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Learning about different ways of expressing number in the development of Palestinian Arabic

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Abstract

The paper describes the acquisition of three number categories - sound feminine noun plurals, duals, and collectives - in a dialect of Palestinian Arabic spoken in the north of Israel. The study population consisted of 58 children aged 3;6-4;6, 5;0-6;0, 6;0-7;0, and 7;0-8;0, all monolingual speakers of Palestinian Arabic as their mother tongue. 30 noun stimuli denoting fruits and vegetables familiar to young children were presented in pictures to elicit plural, dual and collective forms. Analysis of the correct results showed two different acquisition patterns – clear development in production of sound feminine nouns and dual nouns, and no increase above the initial 50% in producing collective nouns. Dual contexts elicited constructions preceded by the numeral 'two'. Collectives and sound feminine plurals tended to replace each other. The study highlights children's perception of noun reference through their learning of how to express number distinctions in a sparsely investigated language that challenges its speakers by marking number in multiple and often opaque ways.

Introduction

This paper investigates the acquisition of three number categories (sound feminine noun plurals, duals, and collectives) in a dialect of Palestinian Arabic spoken in an Arabic-speaking city in the north of Israel. Palestinian Arabic has two widespread noun pluralization systems – regular so-called "sound" linear stem-and-suffix plurals and irregular "broken" plurals, which involve vowel changes within the noun stem. In addition, Palestinian Arabic has several more restricted number systems of dual, pseudo-dual and collective noun forms. Studying the distribution of correct and erroneous plural, dual, and collective formations in young Palestinian Arabic speakers aged 3-8 provides a window on how nominal reference is learned in a language that challenges its speakers by marking number in multiple and often opaque ways.

Noun reference in early language acquisition

The developmental route of acquiring number categories in Palestinian Arabic is relevant to the ongoing debate about children's construal of novel word reference. The rapidity with which young children acquire words has led to contradictory models of how a novel word is inferred. One view attributes knowledge of the conceptual difference between discrete objects and substances to language learning which informs the child on the grammatical distinction between count nouns and mass nouns (Quine, 1960). On this view, individuation of objects comes from the linguistic domain of noun quantification in natural languages (Carey, 1994). An opposing view holds that such knowledge exists prior to language acquisition, and that it constrains and guides children in novel word learning early on (Soja, Carey & Spelke, 1991).

Proponents of universal built-in constraints in lexical acquisition have made specific assumptions about linguistic learning mechanisms that are supposed to help

children cope with the inductive problem involved in learning novel nouns. According to this view, children have innate lexical biases such as the whole object constraint, the taxonomic bias and the shape bias (Golinkoff, Mervis & Hirsh-Pasek, 1994; Markman, 1994; Woodward & Markman, 1998). Together these constraints predict that a child encountering a new noun will assume that its label refers to the whole object rather than to its parts or to properties associated with it; that there are other whole objects sharing the same category with it; and that the shape rather than the size or texture of a count noun will determine what other nouns will be regarded as sharing the same category. An alternative account of such mechanisms is proposed by Bloom (1994), who argues that syntactic distinctions of mass vs. discrete reference of nouns correspond to aspects of abstract cognition, and that young children are able to exploit such innate syntax/semantic mappings in order to learn new words, and specifically, types of new nouns.

Recent work on the early acquisition of noun reference denies the existence of innate lexical biases to explain how children handle the almost infinite number of possible interpretations logically possible for every novel noun (Landauer & Dumais, 1997; Smith, 1995; Tomasello, Strosberg & Akhtar, 1996). These studies suggest that initial lexical learning is guided by cognitive knowledge, parental guidance, world knowledge, and by attending to language-specific properties of words provided in the input. In a series of crosslinguistic studies, Gathercole & Min (1997), Gathercole, Thomas & Evans (to appear) and Gathercole, Thomas & Kim (in press) also propose that children's lexical biases are a symptom of their reliance on regularities they discover about their own particular language in interaction with linguistic and cognitive factors.

Considerable work has been done in relation to these claims on nouns

referring to collections. Collective nouns such as *forest* or *audience* are count nouns, since, for example, they take the indefinite article in English, and they can be quantified. But they are not the prototypical kind of nouns referring to discrete whole objects, since they refer to a single entity made up of a collection of other entities (*trees, people*). Therefore they are predicted to be problematic in acquisition in all languages, if indeed all children learning any language are motivated by built-in biases such as the whole object constraint.

A number of studies have found that collective nouns are difficult to acquire in English-speaking children. Bloom's studies on the acquisition of collectives (Bloom, 1996; Bloom & Kelemen, 1995; Bloom, Kelemen, Fountain & Courtney, 1995) present evidence that preschoolers do not differentiate between individual object and collective reference of novel nouns even when syntactic and pragmatic cues are provided unless there is explicit visual information. More evidence on children's difficulty in providing collective reference for superordinate terms and novel nouns is supplied by Huntley-Fenner's 1995 study of 3- and 4-year olds. Bloom emphasizes the importance of a noun with a collective reference having "an independent causal role in some conceptual domain" in order for it to be construed as an individual (1994:319); that is, a physical entity such as a forest, for example, or a social group such as the family that has a coherent place in the structure of reality and about which children might have a 'naïve theory'. Bloom & Kelemen (1995) propose that the absence of such pragmatic cues, together with children's lower sensitivity to syntactic cues than adults, may explain their results.

These findings, however, may be an artifact of the fact that the data on acquisition of nouns with collection references initially comes from English-speaking participants. Recent cross-linguistic studies comparing aspects of the acquisition of

nouns in English with Mandarin Chinese (Tardiff, Gelman, & Xu, 1999), and with Japanese (Imai & Gentner, 1997) suggest that culture-specific input factors in maternal speech and language-specific factors such as count/mass syntax affect children's performance.

