Input characteristics of noun types in Welsh- and English-speaking mothers' speech to infants

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Abstract

Welsh language structure differs from that of English in important ways with regard to object reference. English makes a clear distinction between singular and plural reference. In contrast, Welsh has a more complex number encoding system that allows a stronger emphasis on collections. The basic forms of one type of Welsh nouns refer to collections; a unitizer ending is added to encode individuation (e.g. *ser* 'stars' versus *se<u>ren</u>* '[a] star'). These differences may have both cognitive and linguistic consequences for the infant language learner, depending on the types of structures the child actually hears in the input. This study aimed to identify the nature of the noun types used by Welsh- versus English-speaking mothers in infant-directed speech. Two different play conditions were examined—a structured play session and a free play session. Overall the results show that the type and token frequencies observed in the two play conditions were similar to those previously observed in adult usage of the two languages, including the use of the additional collection/unit system observed in Welsh. Welsh-speaking mothers used a substantial number of collection/unit noun types. However, nouns of this type were

used primarily in their unit forms, despite the unit form being morphologically more complex than the collection form. These findings are considered in relation to factors influencing children's learning of nouns across languages.

Introduction

The purpose of this study was to examine differences and similarities in the use of nouns by Welsh- and English-speaking mothers in their speech to infants. The structure of English and Welsh nouns is markedly different, so this may have ramifications for the type of input Welsh- and English-learning infants hear and, thus, for the nature of nominal reference they exhibit in their early acquisition. Recent work on language development in children suggests that children are influenced from the beginning by the language-specific patterns they hear in the input, with ramifications for the infants' learning about language encoding, e.g., space, motion, tense and aspect (Behrens, 2006; Bloom and Wynn, 1997; Crago, Allen and Pesco, 1998; Huttenlocher, Vasilyeva, Cymerman, and Levine, 2002; Mintz, Newport and Bever, 2002; Naigles and Hoff- Ginsberg, 1998; Rohde and Plaut, 1999; Rowland and Pine, 2000; Theakston, Lieven, Pine and Rowland, 2001; Wijnen, Kempen, and Gillis, 2001). In this vein, previous work has documented that Welsh-speaking children and adults appear to be influenced by the Welsh system: Even two-year-olds are more willing to allow new nouns to refer to collections than their English- and Spanish-speaking peers (Gathercole, Thomas, and Evans, 2000); and school-age children appear to consider quantifying by individuals or by collections when processing number in Welsh (Roberts and Gathercole, 2006). It is not known to what extent these differences might be due directly to differing input patterns in speech to young Welsh-speaking children in comparison with such other languages. It is widely recognised that mothers modify their speech to infants, so they do not necessarily speak to children in the same way as they speak to adults (Gathercole and Hoff, 2007; Hoff, 2003; Hoff-Ginsberg, 1985; 1986), and this may vary by context (Choi, 2000; Yont, Snow and Vernon-Feagans, 2002). By examining parents' speech to children directly we can determine the extent to which language-specific structural differences are reflected in the speech of mothers to children and therefore might be critical in the patterns picked up by children from the start. The main focus here is on mothers' use of nouns, with special attention on number distinctions encoded in those nouns.

In a recent typological study of the distribution of noun types and their token frequencies in Welsh and English text materials, we discovered important differences in the encoding of number reference across the two languages (Roberts and Gathercole, in press). While there are some similarities across the two languages for some noun types, there are marked differences in other types. Both languages have one category of nouns that distinguishes the singular from the plural by encoding singular reference in the basic noun (e.g. *cup/cwpan*; *chair/cadair*; *lion/llew, train/trên*) and adding overt markings/suffixes for plural reference (e.g. *cup-s/cwpan-au*; *chair-s/cadeir-au*; *lion-s/llew-od*; and *train-s/tren-au*). Both languages also have some collective nouns, where singular forms refer to collections (e.g. *army/byddin*; *family/teulu*; *forest/coedwig*; and *audience/cynulleidfa*), and can be pluralised (e.g. *arm-ies/byddin-oedd*; *famil-ies/teulu-oedd*; *forest-s/coedwig-oedd*; and *audience-s/cynulleidfa-oedd*).

