CHAPTER 13

Diminutives provide multiple benefits for language acquisition

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This chapter explores the hypothesis that diminutive usage in child-directed speech may provide multiple benefits for language acquisition. We summarize a series of experiments that exposed naïve English-speaking adults to Dutch or Russian diminutives, and tested their ability to isolate words in fluent speech or acquire gender categories. Across studies, adults benefited from exposure to diminutives over their simplex counterparts, supporting the hypothesis that diminutives simplify word segmentation and morphology acquisition, by increasing word-ending invariance, regularizing stress patterns, and decreasing irregularity in morpho-syntactic categories. A similar diminutive advantage is observed in experimental studies of first language acquisition: Preschool children produce fewer gender agreement and case marking errors with diminutives than with simplex nouns across several languages (Russian, Serbian, Polish, Lithuanian).

Introduction

Peter Jusczyk's seminal studies of the development of infant speech perception have spurred intense interest in exploring the learning processes that enable young children to discover the linguistic structures of their native language(s) (e.g., Jusczyk & Aslin 1995; Jusczyk & Hohne 1997; Jusczyk 1997, 2002). One hypothesis, receiving renewed attention, is that general-purpose associative learning mechanisms play a crucial role in the acquisition of linguistic categories and structures (Gomez & Gerkin 2000; Seidenberg & McDonald 1999). At present there is considerable evidence that infants and children are successful in tracking distributional patterns and regularities at a number of levels of linguistic analysis, including prosodic, phonological, morphological, and syntactic (e.g., Brooks & Zizak 2002; Gomez & Gerkin 1999; Saffran, Aslin & Newport 1996; Saffran & Wilson 2003). This work, which suggests that language acquisition involves the implicit learning of probabilistic regularities extracted from highly com-

plex input, makes the particular distributional characteristics of the speech directed to children a topic of considerable interest, both from applied (e.g., Hoff 2003; Huttenlocher, Vasilyeva, Cymerman & Levine 2002; Weizman & Snow 2001), and theoretical perspectives (e.g., Bates & MacWhinney 1987; Elman, Bates, Johnson, Karmiloff-Smith, Parisi & Plunkett 1996). There now is a sizeable body of research suggesting that child-directed speech (CDS) might simplify, regularize, and highlight relevant linguistic structures and, thereby, might facilitate the language acquisition process (e.g., Kuhl et al. 1997; Golinkoff & Alioto 1995; Morgan & Demuth 1996; Tamis-LeMonda & Bornstein 2002, but see also Fernald & McRoberts 1996, for a note of caution). In this chapter, we will focus on one feature of CDS, the use of diminutives: Starting with a cross-linguistic comparison of the frequency of diminutives in CDS, we will show how diminutives may exert simplifying and regularizing effects on different levels of linguistic structure and in different languages. Specifically, we will present empirical evidence from two typologically diverse languages, Dutch and Russian, to show how diminutives aid in two major language-learning tasks, word segmentation and grammatical gender acquisition. We report on experiments demonstrating that exposure to elements resembling Dutch and Russian diminutives facilitate word segmentation in adult language learners. We also report studies showing that Russian diminutives lead to advantages in the acquisition of grammatical gender, both in Russian children as well as in second language learners. For brevity, we omit the outcomes of the statistical tests but report only on findings that were statistically significant. We will end the chapter with some thoughts on why diminutives differ in their frequency across CDS registers of various languages, and what factors may account for the pervasiveness of beneficial forms in CDS in general.

1. The pervasiveness of diminutives in CDS

Diminutives are morphological derivations that express smallness, and connote affection and endearment. In some languages, diminutives are also used in a pejorative way. Quite obviously it makes semantic sense to use diminutives in CDS as they are well suited to adjust the meanings of words to the smaller world of the child. Indeed, an analysis of the semantics of diminutives in over 80 languages has identified child-relatedness as the core meaning of the diminutive derivation (Jurafsky 1996). Still, to speakers of English, our focus on diminutives as a major regularizing and simplifying force in children's language input might seem unwarranted given that in this language, the productivity of diminutives is extremely limited.[1] English diminutives can be derived from proper names as in *Billy*, *Patty* and *Johnny,* names of relatives as in *mommy*, *daddy* and *auntie*, and some names of animals as in *doggie*, *horsy*, and *birdie* (but not much beyond these, as ill-formed examples like **sheepy*, or **cowie* attest). A few additional English diminutives comprise child-related or other small objects such as *binkie*, *bootie*, *cookie*, and

panties. In all cases, the diminutive appears to be derived from a monosyllabic stem or base noun, creating a bi-syllabic noun with a trochaic stress pattern.