The studies that Gathercole and her colleagues have conducted compare children's construal of noun referents in English, Korean, Spanish, and Welsh, four languages with varying degrees of overt singular/plural and count/mass marking and with distinct properties of marking nouns in context: Many individuated contexts in English and Spanish, fewer Welsh nouns in individuated contexts, contrasted with nouns with collective reference, and few individuated contexts in Korean. Children acquiring these different languages gave different response patterns consistent in various degrees with the whole object, taxonomy and shape biases. English- and Spanish-speaking children were found to favor same-shape responses and to perform more in line with the whole object approach. In contrast, Korean-speaking children favored same-substance responses, and Welsh-speaking children did not perform in accordance to the whole object approach. These studies also indicate that as soon as children understood the task at hand, they responded to new words in ways that are consistent with the adult language and that consistent and obligatory singular/plural syntax affects children's response patterns (Gathercole & Min, 1997; Gathercole et al., in press; Gathercole et al., to appear).

The current study intends to enrich the investigation of this issue by focusing on the development of noun reference in a single Semitic language, Palestinian Arabic (henceforth: PA), through children's learning how to mark number distinctions in their language. PA has a rich and diverse number system, including two noun pluralization structures as well as dual, pseudo-dual and collective systems, each of

which takes different inflectional forms. This is a unique opportunity to compare children's developing perception of those very noun classes which are of interest to the current controversy where they already exist as distinct classes in the input to children. In order to focus on all and only the target structures in the age span within which relevant development has been shown to take place, we use a cross-sectional experimental design in the current study.

Number in Arabic

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; and a colloquial language, which is everybody's mother tongue (Ferguson, 1959; Versteegh, 1997). Modern Standard Arabic (henceforth: MSA) is the modern 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). 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). However, the span of the continuum that individuals control depends on their background, education and upbringing (Versteegh, 1997). MSA is not the spoken language acquired by Arabic-speaking children: Children acquire the local dialect at home, and learn MSA in school (Omar, 1973). The focus of our discussion here is the acquisition of three morphological categories of number in a PA dialect spoken in the north of Israel (Cowell, 1964; Levin, 1994; Ravid & Farah, 1999, 2001).

Number in Arabic can be characterized as a four-way grammatical system: Singular, dual, collective and plural. Plural nouns in Arabic refer to countable entities which are more than two in number, and are formed by two different procedures: The classical Semitic device of non-linear root-and-pattern affixation, referred to as the "broken plural"; and linear suffixation by either a feminine or a masculine suffix, termed "sound plural". This basic split plural system found in MSA applies also, with some modification, in the current spoken dialects, where the sound masculine suffix is –*i:n* and the sound feminine suffix is –*a:t* (Holes, 1995; Versteegh, 1997). In this study, following the results of Ravid and Farah (1999, 2001), we have selected the sound feminine form due to its prevalence in Arabic child language for comparison with the other number categories.

The dual constitutes a separate inflectional category in Arabic, specifying two of what the noun base designates, e.g., *ktab:en* 'book,DUA'. In Classical Arabic, the dual was a grammatical concord category like singular and plural, and entailed obligatory marking across the board on all lexical classes – nouns (and pronouns), adjectives, and verbs. Thus the following translated sentence describing two boys would have dual suffixation (marked by the numeral 2) on each of its components: *These₂ boys₂ were₂ close₂ friends₂* (Blanc, 1970). The dialectal, or vernacular, dual, in contrast, is not a concord category, is marked only on nouns, and entails plural agreement (Ferguson, 1989). In the dialects, the dual takes the form of the suffix –*e:n* (or -*ay:n*) on masculine nouns, and -*te:n* (or -*tay:n*) on feminine nouns (Abu-Haidar, 1979).

Most scholars studying Arabic and its dialects share the view that the dual category is no longer functioning as an obligatory inflection. Despite its morphological form, the vernacular dual is, according to Blanc, "functionally

equivalent to nouns preceded by a numeral or another quantifier…[It] has…become little more than an equivalent of the numeral 2; overt reference to two-ness is no more obligatory… than is overt reference to three-ness, four-ness, n-ness" (1970: 43). This view is shared by Cowell (1964), who claims for Syrian Arabic (the dialect of Damascus, close to northern Palestinian Arabic) that the dual inflection is more comparable to numerals than to the plural inflection. The dual is not obligatory in the dialects: a noun does not have to be inflected for the dual every time two of anything is used, and the plural may be used instead, unless it is the very two-ness of the noun that is important. It is possible to designate two-ness by the free numeral two, and even by using the dual noun with the numeral following in apposition, e.g., *ktabe:n tne:n* 'book,DUA two'. Duals, like the free numeral 2, also refer to a small, unspecified number, a small quantity (Blanc, 1970). Moreover, most dialects have both a "real" dual (described above) and a pseudo-dual, which is used for paired parts of the body and also for the countable plurals of these words (Blanc, 1970; Ferguson, 1989; Versteegh, 1997; and compare Hebrew on such pseudo-duals, Schwarzwald, 1996). According to Blanc, the largest, most open sets using the dual morphemes are the Syro-Mesopotamian dialects, of which PA is one.