Within this similarity of structure, however, there were striking differences in the use of singular versus plural forms. Whereas plural forms accounted for 25.4% of noun tokens in the written texts for English, very few plural forms were used in the written texts in Welsh (only 1.25% of all noun forms). We return below to consider why this might be.

An additional important difference between the two languages is that alongside the singular/plural class of nouns, Welsh also has a set of

nouns that encode a collection/unit (c/u) classification, wherein the basic form of the noun refers to a collection (e.g. *ser* 'stars', *llygod* 'mice', *dail* 'leaves', *mefus* 'strawberries', *gwenyn* 'bees'), and a more marked version refers to a singleton from that collection (*ser-en* '(a) star', *llygod-en* '(a) mouse', *deil-en* '(a) leaf', *mefus-en* '(a) strawberry', *gwenyn-en* '(a) bee'). This distinct number reference system accounted for 2.5% of all noun types examined in Roberts and Gathercole (in press), with the collection forms (i.e. the basic forms) occurring almost as often as the unit forms (i.e. the marked form). Thus, c/u nouns provide an additional way for Welsh speakers to conceptualise entities and numerosity by the way they encode number, particularly in relation to collections.

These differences between the nominal systems in Welsh and English appear to have ramifications for the acquisition and processing of the two languages. In one study on children's acquisition of new nouns, the evidence suggested that these structural differences affect children's first 'best guesses about the meaning of new nouns in English versus Welsh (Gathercole, Thomas and Evans, 2000). According to the hypothesized Whole Object bias (e.g.,Markman, 1990, 1994), children are purported to assume by default that any new word will refer to a single individual whole object. Gathercole, Thomas, and Evans argued that the previous evidence for such a bias was flawed in that the evidence primarily came from English-learning children, and English structure highlights individuability. Children's preference for treating new nouns as referring to individuals may, thus, be an outgrowth of what the English-learning children were learning about the meanings of nouns in English. (See a similar position arguing that children's focus on similarity of shape, or a "shape bias", is an outgrowth of children's learning about how nouns encode meaning, Smith, 1999). The structure of Welsh, in contrast, they argued, may lead children to entertain two possibilities for new nouns—reference to an individual or

reference to a collection. Children were given a task in which they were invited to give a bear, e.g., his "torvel" (in English)/"tylfir" (in Welsh) in a context in which it was ambiguous whether the new noun ("torvel"/"tylfir") referred to a single entity or a collection. Whereas English-speaking children generally assumed that the new noun referred by default to a single entity, Welsh-speaking children, even by the age of 2 ½, allowed that the new noun might refer to a collection of entities. This difference increased with age, suggesting that it was indeed an outgrowth of children's learning about the nominal systems in the two languages.

In another study, we found that the difference between the two nominal systems appears to have ramifications for the processing of new nouns in school children (Roberts and Gathercole, 2006). In contexts that allow Welsh speakers to have competing interpretations of a new noun (as referring to either a single entity or a collection) and English speakers only one (as a single entity), Welsh speakers take significantly longer to respond than English speakers when asked to report "how many" X they saw on a screen. These findings for Welsh are consistent with numerous other cross-linguistic studies revealing that children acquiring different languages show differential patterns of cognitive and linguistic behaviour according to the structure of the language they are learning (Bowerman, 1996a; 1996b; 2000; Bowerman and Choi, 2001; Choi, 1997; Choi and Bowerman, 1991; Choi, McDonough, Bowerman, and Mandler, 1999; Lucy, 1992a; 1992b; 1996; Gathercole, 1997; Gathercole and Min, 1997; Gathercole, Sebastián, and Soto, 1999; Imai, 1999).