Unlike English, many other languages have a much wider range of diminutive productivity. Thus, in languages as diverse as Dutch, German, Finnish, Lithuanian, Spanish, Serbian and Russian, diminutives can be derived from almost any concrete noun, and in some languages (e.g., Spanish, Russian, Serbian) even from adjectives and adverbs. The latter fact clearly suggests that diminutive usage is governed not just by semantic factors to convey the meaning of smallness, but seems to be primarily a pragmatic device[2] to express endearment and affection. Clearly, on pragmatic grounds, it seems reasonable to expect a higher frequency of diminutives in CDS than in adult-directed speech (ADS). Indeed, there is quite a lot of evidence for the pervasiveness of diminutives in CDS. Table 1 lists the estimated frequency of diminutivized nouns in the CDS registers of a number of languages. The estimates are provided for nouns only to account for the fact that modifiers can only be diminutivized in some languages.[3]

Table 1. Estimated frequency of diminutivized nouns in CDS registers of a number of languages obtained from corpora of one mother-child dyad in each language

language	% diminutivized nouns	source
Lithuanian	30-40	Savickienė (1998), (2003)
German	3	Kempe, Brooks & Pirott (2001)
	3	Korecky-Kroell &Dressler (2004)
Dutch	20-30	Gillis (1997)
Spanish	42	Kempe, Brooks & Pirott (2001)
Russian	45	Kempe, Brooks & Pirott (2001)
Polish	20	Haman (2003)

Unfortunately, direct comparisons between CDS and ADS within the same language, or, even more informatively, within the same speakers of a language, are rare. Most of the estimates stem from recorded mother-child interactions, and fail to include an ADS baseline to which the frequency of diminutives in CDS can be compared. Thus, one might argue that a high frequency of diminutives may just be a peculiarity of certain registers in a particular language, and does not have to be a pervasive feature of just the CDS register. This argument has often been invoked with respect to Dutch, a language that is characterized by pervasive use of diminutives in colloquial speech.

In order to get direct evidence for an increase of diminutives in CDS, we recorded conversations of twelve Russian mothers with their 23-month-old children (range 18 – 28 months), and compared those to conversations of the same mothers with an adult interlocutor (Kempe, Brooks, Mironova, Pershukova, & Fedorova in press). In the CDS samples, the mothers were engaged in normal daily activities like eating, dressing, going for a walk, and playing, and were asked to audio-tape their interactions with the

child. No other person was present during the interactions with the child. To obtain samples of ADS, the mothers were asked to engage into a conversation with an adult researcher in the absence of their child, which was audiotaped as well. The researcher prompted them to talk about various past events of their life avoiding child-related topics. Since the researcher was an acquaintance in all cases these conversations tended to be relatively informal thus providing estimates of diminutives from adult-directed colloquial speech. To obtain preliminary estimates of the frequency of diminutives, and due to feasibility limitations for analysing the entire conversational episode, we analysed just the first 100 nouns from each interaction. The frequency of productive diminutives was 45% (range 13% – 81%) in CDS, and 3% (range 1% – 8%) in ADS, and the difference was highly significant. This estimate provides strong evidence that, in Russian, the frequency of diminutives is much higher in CDS than in ADS. Clearly, corroborating evidence from other languages is needed to show that increased frequency of diminutives in CDS is not an isolated phenomenon. However, given the rather impressive rates of diminutives in Lithuanian, Spanish, and other languages (see table 1), it seems reasonable to assume that the frequency of diminutives increases in CDS registers as much as the diminutive productivity of a given language permits.

