound plurals in Palestinian Arabic (PA) are formed by attaching to the singular stem one of two suffixes, determined by the gender of the singular nouns, and found in all spoken Arabic varieties (Holes, 1995:139). The masculine suffix is *-i:n* as in *falla:H / fallaHi:n* `farmer / s'. The feminine suffix is *-a:t*, as in *kubba:y / kobaya:t* `glass / es'. The feminine plural suffix is more productive than the masculine plural suffix, it may also attach to masculine stems (e.g., *balo:n / balona:t* `balloon / s'), and to foreign borrowings that cannot be accommodated by a broken plural pattern. It may thus be considered as the default plural suffix as in other spoken Arabic varieties (Holes, 1995). Broken plurals follow the four shape-determined categories assembled in McCarthy & Prince (1990), encompassing the 31 categories described in Wright (1971); however they are governed by the same general dialectal phonetic changes that apply to PA as a whole.

The three main phonetic sound changes that are relevant to plural formation are the following (Levin, 1994)[1]:

  * Short vowels delete in open unstressed syllables, so that the Standard iambic plural pattern $CiCa:C$[2] is realized as $CCa:C$ in PA (e.g., MSA *jamal / jima:l,* PA *jamal / jma:l* `camel / s').

  * Long vowels shorten in unstressed syllables, so that Standard plural pattern $CaCa:Ci:C$ is realized as $CaCaCi:C$ in PA (e.g., MSA *'aSfu:r /* `aSa:f◻:r, PA *'aSfu:r /* `aSaf◻:r `bird / s').

  * The glottal stop tends to delete, and thus Standard metathesized `aCCa:C is realized as $CCa:C$ (e.g., MSA *ba:b / 'abwa:b*, PA *ba:b / bwa:b* `house / s').

Studies of plural formation in another Semitic language spoken in the same geographical area, namely Hebrew, have shown that number and gender are marked early on, although mastery of all stem changes takes until age 7-8 (Berman, 1981, 1985; Kaplan, 1983; Levy, 1980; Ravid, 1995). Observation has indicated this to be the case in PA as well.

2.0     The study

The study described below was an experimental design containing both sound and broken plurals, aiming to map the route Arabic-speaking children take in learning a system where the "default" is the minority case and the "exceptions" are the majority. We wanted to see whether, in the absence of a frequent default, children would tend to learn all forms by rote, and would thus err in all directions; or whether they would apply linear suffixation across the board, in which case they would simplify all structures to a sound stem+suffix string; or whether they would use both overregularization and irregularization towards the broken plurals.

*2.1 Participants.* 48 children - 24 boys and 24 girls - took part in this study: 12 2-year-olds (age range: 2;3-3;3, mean age: 2;7); 12 3-year-olds (age range: 3;4-4;1, mean age: 3;8); 12 4-year-olds (age range: 4;2-5;2, mean age: 4;6); and 12 5-year-olds (age range: 5;2-6;2, mean age: 5;6). They were all native speakers of PA as their only mother tongue and attended the same educational facility (nursery school to kindergarten) in a middle/high socio-economic neighborhood in an Arabic-speaking

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[1]  A note about vowels in PA: *i* and *e* are not phonemically distinguished.
[2]  Patterns are vocalic tiers interdigitated by root consonants, indicated by C's. For example, both *jma:l* `camels' and *bwa:b* `houses' share the plural pattern $CCa:C$.

city in northern Israel. All participants came from urban, educated families and had no developmental or linguistic problems of any kind. These age groups were selected since previous studies in both Semitic and non-Semitic languages have shown 2-6 to be the age range during which number and gender inflection is mastered (Berman, 1981, 1985; Clahsen et al, 1993; Levy, 1980; Ravid, 1995).