A fourth number category in addition to singulars, duals, and plurals, is that of collectives. In MSA, the collective is a separate morphological category used to refer to uncountable entities or to living things –fruit, vegetables, grains, flowers, grasses, trees, fish, seafood, animals and humans – as an undifferentiated group, e.g., *samak* 'fish,COL' (Cowell, 1964; Holes, 1995). The three-way singular / plural / collective distinctions are preserved in some of the more conservative Arabic dialects, but in many cases the collective seems to be less and less used, with the plural replacing it in collective contexts. Moreover, there is a trend in the dialects towards the development

of an analytic singular / plural distinction by using a free lexeme meaning "one", "a piece", "a single example of", to yield a partitive form from the collective. Another way in which the collective is used towards achieving this distinction is through adding the suffix –*a* to collective forms to form the singular (Holes, 1995). Collective noun stems can also occur in the plural, in which case the meaning is individualized and particularized (Abu-Haidar, 1979).

Cowell (1964), in describing the number system in Syrian Arabic (of which PA is a close branch), makes the following observation: "It is not always possible to determine the Arabic number inflection by meaning or by translation into English. Many kinds of 'things' may be regarded either as wholes or as aggregates of discrete parts. Not only the form of a plural, but also the kinds of plural a noun will have or whether it will have a plural at all are to a considerable extent questions of lexical idiosyncrasy" (1964: 371). Testing young PA-speaking children on knowledge of this system of noun plurals, duals and collectives seems particularly suitable to the current state of the art.

The development of noun plurals in Arabic

Not much is known about children's acquisition of contemporary spoken Arabic by native-speaking monolingual children. Although there have been a few studies of diverse aspects of children's acquisition of contemporary Arabic (Al-Akeel, 1998; Badri, 1983; Eviatar & Ibrahim, 2000; Henkin, 1996, 1998; Idrissi-Bouyahyaoui, 1987; Omar, 1973), the only published studies on the native acquisition of plural forms in spoken Arabic are reported in Ravid and Farah (1999) and (2001). The 1999 study was an experimental design testing sound and broken plurals in 48 children aged 2-5, all native speakers of PA as their only mother tongue from urban, educated families. The participants were asked to give the plural form of 42 noun

stimuli in three categories: masculine *-i:n* suffixed sound plurals (e.g., *Tabba:x /*
Tabbaxi:n `cook / s'); feminine *-a:t* suffixed sound plurals (e.g., *Ta:wle / Tawla:t*
`table / s'); and  broken plurals in 7 formal classes (e.g., *šobba:k / šabbabi:k* `window
/ s'; *jamal / jma:l* `camel / s'). Findings revealed that the unmarked form of
pluralization was sound feminine plurals suffixed by *-a:t.* The category of sound
feminine plurals 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 also with an increasing presence in the
erroneous responses of the oldest age groups.

The second published report is a longitudinal case study tracing the route a PA-
speaking child takes during one year (1;8-2;8) in learning about the noun plural
categories. The results of the initial analysis reported in Ravid and Farah (2001)
indicate that two major plural categories are active in the child's early lexicon: the
broken plural category, which occurs most frequently in his productive speech, and
the sound feminine category, which lags somewhat behind but makes up in being the
target of most erroneous forms. All other plural forms – sound masculines, duals and
collectives – range between 4%-22% of all plural forms and are always correct. It thus
seems that at this developmental point, most active "work" is taking place in the
sound feminine and the broken plural categories alone.

Given the variety of number categories in Arabic and the patterning of sound
and broken noun plurals in the development of PA reported in Ravid & Farah (1999,
2001), the aim of this study was to continue investigating number categories in child

PA. The current study focuses on the acquisition of three number categories in the speech of children acquiring a PA dialect spoken in the north of Israel (Abu-Haidar, 1979; Cowell, 1964; Levin, 1994). Due to its prevalence and early acquisition, we selected for this study the category of sound feminine plurals (henceforth: SFP) suffixed by –a:t. Knowledge of this basic default plural category is compared to two other number categories, which have not been investigated yet in child Arabic: the dual and the collective categories.

The study

In order to compare the development of dual, collective, and SFP forms in PA, we tested four groups of children acquiring PA as their native tongue on production of these categories.

Predictions

Of the three categories, we expected SFP to be the easiest for all participants, to score the highest in all age groups, and to reach ceiling scores in the oldest age group, due to their transparency and consistency in the language, and in view of the findings in Ravid & Farah (1999, 2001). We predicted duals and collectives to be more difficult to acquire due to their less robust status as grammatical classes in the spoken Arabic dialects.

Population

The study population consisted of 58 children (27 boys and 31 girls) from an Arabic-dominant city in the north of Israel, in two preschool and two gradeschool age groups, as follows: 3;6-4;6 (N=13, mean age 4;2), 5;0-6;0 (N=15, mean age 5;8), 6;0-7;0 (N=15, mean age 6;7), and 7;0-8;0 (N=15, mean age 7;8). All children were monolingual speakers of PA as their mother tongue, from a middle-to-high socioeconomic background, with no hearing, language or developmental problems.

Procedure

Children were selected randomly from the class register, screened for hearing, language, and emotional problems, and tested individually at school or in kindergarten by the second author, who is a native speaker of PA. In addition, children were screened for understanding of number concepts by the following procedure: the child was asked to hand to the investigator one, two, three, and many pens or keys. Every number was tested in random order three times. Children who passed this screening procedure were administered the test.

Materials

10 basic stimuli were selected for this test, all nouns denoting fruits and vegetables familiar to preschoolers and pertaining to their daily diet, such as cucumbers, oranges, eggplant and carrots (see Appendix I for a full list). Each target stimulus was presented in four pictures as follows: a single item, used to present the target stimulus (e.g., *burda:ne* 'orange'); two items, used to elicit the dual form (e.g., *burdante:n* 'orange,DUA'); three items, used to elicit the plural form (e.g., *burdana:t* 'oranges'); and numerous (7-12) items, used to elicit the collective form (e.g., *burda:n* 'orange,COL'). All in all there were 30 target stimuli in random order.