The exact usage of noun forms in speech of mothers to children in Welsh is not known, however. Do Welsh-speaking mothers' choice of noun forms mirror the distribution of the noun types in adult usage in written texts? It is possible, for example, that they prefer certain types of noun forms in speech to children, shifting the type of reference or the

distribution of forms, much as English-speaking parents might use a higher incidence of full noun forms over pronouns in their speech to children. It has been reported that nouns for collections are generally difficult for children to learn (e.g., Huntley-Fenner, 1995; Bloom, Kelemen, Fountain, and Courtney, 1995; Ravid and Hayek, 2003). Is this due to linguistic factors, cognitive complexity, or the nature of the input to children? The majority of the research on the acquisition of collection nouns has focused on English-speaking children, so it is possible that development in a language like Welsh, which systematically encodes collection reference, would show less difficulty with collections. Alternatively, it could reflect cognitive difficulty with processing collections, so that children hearing both types of language might all show such difficulties. Or, it is also possible that even if the structure of the adult languages is distinct, mothers modify their use of nominal forms in speech to children, so that reference to collections is rare or is avoided. Only by examining the extent to which mothers' speech reflects the structural properties of the adult language and the extent to which their speech reflects modifications of those properties can we gain a full understanding of the role that input can play in the acquisition of collection words, and ultimately in the course of language development in general. To this end, in this study, the aim was to identify and compare the use of noun types by Welsh- and English-speaking mothers in their speech to infants. Mothers' speech is examined in two different play conditions, a free play session and a more structured play session.

Method

Design

Mothers' naturalistic speech in interaction with their children was examined in two settings. A 'freeplay' session involved the mother and child playing with the child's own toys. A 'structured' session involved the mother and child playing with toys specifically chosen to elicit mothers' usage of the particular types of nouns of interest.

Participants

Ten mother-child dyads were videotaped. Five Welsh-speaking and five English-speaking infants and their mothers took part in this study. The mean age of the Welsh-speaking infants was 1 year 9.3 months (range: 1year 8.2 months – 1year 11 months); the mean age of the English-speaking infants was 1 year 7.3 months (range: 1 year 5 months – 1 year 10 months).[1] Participants were recruited from the local community subject panel. Recruitment of Welsh-speaking infants and mothers was based on the parental reports of the child's, and their own, language background via a questionnaire. The criteria for inclusion into the Welsh group were based on parental reports indicating that the mother's own and the child's first language was Welsh and that the primary language spoken at home was Welsh (80-100% Welsh at home). English-speaking infants and mothers similarly were included only if the parental report indicated English as the mother's and the child's first language and 100% use of English in the home. Each mother and child pair participated in both the 'freeplay' and 'structured' play sessions.

Equipment

A video recorder was used to record mother-child interactions during each session. A specific selection of toys was used for the 'structured' session only.

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[1] We are grateful to Helen Sproson for collecting and recording the data from the English-speaking mothers. All tapes, both Welsh and English, were transcribed and analysed by the first author. An initial analysis of the English data were reported in Sproson (2001).

Stimuli

The toys selected for the 'structured' session were objects whose names fell into one of three noun type categories critical for distinguishing English and Welsh noun structure. These included two types of nouns that had similar structures in English and Welsh—singular/plural nouns and collective nouns—and one type that differed—collection/unit nouns. A set of toys was chosen to represent examples of each noun type and are detailed in Table 1. These toys were provided in the hope of eliciting usage of the toys' names by the mothers in their speech to the infants.

Table 1

Toys used for each noun type category in the structured play condition.