As stated earlier, the use of diminutives in CDS seems to be primarily pragmatically motivated. How can a pragmatic device aid language acquisition on various other levels of linguistic analysis? The answer lies in the fact that any frequently occurring morphological derivation may increase regularity at several different levels of analysis. In the case of diminutives, firstly, there is a tendency to regularize metric stress patterns, which makes it easier to detect word boundaries, thereby aiding the task of segmenting the stream of uninterrupted speech into discrete words. Secondly, diminutives increase the invariance of word endings, which provides an additional word segmentation cue. Thirdly, diminutives may serve as word class markers thereby making it easier to distinguish nouns or modifiers from other parts of speech. Finally, in many languages, diminutives have a tendency to regularize irregular aspects of inflectional morphology thereby facilitating the acquisition of morpho-syntax. Below we will focus on the effects of frequent diminutive usage on word segmentation and morphology acquisition by presenting empirical evidence from Dutch and Russian.

2. Diminutives aid word segmentation

One of the major challenges of language acquisition is to segment the incoming stream of continuous speech into discrete meaningful units. A large body of research has demonstrated that many different sources of information may serve as word segmentation cues such as utterance boundaries (Brent & Siskind 2001), phonotactic regularities (e.g., Mattys & Jusczyk 2001b), transitional probabilities between phonemes or syllables (e.g., Saffran, Aslin & Newport 1996), context- or position-sensitive allophony (e.g., Jusczyk, Hohne & Bauman 1999; Mattys & Jusczyk 2001a), as well as rhythmic

and prosodic patterns (e.g., Morgan & Saffran 1995; Morgan 1996; Jusczyk, Houston & Newsome 1999). There is evidence that CDS is much richer in word segmentation cues than ADS due to its exaggerated stress patterns, shorter utterances, and longer and more frequent pauses (Redford, Davis & Miikkulainen 2004). Not surprisingly, computational word segmentation models have shown superior performance with CDS input as compared to ADS input (Aslin, Woodward, LaMendola & Bever 1996; Brent & Cartwright 1996; Christiansen, Allen & Seidenberg 1998; Batchelder, 2002).

In this context, frequent use of diminutives in CDS serves to increase the availability of word segmentation cues. This idea was first expressed by Jusczyk (1997) and Echols, Crowhurst and Childers (1997) who suggested "…that many diminutive forms in English that are used in addressing infants have strong/weak patterns … (e.g., "daddy," "mommy," "doggie," "cookie," "kitty," etc). Consequently, it is not implausible that infants in English-speaking environments might develop a bias for trochaic patterns…" (Jusczyk 1997: 108). Since diminutives are often derived by adding unstressed suffixes to word stems, it is possible that stress regularization is a general phenomenon in languages with frequent diminutives in CDS. For example, Dutch diminutives comprise about 20–30% of all child-directed noun tokens (Gillis 1997), which increases the frequency of stressed/unstressed nouns in CDS to 74% of multi-syllabic word types (Taelman & Gillis 2000). For Russian, connectionist simulations of word boundary detection based on metrical stress of the 200 most frequent nouns show superior performance when the networks are trained on the diminutive rather than simplex forms of these nouns (Kempe in preparation). This suggests that the complex metrical stress pattern typical for Russian becomes simplified and regularized in diminutive nouns, for example, by eliminating word-final stress. In Spanish, many words with atypical stress assignment (e.g., *teléfono* [telephone] with stress on the second syllable) have regular penultimate stress when diminutivized (e.g., *telefonito* [small telephone]).

Cutler and Norris (1988) and Cutler (1994) proposed the use of a metrical segmentation strategy which implies that listeners rely on knowledge about predominant rhythmic patterns in their language to detect word boundaries. For example, in English, stressed syllables are important cues for word onsets, which are utilized by both infants and adults, with phonotactically familiar (Echols et al. 1997; Jusczyk et al. 1999) as well as unfamiliar (Houston, Jusczyk, Kuijpers, Coolen & Cutler 2000; Kempe, Brooks & Gillis 2005) language input. Stress regularization through diminutivization obviously facilitates the use of metrical stress as a word segmentation cue.