The singular forms used to present the target stimuli were all feminine nouns ending in *–a* or *–e*, e.g., *gazara* 'carrot'. The plural forms took the SFP suffix *–a:t* (e.g., *gazara:t*), which emerges early on in child PA (Ravid & Farah, 1999, 2001). The dual forms all ended in the PA dual suffix *–te:n,* e.g., *gazarte:n* 'carrot,DUA'. The collective forms were similar to the singular form minus the final vowel, e.g., *gazar* 'carrot,COL'.

The test was preceded by a training session with pictures, whose objective was to familiarize children with the testing procedure and with the test categories. This

session consisted of three training items which did not denote edible fruits and vegetables, but which nonetheless take dual, collective and plural forms in PA and were easy to depict visually: a fish, a flower and a balloon. Each of the three training items was presented to the participant in two forms, thus introducing the three target categories – dual, collective, and SFP. Duals and collectives always appeared twice in the training session, while SFP forms appeared once. The investigator presented each of the training items by saying, for example: "here is one fish (*samake*), and when there are two [presenting picture] we say *samakte:n* 'fish,DUA', right?; when there are many [presenting picture] we say *sama:k* 'fish,COL', right?", etc. Training items were interspersed by distractor items (see below).

Once the training session was over, participants were administered the actual test items. Each target form of each item (dual, collective, singular) was elicited in the following way: The participant was presented with a picture of the singular form (e.g., *burda:ne* 'orange'), and the investigator said: "This is one orange (*burda:ne*). When there are two [producing a picture of two oranges] we say … (target response *burdante:n* 'orange,DUA')"; or "This is one orange (*burda:ne*). When there are three [producing a picture of three oranges] we say … (*burdana:t* 'orange,PLU')". The singular form always preceded each and every elicitation of a dual, a collective or a plural form. Target stimuli were randomized.

In order to prevent set effect, 19 distractor items, all nouns taking the broken plural forms (e.g., *ba:b / bwa:b* 'door/s') were used. These appeared after every two test items and also after training items, and consisted of pictures showing single items. The investigator said, for example, "This is one door (*ba:b*), and when there are many we say… (target response *bwa:b*)".

Results

Responses were classified into two initial types: Correct responses, which corresponded to the forms used by adults; and incorrect responses, which were further subdivided into 9 types, laid out in Appendix II below.

INSERT TABLE 1 ABOUT HERE

Correct responses

For each category, the maximal number of correct responses was 10. Table 1 gives the mean correct score for each category in each of the age groups. To test the prediction that SFP would be the easiest of the three morphological categories, we carried out a two-way ANOVA of age (4) x morphological category (3) on the data presented in Table 1. There was an effect for age ($F(3,54)=10.13$, $p<.001$), confirming that there is a rise with age in the number of correct responses. There was also an effect for morphological category ($F(2,108)=14.38$, $p<.001$), showing that the three categories differed in their correct scores. There was an interaction between age and morphological category ($F(6,108)=3.01$, $p<.009$), shown in Figure 1.

INSERT FIGURE 1 ABOUT HERE

To see where the differences among the groups originated, we conducted a Bonferroni Test comparing pairs of age groups in each category at the .05 level. In both dual and SFP categories, the youngest group (3-4 year olds) had the lowest score and differed from the rest of the groups, which did not differ, however, from each other. In the collective category, none of the age groups differed from each other. Thus, learning takes place in the age span 3-5 in the dual and SFP categories, but not in the collective category.

Error analysis

Incorrect responses on this test were classified into 9 types (see Appendix II

for full details and examples). These included repetition of the singular stimulus; a numeral word; a quantifier with the singular stimulus; a broken plural; an inappropriate dual in the other two categories; an inappropriate collective (with or without a preceding numeral) in the other two categories; an inappropriate SFP (with or without a preceding numeral) in the other two categories; and an erroneous sound masculine for SFP.

For the purpose of this analysis, all incorrect responses produced by each participant in each category were taken as a new total, and the distribution of the ten response types within this total was calculated and analyzed. Below, children's incorrect response categories are presented and analyzed.

Non-morphological responses

There were three types of non-morphological responses: *Repetition responses, quantifier plus singular form,* and *numeral word.* Repetition of the target singular stimulus occurred only in the youngest age group and mostly in the collective (7.7%) and SFP (3.4%) categories. A second non-morphological response consisted of a quantifier (e.g., *kti:r* 'a lot of') followed by the singular stimulus. This occurred mainly in the collective (18.6% in the youngest group) and in the dual category, where it persisted in all age groups (ranging from 3-10%). A third type consisted of giving only the numeral word *tinte:n* 'two' in the dual category, mostly in the youngest group (26.13%) and persisting in the rest of the population (5-6).

Morphological responses

The next set of incorrect response types concern word-internal changes. None of them occurred in all morphological categories.

INSERT TABLE 2 ABOUT HERE

Erroneous Broken Plural. A common plural form in Arabic is the broken

plural which involves a non-concatenative shift from a singular to a plural pattern

(Holes, 1995), e.g., *ba:b / bwa:b* 'door /s'. This response type occurred only in the

collective and SFP categories (Table 2), e.g., broken **mwa:z* for collective *mo:z*

'banana,COL' or for SFP *moza:t* 'bananas' (recall all plurals in this study had the SFP

form, which attaches the suffix *−a:t* to singular noun stems). Table 2 shows that in the

collective category, such responses occurred only in the middle age groups, while in

SFP they occurred only in the oldest age group. There were no statistical differences

between the categories.

Inappropriate Dual. The inappropriate dual occurred only where SFP was

required (e.g., *mozte:n* 'banana,DUA' for *moza:t* 'bananas') and only in the youngest

age group. No significant difference was found among the age groups.