Noun Type	Toy	Welsh Nouns	English Nouns
Singular/plural nouns in Welsh and English (Note: toys in this category were of different shapes, colours, sizes)	5 Balls 3 Teddies 5 Cars	Pêl/Peli Tedi/Tedis Car/Ceir	Ball/Balls Teddy/Teddies Car/Cars
Collection/unit nouns in Welsh and singular/plural nouns in English	3 Star shaped cushions 5 Plastic Pigs 5 Plastic Fish	Seren/Ser Mochyn/Moch Pysgodyn/Psygod	Star/Stars Pig/Pigs Fish/Fish(es)
Collective nouns in Welsh and English	4 Dolls (male, female, small female and baby) 7 Plastic Cows 9 Plastic Trees	Teulu/Teuluoedd Gwartheg Coedwig/ Coedwigoedd	Family/ Families Cattle Forest/ Forests

Procedure

Two one-hour play sessions, one 'freeplay' and one 'structured', were recorded for each mother-child dyad. The order in which participants undertook the play conditions was counterbalanced across participants within each language group. For each mother-child pair, the two sessions were recorded back to back, with the exception of one Welsh mother-child dyad, for whom the 'structured' session was recorded a week after the 'freeplay' session.

All sessions involving the Welsh mother-child dyads were recorded at the Child Language Laboratory, Bangor University. Two of five English mother-child dyads had both sessions recorded at their home; the remaining three were recorded in the same Child Language Laboratory at the university. For the 'freeplay' sessions at the laboratory, mothers were asked to bring along the child's own toys to play with. For the 'structured' session, mothers were asked to play with their child using only the toys specified in Table 1.

Initially, mothers were simply told that the aim of the experiment was to observe the way children played and used language in two different play conditions. Mothers were asked to play with their child in a natural way during these sessions. The video recorder was switched on at the start of each session. The experimenter remained in the room recording but did not engage in the play unless spoken to directly by the mother or child. This was to encourage naturalistic mother-child interactions. Participants were given a break between sessions when the sessions were undertaken successively. Following the final session, mothers were given details of the precise nature of the study and debriefed.

Results

The mothers' speech in each videotaped session was transcribed. Only the nouns in the transcripts were analysed. The nouns were classified into one (or more) of six noun type classifications. These noun classes and associated definitions are shown in table 2, following Roberts and Gathercole (in press). The type and token frequencies were computed for each noun class type, and, within noun class, the type and token frequencies of each morphological form (i.e. singular, plural, collection or unit) were also calculated.

Table 2

Noun type classification and operational definitions[2] (adapted from Roberts & Gathercole, in press)

Noun Type	Criteria for classification in English	Criteria for classification in Welsh	Comments
Singular/Plural	1. Nouns occur in singular and plural form; can take plural –*s*	1. Nouns occurs in singular and plural form; can take one of the 13 plural inflections, an internal vowel change or both	

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2 Some nouns overlapped noun classes by satisfying some or all the conditions for more than one class. These were classified into all the relevant classes. For example, nouns such as 'noise', 'cake' and 'plaster' satisfied the conditions for classification as singular/plural nouns and singular only nouns. Similarly, nouns such as 'pack', 'set' and 'bunch' satisfied the conditions for classification as collective nouns and measure nouns.

	2. Nouns co-occur with a specific set of quantifiers, singular forms can be preceded by *a /an*; and plural forms could be preceded by *many*, *few*, and numerals such as *two* or *three*	2. Nouns co-occur with a specific set of quantifiers, singular forms can be preceded by numerals such as *dau/dwy* 'two', *tri/tair* 'three'; and, plural forms can be preceded by partitives such as *dau/dwy o* 'two of', *tri/tair o* 'three of', and the quantifiers *ychydig o* 'a bit of', *llawer o* ' lots of'	Irregular plural forms were included in this class if they satisfied this second criterion
Singular only	1. Noun occurs only in a singular (unmarked) form and does not take a plural *–s*	1. Noun occurs only in a singular (unmarked) form and take one of the 13 plural inflections, an internal vowel change or both in Welsh	
	2. Nouns do not normally occur directly quantified by numerals or ordinals, cannot be preceded by *two*, *three*, *first*, *second*	2. Nouns do not normally occur directly quantified by numerals or ordinals, cannot be preceded by *dau/dwy* 'two', *tri/tair* 'three', *cyntaf* 'first', or *ail* 'second'	
	3. Nouns co-occur with specific sets of nominal measure nouns such as *much*, *little*, and *some*	3. Nouns co-occur with specific sets of nominal measure nouns such as *ychydig o* 'a bit of' and *llawer o* 'lots of'	