*2.2 Materials and procedure.* The study was an experimental design in which participants were asked to give the plural form of 42 stimulus items - all nouns familiar to young children (Appendix A). All nouns denoted concrete objects that could be drawn and were all familiar to very young children. They consisted of the following 3 groups:

1) 14 masculine *-i:n* suffixed sound plurals (e.g., *Tabba:x / Tabbaxi:n* `cook / s'). It was very hard to find sound masculine nouns in the PA addressed to young children, since the overwhelming majority of such nouns take either broken plurals or sound feminine suffixes; as in MSA, *-i:n* is a suffix that occurs only with masculine human nouns whereas all inanimate nouns take the . Therefore, we selected the transparent agentive *CaCCa:C* pattern  (Holes, 1995: 128, 136), denoting professional people, e.g., *najja:r / najjari:n* `carpenter / s' all known to children.

2) 14 feminine *-a:t* suffixed sound plurals, e.g., *Ta:wle / Tawla:t* `table / s'. Most of the sound plurals that occur in everyday PA take feminine suffixes.

3) 14 broken plurals in 7 formal classes, e.g., *šobba:k / šabbabi:k* `window / s'; *jamal / jma:l* `camel / s'. These 7 broken plural patterns were selected according to pragmatic rather than morphophonological criteria: they characterize many of the nouns occurring frequently in the PA dialect spoken in northern Israel. A full list of the test items is given in Appendix A.

Children were tested individually in nursery school and kindergarten by author Farah, a native speaker of PA. Participants were presented with a set of picture cards depicting singular and plural nouns. They were given the singular form of the stimulus noun, and asked to give its plural form, e.g., *"This is ba:b `a door'. What are these? Many _____. How do you say many? Many _____."* The test items were presented in three different orders and preceded by 3 training items: a regular masculine, a regular feminine and a broken plural.

In view of the fact that most inanimate nouns encountered by children in everyday speech take the sound feminine suffix, we expected 1) sound feminine

plurals be acquired earlier than other plural types; 2) the most frequent error in participants' responses to be overregularization (regular for irregular) of broken to sound plurals, and 3) the most frequent error in sound plurals to be the exchange of feminine for masculine suffix . These predictions of the basic role of sound feminine plurals in PA can be motivated by both models of morphological acquisition - the dual route model which assumes both a rule system for default forms and a storage system for irregularities; as well as the single route model which captures statistical regularities between input and output strings. However, we also expected 4) irregularization errors, i.e., irregular broken plurals for regular sound plurals, to show up in older age groups, when children have been exposed to enough input to have become familiar with a variety of pluralization patterns. This phenomenon is better accounted for by the single-route model where similarity, consistency and frequency strengthen connections between input and output strings.

### 3.0 RESULTS

In this section we present an analysis of the correct responses of the 4 age groups by plural types, and an analysis of error types produced by the children.

### 3.1 Correct responses

Participants' responses were first classified into either correct or incorrect. We determined correct responses to be the ones produced by adults speaking the same dialect (e.g., *Tabel / Tbu:li* `drum/s'). Table 1 gives the means of correct responses for each plural type category - sound masculine, sound feminine, and broken plural. The maximum number of correct responses for each category was 14.

Insert Table 1 about here

Insert Figure 1 about here

A two-way ANOVA (Age (4) x Plural Type (3)) showed an effect for Age ($F_{(3,44)}=65.07$, $p<.001$), and for Plural Type ($F_{(2,88)}=26.98$, $p<.001$). These indicate a rise with age in the number of correct responses, and that the category of Sound Feminine plurals (M=10.29) is easier than that of Broken Plurals (M=6.48) and Sound Masculines (M=6.00). Pairwise comparisons of the age groups at the .05 level show that the youngest group of 2-year-olds differs from the rest, and that the 3-year-olds differ from the 5-year-olds. Pairwise comparisons of the plural types at the .05 level (Bonferroni) show that all plural types differ from each other. There was an interaction of Age by Plural Type ($F_{(6,88)}=3.91$, $p<.002$), which is shown in Figure 1.

The interaction derives from the different learning patterns of the three plural types: While Sound Masculines and Broken Plurals reach 6 and 5 means by age 3 and proceed gradually to over 10, Sound Feminines rocket from 1 in the youngest group to ceiling level (14) by age 3. The Duncan Test places the age groups in three subsets for the Sound Masculine Plural Type: 2-year-olds, 3+4-year-olds, and 5-year olds; for the Sound Feminine Plural Type the 2-year-olds are in a subset apart from the rest; and for the Broken Plurals, each group forms a subset of its own.