Inappropriate Collective. Inappropriate collective responses occurred in both

possible contexts – where duals and SFPs were required (Table 2). A two-way

ANOVA (age (4) x morphological category (2)) found no effect for age but did find

an effect for morphological category ($F(1,54)=55.82$, $p<.001$): many more

inappropriate collective were found in the SFP context (M=54.73%) than in the dual

context (M=7.83%). There was also an interaction of age and morphological category

(Figure 2): Inappropriate collectives were few across the age groups in the dual

context, but their number was very high in the three younger age groups in the SFP

context, and declined sharply in the oldest 7-year-olds. A Bonferroni Test showed a

close to significant difference between inappropriate collective responses in the SFP

context in the youngest and the oldest age groups.

Numeral followed by Inappropriate Collective. Participants sometimes gave

an inappropriate collective preceded by a numeral word. This happened only in the dual context, e.g., *tinte:n mo:z* 'two banana,COL' for *mozte:n* 'banana,DUA'. No significant difference was found among the age groups.

   Inappropriate SFP. There occurred in both possible contexts - dual and collective, e.g., *moza:t* 'bananas' for *mozte:n* 'banana,DUA', or for *mo:z* 'banana,COL' (Table 2). A two-way ANOVA (age (4) x morphological category (2)) found an effect for age ($F(3,54)=3.1$, $p<.04$): the amount of such responses declines with age. An effect for morphological category was also found ($F(1,54)=126.05$, $p< .001$): There were more than 5 times as many inappropriate SFPs in the collective context (M=88.72%) than in the dual context (M=16.11%). Inappropriate SFPs in the dual context had a U-shape, with the most responses in the 6-year-olds; while in the collective context the amount of such responses increases until it constitutes the whole of the incorrect responses in the collective context in the oldest age group.

   Numeral followed by Inappropriate SFP. This response-type occurred only in the dual context (Table 2). A one-way ANOVA showed an effect for age ($F(3,57)=3.52$, $p< .03$): such responses decline with age. The Bonferroni Test located the difference between the youngest age group (M=29.57%) and the other age groups.

   Erroneous Sound Masculine Plural. Recall that sound plurals in Arabic can take either a masculine *–i:n* or feminine *–a:t* suffix. All target sound plurals in this study were feminine, however participants sometimes gave an erroneous masculine sound plural in SFP context, e.g., *betingani:n* 'eggplants,Masc' for *betingana:t* 'eggplants,Fm' (Table 2). This response type occurred only the middle age groups.

Discussion

   This study concerns the acquisition of three inflectional noun categories in

PA: duals, suffixed by *–te:n*; collectives, formed by deleting the final vowel (*e* or *a*) on the singular form; and SFP, suffixed by *–a:t*. These were tested using an elicitation procedure of 30 target stimuli in four groups of PA-speaking children aged 3-8.

Analysis of *the correct results* showed two different acquisition patterns – for SFP and dual nouns, on the one hand, and for collective nouns, on the other hand: Correct scores in SFP increased from 50% to over 95%; correct scores in the duals increased from 40% to over 90%; but correct responses in the collective category did not show any increase and stayed around 50% in all age groups.

Non-morphological responses using numerals and quantifiers instead of the required word-internal operations occurred only in the collective and dual categories; and responses using a numeral followed by inappropriate SFP and collective forms occurred only in the dual category. *Inappropriate* SFP responses occurred much more in collective than in dual contexts, and their amount declined with age. Inappropriate dual responses occurred only in SFP contexts. Inappropriate collective responses occurred much more and more extensively in SFP than in dual contexts. There were two types of *erroneous* responses: Broken plurals, which occurred only in SFP and collective contexts; and erroneous sound masculines in SFP contexts. Such erroneous forms occurred only in the middle and older age groups.

Learning to mark SFP, Duals, and Collectives in PA

Sound Feminine Plurals. Of the three constructions investigated in this study, SFPs, which reach ceiling scores in the oldest group, are the most accessible in both structural and semantic terms. PA makes a singular / plural distinction, though it is less clearly marked than in English: There are two forms of marking plurals (sound and broken), using both suffixation and word-internal vowel changes. Noun plurality is not, however, extended within the NP, since adjectives in the plural NP usually take

singular feminine marking (Levin, 1994). SFP –*a:t* suffixes are linear, prosodically salient, forming a clearly marked final stressed syllable with a long vowel. The SFPs in this study did not alter the form of the stem, and simply substituted the last vowel of the singular stem (e.g., *basale / basala:t* 'onion / onions). Results confirm that SFPs are indeed the default number category in child PA (Plunkett & Nakisa, 1997), and lacking semantic specification, the least restricted.

This status of SFP is reconfirmed in the pattern of erroneous responses. One piece of evidence is the distribution of erroneous periphrastic responses consisting of a quantifier (e.g., *kti:r* 'lots of') followed by a singular form, yielding, for example, *kti:r mo:ze* 'lots of banana'. The SFP category had very few of these responses, and only in youngest group, while morphological SFPs replaced periphrastic expression of number very early on. Another piece of evidence is the fact that despite the potential of exchanging a masculine suffix –*i:n* for the required feminine suffix –*a:t* on sound plurals, only the middle age groups did that, and in negligible numbers (see Ravid & Farah, 1999, 2001, for similar findings).