Plural only	1. Nouns occur only in a plural (marked) form with plural *–s* in English e.g. *economics*, *mathematics* and *statistics*	1. Nouns occur only in a plural (marked) form with any of the 13 plural inflections, internal vowel change or both	
	2. Nouns do not normally occur directly quantified by numerals or ordinals, specifically cannot be preceded by *two*, *three*, *first*, and *second*	2. Nouns do not normally occur directly quantified by numerals or ordinals, specifically cannot be preceded by *dau/dwy* 'two', *tri/tair* 'three', *cyntaf* 'first', *ail* 'second'	
Measure	1. Nouns meet the criteria for classification as a singular/plural noun above.	1. Nouns meet the criteria for classification as a singular/plural noun above	
	2. Nouns refer to a measure or an amount; act to quantify other singular/plural or substance nouns e.g. "a *pile* of books", " a *piece* of bread"	2. Nouns refer to a measure or an amount; act to quantify other singular/plural or substance nouns e.g. "*swp* o lyfrau"'(a) pile of books','*darn* o fara"'(a) piece of bread'	

Collective	1. Nouns meet the criteria for classification as a singular/plural noun above.	1. Nouns meet the criteria for classification as a singular/plural noun above	
	2. Singular (unmarked) forms refer to multiple entities and plural (marked) forms refer to multiple sets of those multiple entities e.g. "army/armies" and "family/families"	2. Singular (unmarked) forms refer to multiple entities and plural (marked) forms refer to multiple sets of those multiple entities e.g. "byddin/ byddinoedd" 'army/armies' and "teulu/ teuluoedd" 'family/ families'	
Collection/unit		1. Collection (unmarked) forms refer to multiple entities	
		2. Nouns take one of two unit inflections (−yn [masculine] or −en [feminine]).	
		3. Nouns cannot take a plural inflection	

Noun Types

Type frequencies for Welsh and English are shown in Table 3. Chi-square analyses of noun type data revealed a significant difference in noun type distributions across the two languages (x^2 (6, n=1364) = 78.15, $p<.001$). [3]

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3 An alpha level of .05 was used for all statistical tests.

Table 3

Number of noun TYPES for Welsh and English occurring in each condition

Noun type	Structured session		Freeplay session		Total	
	Welsh Type Frequency	English Type Frequency	Welsh Type Frequency	English Type Frequency	Welsh	English
Singular (sg)/ plural (pl) e.g. *chair/s*	113	127	169	158	282	285
Dual function (sg/pl & sg only) e.g. *cake/s*	2	4	3	8	5	12
Sg only e.g. *milk*	26	8	28	8	54	16
Pl only e.g. *trousers*		1				1
Measure nouns e.g. *pile*	1	1	3	2	4	3
Collective nouns e.g. *forest*		1	2		2	1
Collection / unit e.g. *moch/ mochyn* 'pigs/ pig	11		6		17	
Total	153	142	211	176	364	318

The differences and similarities across Welsh and English nouns used by the mothers in the speech to their children are consistent with those found in written texts (Roberts and Gathercole, in press). Namely, the data show that the main points of divergence between the two languages are the following: First, consistent with the lack of availability of collection/unit forms in English and of plural-only forms in Welsh, there were (1) collection/unit forms in Welsh, but not in English and (2) plural-only forms in English, but not in Welsh. Beyond this, where both languages have similar forms in principle available, there were other significant differences: There were (3) fewer singular-only nouns in English than in Welsh and (4) fewer dual function (singular/plural - singular only) nouns in Welsh than in English.

There were also some similarities across the languages. The data show that singular/plural nouns were the most frequent noun type across the two languages, measure nouns were relatively scarce across the two languages, and collective nouns constituted a very small proportion of the nouns across the two languages.