  3.2 Error analysis

  In addition to correct responses, 6 categories of erroneous responses were identified in the collected data: 1) No response or repetition of test item; 2) Analytical response, in which plurality is indicated by the child by a separate lexical item, e.g., *jamal / kti:r jamal* `camel / many camel' for correct broken *jma:l* `camels'. 3) Overregularization Broken ---> Sound: a broken stem is treated as a sound stem, is left unchanged, and is attached a suffix, e.g., *Sandal / Sandali:n* `sandal / s' instead of correct adult broken plural *Sana:del* in which the stem changes to a new CV template*;* or *šobbak / šobbaka:t* `window / s' for correct broken plural *šababi:k*. The next two response types involve suffix rather than stem errors on items that take sound pluralization. Here, participants sometimes erred in exchanging suffix gender (masculine *i:n* or feminine *a:t* in two possible directions: 4) Suffix exchange Masculine ----> Feminine in sound stems involved giving a feminine for a masculine suffix, e.g., *falla:H / fallaHa:t* 'farmer, Masc / farmers, Fm' for correct masculine *fallaHi:n* . 5) Suffix exchange Feminine ----> Masculine in sound stems involved giving a masculine for a feminine suffix, e.g., *sayya:ra / sayyari:n* 'car, Fm / cars, Masc' for correct feminine *sayyara:t*. Finally, two response categories involve Illicit stem change = creating forms which do not match target adult forms. These are 6) lllicit stem change Broken ---> Broken: Broken stem of one category exchanged for a broken stem of another category, with a different CV template, e.g., *Tabel / Tba:l* `drum /s' (pattern *CCa:C*) for adult *Tbu:li* (pattern *CCu:Ci*); and Illicit stem change Sound ---> Broken: A sound stem is treated as broken and undergoes internal change instead of remaining unchanged with a sound suffix. Thus, childish *balo:n / balali:n* `balloon / s' is exchanged for sound plural *balona:t*.

  Below we analyze these errors in the four age groups. Maximum possible number of incorrect responses was 14 for each plural type.

3.2.1 *Repetition / no response*. This response type appeared only in the 2-year-olds, and did not differ across the plural types (M=12.67 in Sound Masculines, M=11.50 in Sound Feminines, M=10.67 in Broken Plurals). It was completely absent in the other age groups. This indicates that the youngest 2-year-olds (mean age: 2;7) could not yet handle the formal morphological task, although observation indicates that they do produce morphological plurals in spontaneous interaction.

3.2.2 *Analytical responses.* This response type employed a periphrastic non-morphological option of expressing plurality by a lexical item meaning 'many', e.g., *jamal / kti:r jamal* `camel / many camel' for correct broken *jma:l* `camels'. In all three plural types, there was a mean of 1.67 analytical responses in the 2-year-olds; under 1.0 analytical responses in the 3-year -olds, while only the Broken Plurals has .58 in the 4-year-olds. There was no significant difference among the plural types and no Age effect.

Insert Table 2 about here

Insert Figure 2 about here

3.2.3 *Overregularization Broken ---> Sound*. Treating broken PA stems as sound involved retaining the singular form and attaching a sound suffix to it, instead of making the shift from one CV template to another (e.g., *šobbak / šobbaka:t* `window / s' for correct broken plural *šababi:k).* This response type shows a U-shape curve, as presented in Table 2 and depicted graphically in Figure 2: the middle age group of 3-year-olds has the most overregularizations. A one-way ANOVA showed an effect for Age ($F(3,44)=12.52$, $p<.001$), and pairwise comparisons at the .05 level showed that the 3-year-olds differed from all other age groups.