Duals. Like SFPs, duals also reach high scores in the oldest group, though their learning is more gradual. The dual suffix in PA is as prosodically salient as the SFP –*a:t*. The dual suffix (–*e:n* on masculine nouns and –*te:n* on feminine nouns) is syllabic, stressed, and does not cause morpho-phonological changes in the stem. Like the plural categories, duals refer to discrete countable entities. They carry transparent and predictable semantic information: two of what the singular noun stem means. In one sense, duals are less restricted than SFPs: Any count noun can take a dual suffix, while not any count noun takes a sound feminine plural suffix. But in another sense, SFPs and duals differ in the degree of their obligatoriness (Bybee, 1985): Dialectal duals can be pre-empted by syntactic dual formation, using the free numeral 'two'. It

is impossible in Arabic to quantify a noun, as we did on this test, without morphologically pluralizing it. But it *is* possible to assign dual value to a noun without morphologically dualizing it, as discussed above (Blanc, 1970; Cowell (1964); Versteegh, 1997).

In that sense, dual morphology in PA is comparable to Hebrew optional bound morphology, where bound genitives, accusatives, and so-called "double compounds" are pre-empted in spoken language and in most other contexts by analytic forms expressing the same semantics (Cahana-Amitay & Ravid, 2000; Ravid & Shlesinger, 1995). This makes input to the PA-speaking child accessible, but inconsistent and not obligatorily encodable in morphological form. One could extend Bloom & Kelemen's (1995) argument about collectives and claim that PA duals do not constitute a "natural" class, since they do not refer to real-world pairs such as hands, eyes or socks. This is the job of the "pseudo-dual", which was not the focus of our study (Blanc, 1970). However, this would mean that morphological classes have to rely on real-world distinctions, which was shown not to be case by Levy (1988) in her study of gender in Hebrew. Levy showed, in fact, that gender in Hebrew is acquired early and easily as a purely formal class.

Indeed, we found some indications that dual formation in PA is losing its morphological number-marking status. Erroneous responses in the dual category were in many cases non-morphological or periphrastic, of the form *tinte:n N-infl* 'two inflected-noun' (inappropriate SFP or collective), or consisted of the numeral word *tinte:n* 'two' alone. These strategies were not limited to young children whose understanding of number concepts is just consolidating, but also occurred in the kindergarteners and gradeschoolers who can certainly count, add and subtract within the first decade.

This is in line with language change processes in Arabic dialects and Modern Hebrew, both of which are less synthetic than their Classical predecessors. Classical Arabic dual had a much broader scope than the dialectal dual: it applied, in addition to the noun, to adjectives, relative, possessive and demonstrative pronouns, proper nouns and 2nd and 3rd person non-present verbs, and is therefore regarded as a grammatical concord category. However, the dialectal dual, which is found in PA as in other spoken Arabic dialects, applies only to nouns, and adjectives appearing in NPs with dual noun heads take a different kind of concord than do adjectives in the plural NP (Blanc, 1970). In Hebrew, the only other major living Semitic language, duals are no longer a viable morphological category. They are used lexically on specific nouns from a variety of domains such as temporal words (e.g., *šnatáyim* 'year,DUA' rather than **štey šanim* 'two years') or dual body parts (e.g., *knafáyim* 'wing,DUA' rather than **štey knafot* 'two wings'). But on the whole, Hebrew nouns do not take the dual suffix productively (Schwarzwald, 1991), and NPs with nouns preceded by the numeral two have the same syntactic form as with those preceded by other numerals (e.g., *šney etim* 'two pens' rather than *etáyim* 'pen,DUA', which might be used jokingly, and compare *šloša etim* 'three pens').

Collectives. Collectives, the category that has been the controversial topic of a number of studies described in the introduction above, was found to be the hardest in the current study. In contrast to SFPs and duals, PA collective nouns show no learning curve even in the oldest age group and stay around 50% throughout our popuolation. *Some* knowledge *is* present to begin with, however, even in the 3-year-olds, since the chance of giving a collective response is at the most 33% (given the non-morphological options). To the best of our knowledge, there exist no spontaneous speech samples of monolingual child Arabic learners and their caregivers, and

therefore CDS and the occurrence of different number categories in it cannot be assessed directly. But given what we know about adult usage of number categories in the Arabic dialects (see above), it seems that compared to SFPs and duals, input of PA collectives is more restricted, less consistent, semantically non-coherent and structurally non-transparent. The morphological operation of singular → collective is semantically restricted to a lexically learned class (fruits and vegetables in addition to miscellaneous others). Though all of the collectives in this study were carefully selected to form a coherent semantic group of fruits and vegetables, this did not seem to help the children in their production. Prosodically, collectives are the least salient of the three study categories. Structurally, forming a collective noun requires the deletion of the final vowel from the singular form (in fact, a process of backformation) which creates a form that is phonologically more simplex but morphologically more complex than the singular stem, with no clear perceptual clue to the meaning of the form.

A curious point is the fact that analysis of the incorrect responses showed collectives to interact with SFPs, and not with duals. For example, inappropriate duals occurred in small numbers only in the SFP context (e.g., *mozte:n* for *moza:t*), and only in the youngest group. In contrast, inappropriate collective and SFP responses interacted strongly. Inappropriate collectives occurred in small numbers across the board in the dual context, and in very large numbers (15 times as many as duals in the youngest group, 7 times as many in the 3rd age group) in the SFP context (e.g., *mo:z* for *moza:t*). Inappropriate SFPs in the collective context constituted the main, and in the older age groups, the *only* incorrect morphological strategy in the collective context (e.g., *moza:t* for *mo:z*).

One possible explanation is that children learning PA perceive the notions of plurality and collectiveness as more closely related to the noun and therefore to be expressed morphologically; while they find it easy to detach the dual sense from the word and express it in the separate numeral 'two', followed by any noun form – singular, collective, SFP, due to the disintegration of duals as a morphological category in the dialects.