However, stress regularization is not the only benefit for word segmentation that arises from frequent use of diminutives. In fact, this cue is inevitably confounded with increased word ending invariance. Since languages contain a limited number of diminutive suffixes, diminutivized words tend to have similar endings. For example, *daddy*, *mommy*, *doggie*, *cookie*, and *kitty* all end in the same vowel. In languages with more complex diminutive derivations, the invariant segment can be even longer. For instance, Spanish diminutives end in *-ito* /ito/ or *-ita* /ita/, depending on gender, Ger-

man diminutives end in *-chen* /Xən/ or *-lein* /lajn/, and Dutch diminutives end in *-tje* /tjə/ or one of its allomorphs.

In Experiment 2 of Kempe et al. (2005), we investigated whether invariance in word endings introduced by diminutives facilitates word segmentation over and above the effects of regular trochaic (strong/weak) stress. We used Dutch materials because Dutch is a language with frequent and productive diminutive suffixation. Almost all Dutch concrete nouns can be diminutivized by adding the unstressed suffix *-tje* /tjə/, or its variants *-etje* /ətjə/, *-pje* /pjə/, *-kje* /kjə/, or *-je* /jə/, to simplex nouns such as chair (*stoel* /stul/ > *stoeltje* /stultjə/), glass (*glas* /7lAs/ > *glaasje* /7lasjə/) or window (*raam* /ram/ > *raampje* /rampjə/). Thus, Dutch diminutive suffixes consist of a consonant cluster containing an affricate and a schwa ending. We varied the invariance in the consonant cluster and the vowel ending systematically to examine the independent contributions of consonant and vowel invariance found in Dutch diminutive affixes.

We utilized an incidental-learning paradigm, which originally was developed for the study of transitional probabilities between phonemes (Saffran, Newport, Aslin, Tunick & Barrueco 1997). Eighty-four adult English speakers with no prior knowledge of Dutch were randomly assigned to one of four conditions, and presented with continuous speech comprising 300 randomized repetitions of six bi-syllabic nonsense words as targets. The nonsense words were synthesized to ensure equivalent levels of co-articulation between syllables (both word internally and across word boundaries), and to eliminate other word boundary cues (e.g., pauses). The four conditions differed in the degree of ending invariance of the final syllable: The *low onset/low rhyme invariance* condition resembled Dutch bi-syllabic simplex nouns by combining the stems with six different consonant/vowel combinations, which were all dissimilar from each other (e.g., *knoochtie, steefkeu*). The *low onset/high rhyme invariance* condition resembled the degree of rhyme invariance of Dutch diminutives by combining the same second syllable consonant clusters with a schwa as the final vowel (e.g., *knoochte, steefke*). The *high onset/low rhyme invariance* condition resembled the degree of onset invariance of Dutch diminutive affixes by combining the onset of the three most frequent allomorphs of the Dutch diminutive, viz. glide /j/ and the obstruent glide clusters /tj/ and /pj/ (Booij 1995), and the full vowels used in the low onset/low rhyme invariance condition (e.g., *knoochjie, steefjeu*). Finally, the *high onset/high rhyme invariance* condition modeled the maximal ending invariance characteristic for Dutch diminutives by combining all stems with the three most frequent diminutive allomorphs -je /jə/, -tje /tjə/, and -pje /pjə/ (e.g., *knoochtje, steefje*). All nonsense words were presented as trochees, which allowed us to investigate the effect of ending invariance over and above the effect of metrical stress on the first syllable. After listening to the speech stream for eighteen minutes, participants were given a forced choice task to determine whether there was better recognition of the target strings over foils. The foils were created by recombining the target syllables in such a way that the second syllables of the targets were followed by first syllables. The syllable combinations of the foils did occasionally occur in the speech stream but with much lower frequency than the syllable combinations of the

targets. All targets and foils are listed in table 2. Finally, to obtain a baseline measure for incidental a-priori familiarity and segmentability of the targets, another eighty-four participants were presented with a no-training condition, in which they completed the forced choice task only, but had no prior exposure to the speech stream.