Insert Table 3 about here

3.2.4 *Suffix exchange on sound stems: Feminine ----> Masculine, Masculine --> Feminine.* When sound pluralization is performed in the correct domain, speakers still have to select correct suffix gender (Feminine *-a:t*, Masculine *-i:n*). Table 3 presents erroneous responses where participants performed suffix exchange in both directions (Masculine to Feminine: *falla:H / fallaHa:t* 'farmer, Masc / farmers, Fm' instead of masculine *fallaHi:n*; Feminine to Masculine: *sayya:ra / sayyari:n* 'car, Fm / cars, Masc' instead of feminine *sayyara:t).* It shows that the preferred direction of such errors is Masculine -----> Feminine. A two-way ANOVA (Age (4) x Exchange Direction (2)) shows an effect for Age ($F(3,44)=7.21$, $p<.001$), with the number of

exchange showing a U-shaped curve; an effect for Gender Exchange Direction towards the Feminine (1,44)=35.5, p<.001); and an interaction of Age and Exchange Direction (F(3,44)=4.9, p<.005), shown in Figure 3. This interaction derives from the fact that there is almost no change in the amount of Feminine to Masculine exchanges, but Masculine to Feminine exchanges show a clear U-shape.

Insert Figure 3 about here

Insert Table 4 about here

   3.2.5 *Illicit stem change (irregularization): Broken  ---> Broken.* Here (Table 4) participants changed the given singular form (e.g., *Tabel* 'drum') into an incorrect (though extant) broken plural template (e.g., *Tba:l*; cf. for example, *kla:b* 'dogs'), instead of into the correct broken plural form (in this case, *Tbu:li* 'drums'). This response type differed significantly across the age groups: the older the age group, the more errors of one broken type for another. A one-way ANOVA showed an effect for Age (F(3,44)=5.88, p<.002), with the oldest group of 5-year-olds differing from the 2- and 3-year-olds at the .05 level.

   3.2.6 *Illicit stem change (irregularization): Sound ---> Broken.* This error type involved making internal vowel changes in the given stem to produce a broken-like CV template instead of attaching a suffix (e.g., *balo:n / balali:n* `balloon / s' for sound plural *balona:t*). It appeared only in the oldest age groups. Table 4 shows irregularization sound to broken responses in Masculine and Feminine Sound Plurals. A 2-way ANOVA (Age (4) x Plural Gender (2)) showed that this response types occurs almost only in Sound Feminines: While there was no age effect, there was an effect of Plural Type gender (F(1,44)=4.46, p<.05).

   4.0   DISCUSSION

   This study examined the acquisition of two types of noun plurals - sound and broken - by Palestinian-Arabic speaking children aged 2;3-6;2, in a structured experiment where children had to give the plural form of a given singular noun. There are two different acquisition patterns for the three plural types. In the sound feminines noun plurals, learning is already complete in the second youngest group, the 3-year-olds. In contrast, in the other two types - sound masculines and broken plurals - learning is more gradual, and is still taking place in the oldest group, the 5-year-olds. These results confirm our initial hypothesis about the basic status of sound feminine plurals in PA: they indicate that it is not the sound pluralization device in general that

is easier than the broken plural, but rather the *feminine* sound plural that is easier to learn than both the sound masculines and the broken plurals.

What makes feminine plurals so easy to learn in comparison to the other two plural types? The reason can be semantic or structural in nature. Both semantically and structurally, the masculine plural type is the most coherent of all plural types: all sound masculine nouns denote a single salient meaning ([+human] agent noun), they are all masculine singular, and 12 out of 14 of its test items follow the singular agentive pattern *CaCCa:C*, e.g., *Sayya:d* 'hunter', *dahha:n* 'painter', to which the plural suffix *-i:n* is attached no modification of the stem (except for loss of vowel length). Yet sound masculines lag even behind broken plurals. In contrast, both sound feminine plurals and broken plurals are inflected from non-human bases, and both sets contain both animate and inanimate items taking a variety of forms. It seems that it is not the semantic coherence of the base stems that makes for easy acquisition. Nor is it the regularity of the linear suffixation process that makes it easier in comparison with the irregularity of stem vowel changes involved in root-and-pattern non-linear affixation (broken plurals), since both masculine and feminine sound plurals share linear suffixation. Rather, it appears that the semantic restriction (agentive humans only) on sound masculine plurals, on the one hand, and the specific structural information necessary for the inflection of each broken class, on the other, constrain the formal space assigned to each plural type. They are both marked forms, and conditions for their application have to be learned, which takes time. In comparison, sound feminines are less constrained semantically and structurally.