Another account for this collective / plural affinity may be sought in the actual semantics of PA collectives, which differ from familiar English collectives such as *family, audience, forest*, and *army*. The latter collectives constitute a single bounded whole, which can be pluralized (*forest / forests*), and consists of a number of entities which are different from the single collective whole and which carry different names (*family members, persons, spectators, trees, soldiers*, etc,). However the PA collective category, containing entities such as collective fish, onions, bananas or flowers, is closer in nature to Hebrew collectives, e.g., *širon* 'song collection, from *šir* 'song', or *cimxiya* 'flora', from *cémax* 'plant'. Like the collectives discussed above, Hebrew and Arabic collectives form a bounded whole, but this whole consists of the same units it refers to, and carries the same name, though morphologically modified. In both Hebrew and Arabic, pluralizing collectives is restricted: Hebrew *–on* suffixed collectives pluralize, while those with *–iya* suffixation do not. In PA, collectives may occur in the plural, in which case the meaning is individualized and particularized (Abu-Haidar, 1979). Thus PA collectives are a semantically different category than the collective categories that have been examined in the literature so far, and may be perceived by adult speakers and children as alternative plural forms, slightly differing from "true" plurals in forming a collective whole, as amoeba do under certain circumstances. This affinity to true plurals may be the reason no learning is going on

during the age span investigated in this study. This examination of the semantic nature of PA collectives also indicates that there is no such thing as a "natural" collective class: What children have to learn is what the particular language encodes, and there are crosslinguistic variations on the collective theme as there are on every facet of morphology (Bloom & Kelemen, 1995; Gathercole et al., to appear; Lucy, 1996).

Phonological opacity, an absence of coherent semantics and an association with the plural category are also reflected in dialectal language-change processes: Plurals sometimes replace collectives in collective contexts and free lexemes and suffixed collectives express singular partitive semantics (Abu-Haidar, 1979; Holes, 1995).

Broken Plurals. Similar to the findings of Ravid & Farah (1999, 2001), erroneous broken plurals, which did not a constitute target category in this study, occurred only in the older age groups, replacing only collectives and SFPs (e.g., *mwa:z* 'bananas' for collective *mo:z* and sound feminine plural *moza:t*). Broken plurals involve internal changes in the vowel pattern of the word, and come in a variety of minor categories. Broken plural nouns are part of the earliest lexicon of children speaking PA (Ravid & Farah, 2001), but their emergence as a productive plural category is delayed to late preschool (Ravid & Farah, 1999). The late occurrence of broken plural forms in this study as an alternative morphological number-marking option constitutes indirect evidence for the consolidation of this morphological category in preschool and early gradeschool.

This study has shed some light on the long and protracted process of learning to mark number on nouns in PA. We have found that plurals – represented by the category of SFP – and duals are easier to learn than collectives; but there are also indications that duals are losing their morphological status and that collectives are

perceived by young children as related to plurals. Further work is necessary to ascertain whether collectives are difficult to acquire due to their relative semantic and structural opacity in PA, and whether PA-speaking adults, too, prefer the plural to the collective option.

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Table 1. Mean percentages and standard deviations of correct responses on the three

test categories: dual, collective, SFP plural, by age group

Test Category	3 year olds		5 year olds		6 year olds		7 year olds		Total	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Dual	40	30.82	72	34.06	75.33	33.56	90.67	17.51	70.51	34.1
Collective	55.38	33.57	47.33	36.54	48	28.83	56	23.84	51.55	30.42
SFP	49.23	34.02	84	17.64	84.67	14.07	96	6.32	79.48	25.91

Table 2. Mean percentages and standard deviations of erroneous morphological responses (Broken Plural; Inappropriate Dual, Inappropriate Collective; Inappropriate SFP, Erroneous Sound Masculine) in the three morphological contexts: Dual, Collective, SFP, out of the total of incorrect responses, by age group.

Response Type	3 year olds		5 year olds		6 year olds		7 year olds	
Erroneous Broken Plural	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In Collective context	**0**	**0**	**1.57**	**4.16**	**1.11**	**4.3**	**0**	**0**
In SFP context	**0**	**0**	**0**	**0**	**0**	**0**	**6.67**	**25.81**
Inappropriate Dual	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In SFP context	**3.84**	**13.86**	**0**	**0**	**0**	**0**	**0**	**0**
Inappropriate Collective	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In Dual context	**4.06**	**11.97**	**10**	**28.03**	**9**	**26.06**	**7.77**	**25.87**
In SFP context	**73.5**	**37.54**	**56.67**	**49.52**	**64.44**	**47.91**	**26.67**	**45.77**
Numeral + Inappropriate Collective	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In Dual context	**16.83**	**24.62**	**6.75**	**15.54**	**5.67**	**19.35**	**6.67**	**25.81**
Inappropriate SFP	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In Dual context	**12.21**	**28.13**	**13.33**	**29.68**	**26.18**	**39.08**	**12.22**	**32.4**
In Collective context	**58.32**	**42.36**	**77.09**	**40.36**	**92.22**	**25.87**	**100**	**0**
Numeral + Inappropriate SFP	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In Dual context	**29.57**	**35.72**	**20.18**	**31.97**	**5.07**	**11.83**	**3.33**	**12.9**
Erroneous Sound Masculine Plural	Mean	SD	Mean	SD	Mean	SD	Mean	SD
In SFP context	**0**	**0**	**6.67**	**25.81**	**2.22**	**8.6**	**0**	**0**