To examine if the play condition mattered, a chi-square analysis of noun type x play condition for each language revealed a significant difference between the two conditions for Welsh (x^2 (5, n=1364) = 13.59, p=.018) but not for English (x^2 (5, n=1364) = 6.89, p=.229). Welsh mothers used collection/unit nouns almost twice as often in the 'structured' session as in the 'freeplay' session, as can be seen in Table 3. This suggests that when toys specifically chosen to provide contexts for all potential types of nouns are available, Welsh mothers do use the relevant collection/unit nouns where appropriate.

Tokens in Relation to Individual vs Multiple Entities

Because of the distinct nominal structure of Welsh and English, it may be that mothers in the two languages pay attention differentially to individual items versus multiple items. While the type analyses above examined ways in which the linguistic form might have affected mothers' use of nouns, a token count of the proportion of times that mothers make reference to the number of referents might reveal potential usage effects of those linguistic differences. For example, it may be that the structure of Welsh leads mothers to home in on collections when talking about entities more than English-speaking mothers. Alternatively, since English highlights a distinction between singular reference and plural reference, English-speaking mothers may be more prone than the Welsh-speaking mothers to talk about number differences.

In order to examine whether there was a difference in the type of referents mothers paid attention to in the two languages, a calculation was made of the frequency with which mothers made reference to individual entities and to multiple entities. Token frequencies of singular, unit, plural and collection forms for each of the noun types for each language and each play condition are shown in Table 4.

Table 4

TOKEN frequencies of singular/unit and plural/collection forms for the noun types in Welsh and English for each play condition

Noun types	Structured session				Freeplay session				Total			
	Welsh Token Frequency		English Token Frequency		Welsh Token Frequency		English Token Frequency		Welsh Token Frequency		English Token Frequency	
	Sg/u	pl/c	Sg	pl	Sg/u	pl/c	Sg	pl	Sg/u	pl/c	Sg	pl
Singular (sg)/ plural (pl) e.g. *chair/s*	783	42	503	160	731	45	627	158	1514	87	1130	318
Dual function (sg/pl & sg only) e.g. *cake/s*	23		7	6	34		25	3	57		32	9
Sg only e.g. *milk*	71		23		84		25		155		48	
Pl only e.g. *trousers*				1								1
Measure nouns e.g. *pile*	3			3	7		4	6	10		4	9
Collective nouns e.g. *forest*			1		2	2			2	2	1	
Collection (c)/ unit (u) e.g. *moch/ mochyn* 'pigs/pig	83	13			12	4			95	17		
Total token frequency	880/83	42/13	534	170	858/12	47/4	681	167	1738/95	9/17	1215	337

Since Welsh has an additional collection/unit noun class not observed in English, direct statistical comparisons across the two languages were not possible. Thus, to statistically compare Welsh and English number reference in mothers' speech to children, mean token frequencies were compared by referent form. That is, the data were explored in relation to whether the forms referred to individual entities or multiple entities. For forms denoting an individual referent, singular and unit forms in Welsh were collapsed for comparison with singular forms in English. For forms denoting multiple referents, plural and collection forms in Welsh were collapsed for comparison with plural forms in English. Mean token frequencies were calculated by dividing the token frequency counts by the type frequency counts giving an indication of the mean number of occurrences of a given noun type in the mothers' speech.

A language x noun type x referent form (i.e. reference to individual versus reference to multiple entities) x play condition (structured versus freeplay session) ANOVA revealed a significant main effect of referent form, F (1,1360) = 149.34, p=.018, and a significant interaction for language x referent form, F (1,1360) = 10.62, p=.042). No significant effects or interactions were found for language x noun type or language x play condition for the token frequency data.

The main effect of referent form suggests that, overall, nouns referring to individuals (i.e. singular/unit nouns) (M = 4.44, SD = 7.81) occur significantly more often than nouns that refer to multiple entities (i.e. plural/collection) (M = 0.68, SD = 1.89).

The interaction demonstrates that the token frequencies of the noun forms differ across the two languages. Post hoc analysis (Least Significant Difference) shows that Welsh had a significantly higher frequency of forms referring to individuals (MD = 1.231, p=.04), and significantly lower frequency of forms referring to multiples (MD = -.772, p<.001) than English.