The basic role of feminine plurals in PA is also apparent in the analysis of error patterns in the study population. In line with our prediction, and with studies of the acquisition of inflectional morphology in other languages, a U-shaped curve has been found in overregularization errors, peaking in the 3-year-olds. We also checked the type of suffix attached to these overregularized Broken ---> Sound forms: In the overwhelming majority of the cases (87% of all overregularized forms), it was feminine *-a:t*.

Both the discrepancy between the acquisition of sound feminine plurals vs. sound masculines and broken plurals, as well as the overregularization error pattern towards feminine sound plurals can be explained by both current models of the development of inflectional morphology. In a dual-route model which assumes the

consolidation of a rule system side by side with an associative memory mechanism, a given singular form would be assigned the default *-a:t* suffix - either correctly or erroneously - unless blocked by a listed form already learned by the child. Masculine plurals would be problematic for the model, however, since they are more regular in behavior than feminine plurals, and it does not make sense to list them separately in the mental lexicon if an abstract rule device is available. The single-route model would take into account the frequency and unmarkedness of sound feminines, which makes it the most probable inflected form, with the same results.

Yet another piece of evidence pointing to the centrality of sound feminine plurals is the direction of suffix exchange. When children do stay within the sound plural system, they may still select the wrong suffix gender. This is done overwhelmingly in the feminine direction, and the error pattern again takes a U-shape, peaking in the 3-and 4-year-olds. Note, however, that unlike over- and irregularization errors, this exchange direction is reinforced since it results in plausible words: All test items which take a sound masculine plural suffix are [+human] agentives, hence attaching a sound feminine for a sound masculine plural suffix merely results in a plural feminine instead of masculine agent noun, e.g., *moharrej / moharreja:t* 'clown / Pl, Fm' for masculine *moharreji:n.* In contrast, when a noun that has to take a sound feminine plural gets a masculine suffix, the result is not a possible word due to the semantic restriction on agentive [+human] nouns, e.g., *ba:S / baS:in* 'bus / Pl, Fm' for correct feminine *baSa:t.*

Irregularization errors in which nouns which ought to take sound plurals are assigned broken templates, or nouns with broken plurals are assigned an incorrect broken template, have a different developmental pattern. They all appear in older age groups and increase with age. Sound to broken plural assignment occurs only in feminine plurals: it seems that once children understand the semantic and hence morphological uniqueness of [+human] agentive nouns, they do not violate sound masculine pluralization. The looseness and unmarkedness of sound feminine stems seem to allow for more erroneous replacement of sound by broken plurals in older age groups who have had more linguistic experience. Broken to broken errors are more numerous, and they increase steadily with age. These findings pose a problem to the dual-route model and can be explained in a single-route model by the gradual

strengthening by links between different types of input/output units to which older children have had the chance to be exposed.

In conclusion, this study presents data on the acquisition of noun pluralization by native-speaking learners of Palestinian Arabic. The unmarked form of pluralization - feminine sound plurals marked by the suffix *-a:t* was found to be learned early on and reach a plateau by age 3, and was moreover the preferred plural option in erroneous responses. The other type of sound plurals suffixed by masculine *-i:n* was found to be the least preferred option of pluralization in both correct and erroneous responses. So called "irregular" broken plurals are located in the middle, between these two extremes, with a learning curve similar to that of sound masculines but with an increasing presence in the erroneous responses of the oldest age groups.

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| Age Group | Total | | Sound Masculine | | Sound Feminine | | Broken Plural | |
|---|---|---|---|---|---|---|---|---|
| | Means | SD | Means | SD | Means | SD | Means | SD |
| 2-year-olds | .78 | .59 | .00 | .00 | 1.33 | 3.55 | 1.00 | 2.59 |
| 3-year-olds | 8.28 | .59 | 6.42 | 4.25 | 13.25 | 1.49 | 5.17 | 2.33 |
| 4-year-olds | 9.67 | .59 | 7.08 | 6.49 | 13.17 | 1.27 | 8.75 | 3.14 |
| 5-year-olds | 11.64 | .59 | 10.50 | 4.82 | 13.42 | 1.17 | 11.00 | 2.34 |