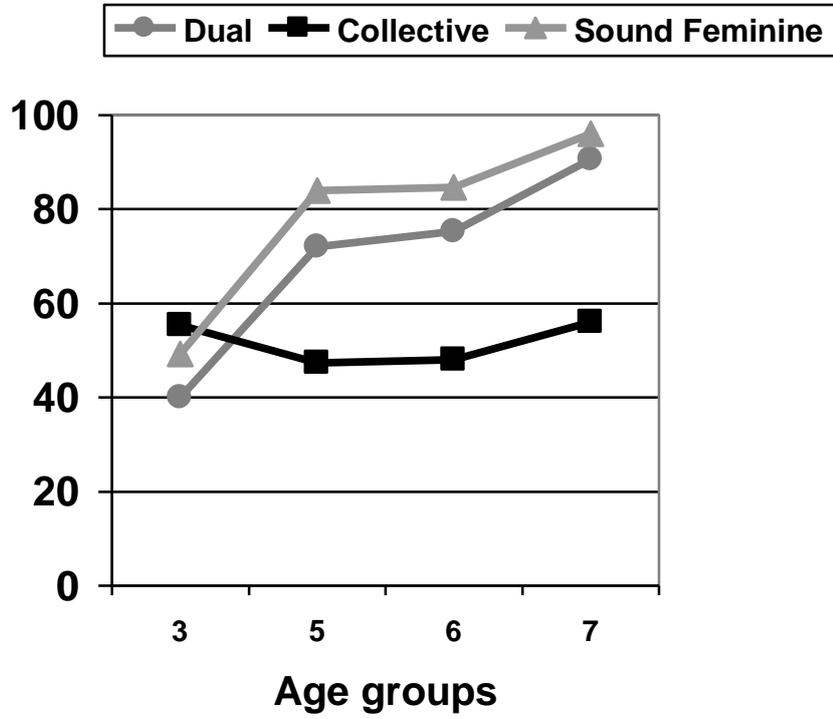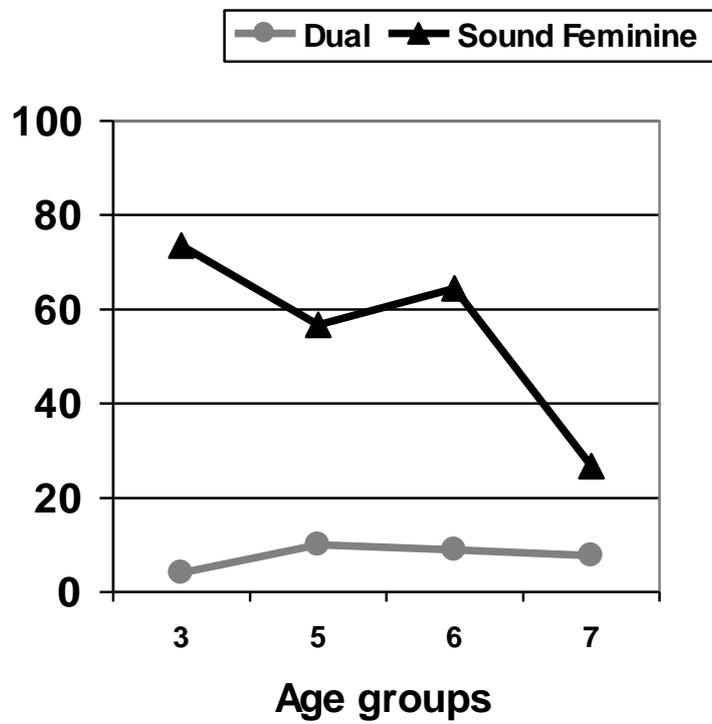Figure 1. Interaction of age and morphological category in the correct responses.

Figure 2. Interaction of age and morphological category in amount of erroneous responses in the inappropriate collective category.

Appendix I. Structure of the experimental design: stimuli (singular forms) and target

responses (dual, collective and plural SFP forms)

Stimuli	Singular	Dual	Collective	Sound Feminine Plurals (SFP)
pear	*nga:sa*	*ngaste:n*	*nga:s*	*ngasa:t*
carrot	*gazara*	*gazarte:n*	*gazar*	*gazara:t*
eggplant	*betinga:ne*	*betingante:n*	*betinga:n*	*betingan:at*
banana	*mo:ze*	*mozte:n*	*mo:z*	*moza:t*
orange	*burda:ne*	*burdante:n*	*burda:n*	*burdana:t*
strawberry	*tu:te*	*tute:n*	*tu:t*	*tuta:t*
lemon	*ha:mda*	*hamete:n*	*hame:d*	*hamda:t*
apple	*tufa:ha*	*tufahte:n*	*tufa:h*	*tufaha:t*
cucumber	*xya:ra*	*xyarte:n*	*xya:r*	*xyara:t*
onion	*basale*	*basalte:n*	*basal*	*basala:t*

Appendix II   Classification and examples of incorrect responses

Category	dual		collective		SFP Plural	
	Form	Gloss	Form	Gloss	Form	Gloss
1. Repetition of singular stimulus	*mo:ze*	banana	*mo:ze*	banana	*mo:ze*	banana
2. Quantifier + singular form	*kti:r mo:ze*	Lots of banana	*kti:r mo:ze*	Lots of banana	*kti:r mo:ze*	Lots of
3. Numeral word only	*tinte:n*	two	*xamse*	five	*tala:te*	three
4. Broken plural	**mwa:z*	bananas,BR	**mwa:z*	bananas,BR	**mwa:z*	bananas
5. inappropriate dual	EMPTY		*mozte:n*	banana,DUA	*mozte:n*	banana,
6. inappropriate collective	*mo:z*	banana,COL	EMPTY		*mo:z*	banana,
7. Numeral + inappropriate collective	*tinte:n* *mo:z*	two banana,COL	EMPTY		*tala:te* *mo:z*	Three banana,
8. inappropriate sound plural	*moza:t*	bananas	*moza:t*	bananas	*betingani:n*	eggplan
9. Numeral + inappropriate sound plural	*tinte:n* *moza:t*	two bananas	*xamse* *moza:t*	Five bananas	EMPTY	