In effect, Welsh-speaking mothers used nouns referring to individuals 17.4 times as often as nouns referring to multiples, while English-speaking mothers did so only 3.6 times as often. This is illustrated in Figure 1.

Mean token frequencies of noun forms across Welsh and English
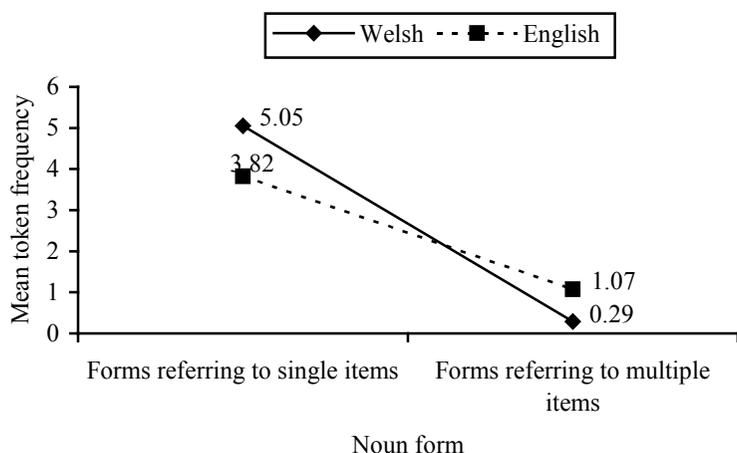
This is a striking result, but these data are consistent with the noun distribution patterns in written texts, in that Welsh singular forms were more frequent than English singular forms, and English plural forms were more frequent than Welsh plural forms (Roberts and Gathercole, in press). Possible reasons for these differences are considered further below.

To further explore the interaction between the nouns that refer to individuals (i.e. singular and unit forms in Welsh and singular in English) and the nouns that refer to multiples (i.e. plural and collection forms in Welsh and plurals in English) across the two languages, the proportions of singular/unit and plural/collection forms were examined further. Of the few nouns used by Welsh mothers to refer to multiple referents (5.47% of total nouns used), only 16.04% were collection forms whilst 83.96% were plural forms. The number of collection nouns used by Welsh mothers was much lower than was expected given the data from written texts, where 58.87% of the nouns referring to multiple referents were collection forms.

Further examination of the collection/unit forms in Welsh mothers' speech reveals that these nouns occurred more frequently in mothers' speech as unit forms than as collection forms: 84.82% were unit forms and only 15.18% were collection forms. (In written texts 44.70% were collection forms.)

One factor that might have led to significantly higher use of singular forms in Welsh than in English has to do with the linguistic structure of Welsh. In English, if numerals occur modifying nouns, the plural form of the noun is used: *3 cows*; in Welsh, numerals modify the singular form: *3 buwch* '3 cow'. To explore whether the high ratio of singular/unit forms to plural/collection forms in Welsh was due to occurrence of nouns with numerals, the linguistic contexts in which the singular/unit forms were used by the mother were examined. There were only 14 singular-referring forms (i.e., only 0.8% of the singular-referring forms) that occurred with

numerals in the whole Welsh corpus (there were 8 instances of numerals co-occurring with singular forms in the 'structured' session, 3 instances of numerals co-occurring with unit forms in the 'structured' session, and 3 instances of numerals co-occurring with singular forms in the 'freeplay' session). This indicates that the high proportion of singular and unit forms in Welsh cannot be attributed to use with numerals.

Discussion

These results reveal both similarities and differences in noun distributions in mothers' speech to infants in Welsh and English. The similarities across the two languages are that both languages had similar numbers of singular/plural nouns; measure nouns; and, collective nouns, with singular /plural nouns more frequent than others, e.g. collective nouns. Forms referring to individuals occurred more often than forms that refer to multiple entities.