Table 1: Means and standard deviations of correct responses on the three types of plural types, by age group (Maximum: 14)

| | Broken--->Sound | |
|---|---|---|
| **Age Group** | Means | SD |
| 2-year-olds | 1.08 | 2.75 |
| 3-year-olds | 7.42 | 3.53 |
| 4-year-olds | 4.00 | 3.02 |
| 5-year-olds | 1.67 | 1.61 |

Table 2: Means and standard deviations of overregularization errors in Broken Plural responses, by age group: Broken ---> Sound.

| Age Group | Masculine>Feminine | | Feminine->Masculine | |
|---|---|---|---|---|
| | Means | SD | Means | SD |
| 2-year-olds | .17 | .58 | .00 | .00 |
| 3-year-olds | 6.58 | 4.12 | .42 | 1.17 |
| 4-year-olds | 6.83 | 6.39 | .25 | .45 |
| 5-year-olds | 3.33 | 4.48 | .17 | .39 |

Table 3: Means and standard deviations of Suffix Exchange errors in Sound Plurals, by age group and exchange direction.

| | Sound ----> Broken | | | | Broken--->Broken | |
|---|---|---|---|---|---|---|
| | Sound Masculines | | Sound Feminines | | | |
| **Age Group** | Means | SD | Means | SD | Means | SD |
| 2-year-olds | .00 | .00 | .00 | .00 | .01 | .29 |
| 3-year-olds | .00 | .00 | .00 | .00 | .42 | .67 |
| 4-year-olds | .01 | .28 | .50 | 1.17 | .67 | .65 |
| 5-year-olds | .17 | .58 | .42 | 1.00 | 1.33 | 1.16 |

Table 4: Means and standard deviations of irregularization Sound---> Broken, by age group and Plural gender; and Broken ---> Broken responses, by age groups.
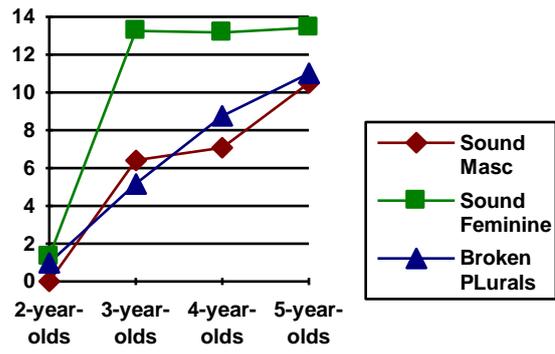
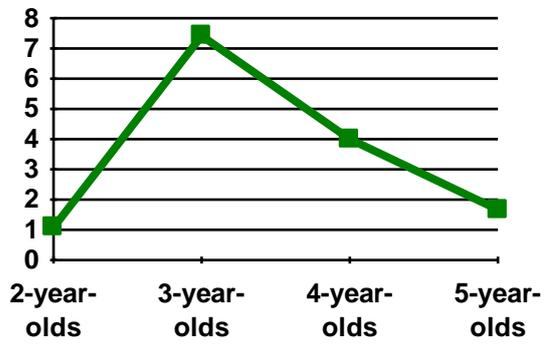Figure 1: Interaction of Age and Plural Type in <u>correct</u> responses

Figure 2: Means of <u>overregularization</u> responses (Broken ---> Sound), by age group
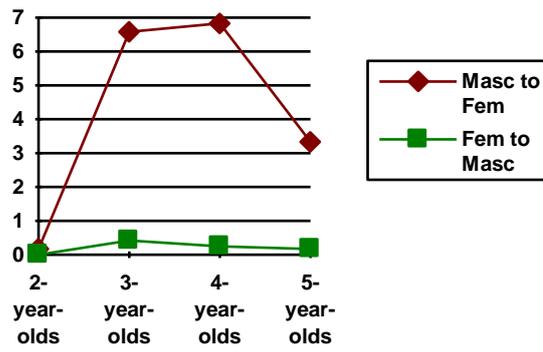
Figure 3: Interaction of Age and Gender Exchange Direction, <u>erroneous</u> suffixes in Sound Plurals.