The input data differed, however, in that forms that referred to individuals occurred more often in Welsh than in English, whilst the forms that referred to multiples occurred more often in English than in Welsh. In contrast to expectations, most of the forms that refer to multiples in Welsh input were plural forms, not collection forms, and of the collection/unit type, unit forms were more frequent than collection forms.

The two play conditions elicited different noun distributions from the Welsh mothers but not from the English mothers. Welsh mothers used more nouns of the collection/unit type in the 'structured' session than in the 'freeplay' session. The 'structured' session involved a specific set of toys chosen to provide a context for use of these noun types. No differences were found between the play conditions for the token frequency data, however. Welsh mothers used more different types of the collection/unit nouns in the 'structured' session, but did not use them more frequently.

Neither did the ratio of each form (i.e. singular, plural, unit and collection) differ across the two play conditions. This suggests that context does play an important role in providing Welsh mothers with the opportunity to use more collection/unit nouns but does not affect the frequency with which these nouns are used. Furthermore, counter to what was expected, the 'structured' play condition did not elicit greater collective noun use for either the Welsh- or English-speaking mothers. In fact, very few collective nouns were used in either type session.

Overall, the data from mothers' language input are consistent with those found in written texts. Thus, the noun patterns used by mothers in their speech to children for the most part reflect the noun patterns available in the language and are similar in distribution to that found in written texts across the two languages. Welsh- and English-speaking mothers rarely used collective nouns in their speech to infants. Collective nouns make up only 1.5% of the different noun types in both languages (Roberts and Gathercole, in press). With few collective nouns in the input, children are not exposed to numerous exemplars from which to acquire collection categories.

It had been hypothesized that Welsh-speaking children might be exposed to nouns referring to collections more than their English-speaking counterparts, because of the collection/unit system in Welsh. The data from this study show, however, that even though Welsh-speaking mothers do use nouns of this type in a similar proportion to that expected from the data in a previous study on written texts, they primarily used them in the unit form, i.e., in reference to individuals. The strongest results of the study have revealed a much higher use of words referring to singular reference in Welsh-speaking mothers' speech than in English-speaking mothers' speech. This high preponderance of singular-referring type forms in Welsh-speaking mothers' speech may be influential in the

nominal structure developing in the Welsh-speaking child's speech. The exact reasons for this high preponderance are not entirely clear. One component is the occurrence of singular forms in conjunction with numerals, but we saw above that such forms occurred only very infrequently in the data. Another component may well be the complex plural forms in Welsh. Welsh has many ways of forming the plural: either by the addition of one of 13 plural suffixes, an internal vowel changes, or a combination of both (Thorne, 1993).

These results suggest that, whereas English-speaking children are exposed to input emphasizing a nominal system that has transparent marking of number distinctions (one versus numerous), Welsh-speaking children seem to be exposed to input that does not emphasize distinctions based on numerosity. That is, numerosity seems to be less of a focus in Welsh input than in English input.

The system in Welsh may have important cognitive implications for Welsh-speaking children. Welsh-speaking children may learn to pay less attention to numerosity because the language does not provide a highly marked encoding of number distinctions. This conclusion brings us back in a roundabout way to our initial predictions. We had predicted that Welsh-speaking children may have access to greater information in the input identifying collections by mothers' naming collections more than English-speaking children would. Our corollary of this was the prediction that the collective forms might lead Welsh-speaking children to be less attentive to an individual-multiple distinction because basic nouns would be heard in the Welsh input referring to both. Our findings suggest, instead, that Welsh-speaking children are hearing primarily nouns referring to single entities, and are largely not hearing nouns in reference to multiple entities, whether plural or collective nouns. Our hypothesis is that this use of nouns in the input may have an impact similar to what we

had hypothesized, but for a different reason. That is, the almost exclusive use of nouns in reference to single entities in mothers' speech may lead children to pay little attention to the encoding of numerosity through nouns.

Further research is needed to explore the effects of these language differences on categorisation and how this impacts on language learning; only then can we begin to build a true picture of the effects of language differences on language acquisition and cognition.

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