Appendix A

The study materials

Sound Plurals


Masculine *-i:n*

All singular forms are masculine

| Singular | Plural | Gloss |
|----------|--------|-------|
| *najja:r* | *najjari:n* | carpenter / s |
| *Sayya:d* | *Sayyadi:n* | hunter / s |
| *moharrej* | *mohareji:n* | clown / s |
| *falla:H* | *fallaHi:n* | farmer / s |
| *Hadda:d* | *Haddadi:n* | ironsmith / s |
| *Tabba:x* | *Tabbaxi:n* | cook / s |
| *Halla:'* | *Halla'i:n* | barber / s |
| *HaTTa:b* | *HaTTabi:n* | woodcutter / s |
| *sawwa:'* | *sawwa'i:n* | driver / s |
| *dahha:n* | *dahhani:n* | painter / s |
| *bayya:'* | *bayya'i:n* | vendor / s |
| *m`allem* | *m`allmi:n* | teacher / s |
| *xayya:T* | *xayyaTi:n* | tailor / s |
| *xabba:z* | *xabbazi:n* | baker / s |


Feminine  *-a:t*

M=masculine gender of singular form; F= feminine gender of singular form.

| Singular | Plural | Gloss |
|----------|--------|-------|
| *balo:n*, M | *balona:t* | balloon / s |
| *m'aSS,* M | *m'aSSa:t* | scissors |
| *ba'ara,* F | *ba'ara:t* | cow / s |
| *Ta:be,* F | *Taba:t* | ball / s |
| *ba:S,* M | *baSa:t* | bus / es |
| *sayya:ra,* F | *sayyara:t* | car / s |
| *maxadde,* F | *maxadda:t* | pillow / s |

| | | |
|---|---|---|
| *mfakk*, M | *mfakka:t* | screwdriver / s |
| *talefo:n*, M | *talefona:t* | telephone / s |
| *fara:še,* F | *faraša:t* | butterfly / s |
| *Ta:wle*, F | *Tawla:t* | table / s |
| *se`a,* F | *se`a:t* | watch / es |
| *hawwa:y*, F | *hawwaya:t* | fan / s |
| *kubba:y*, F | *kobaya:t* | glass / es |

Broken plurals

 7 groups arranged by their plural patterns

1

| Singular | *CCa:C*  Plural | Gloss |
|---|---|---|
| *jamal*, M | *jma:l* | camel / s |
| *kalb,* M | *kla:b* | dog / s |

2

| Singular | *CeCa:C*  Plural | Gloss |
|---|---|---|
| *dobb,* M | *deba:b* | bear / s |
| *bissi*, F | *bessa:t* | cat / s |

3

| Singular | *Cwa:C*  Plural | Gloss |
|---|---|---|
| *bo:T*, M | *bwa:T* | shoe / s |
| *ba:b,* M | *bwa:b* | door / s |

4

| Singular | *CaCa:CeC* Plural | Gloss |
|---|---|---|
| *Sandal*, M | *Sana:del* | sandal / s |
| *manšafe,* F | *mana:šef* | towel / s |

5

| Singular | *CCu:Ci*  Plural | Gloss |
|---|---|---|

| | | |
|---|---|---|
| *HSa:n*, M | *HSu:ni* | horse / s |
| *Tabel*, M | *Tbu:li* | drum / s |

6

| Singular | *CaCaCi:C*  Plural | Gloss |
|---|---|---|
| *šobba:k*, M | *šababi:k* | window / s |
| *'aSfu:r*, M | *'aSafi:r* | bird / s |

7

| Singular | *Final V --> 0*  Collective[3] | Gloss |
|---|---|---|
| *tuffaHa*, F | *tuffa:H* | apple / s |
| *mo:ze*, F | *mo:z* | banana / s |

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[3] These are collective rather than plural nouns, referring to living things such as animates and fruits, vegetables, trees, etc (Holes, 1995: 133). When counted, the sound plural is used, e.g., *'arba` tuffaHa:t* `four apples'.

Notes