Table 2. Targets and foils used in the word segmentation experiment (from Kempe, Brooks & Gillis, 2005)

	Rhyme Invariance			
	low		high	
Onset Invariance	targets	foils	targets	foils
low	knoochtie	tieflijm	knoochte	teflijm
	steefkeu	keuvraul	steefke	kevraul
	schraamloo	loogluin	schraamle	legluin
	flijmsaa	saaknooch	flijmse	seknooch
	gluinfee	feeschraam	gluinfe	feeschraam
	vraulpuu	puusteef	vraulpe	pesteef
high	knoochjie	jieflijm	knoochje	jeflijm
	steefjeu	jeuvraul	steefje	jevraul
	schraampjoo	pjoogluin	schraampje	pjegluin
	flijmpjaa	spjaknooch	flijmpje	pjeknooch
	gluintjee	tjeeschraam	gluintje	tjeschraam
	vraultjuu	tjuusteef	vraultje	tjesteef

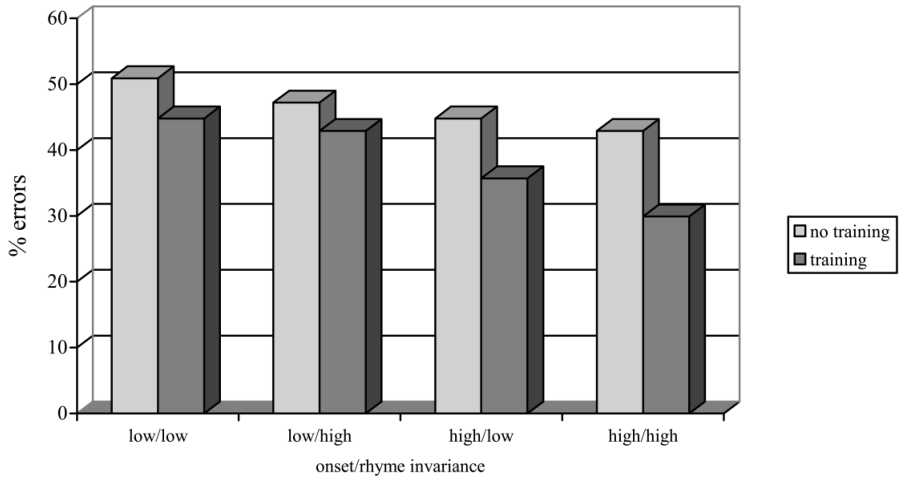

Figure 1. Percent errors in the forced-choice task in the word segmentation experiment (from Kempe, Brooks é Gillis, 2005)

The results, depicted in figure 1, showed that participants were able to recognize the targets above chance in all conditions except for the two no-training conditions that contained variable final syllable onset consonant clusters (e.g., *knochtie, steefkeu* etc. and *knochte, steefke* etc.). This suggests that onset invariance, specifically the presence of the affricate in the final syllable onset, acts like a marker for the upcoming word ending, even without any exposure to the targets. It also shows that after 18 minutes of listening to the speech stream, participants learned to recognize all types of targets, even those which contained variable final syllable onsets and rhymes. This is due to the fact that all targets were trochees, and, as expected, stress on the first syllable was being used as a word onset cue. The most important finding, however, was related to the distribution of error rates. We observed an interaction between training and onset invariance. Thus, although performance generally improved after training, this interaction indicated that performance improved more in conditions with invariant consonant clusters containing the affricate typical for Dutch diminutives. Participants exhibited by far the best performance (70% correct) after listening to targets with maximal ending invariance, i.e., targets modeled after Dutch diminutives.

This experiment demonstrated that ending invariance induced by diminutives improves word segmentation performance over and above the benefits from regular trochaic stress. So far, we have presented evidence for only one language, Dutch. In general, however, any type of ending invariance induced by a morphological change that applies to word endings could facilitate word segmentation. Thus, there is no reason to assume that similar effects could not be obtained from regularly occurring plural morphemes or inflectional endings on verbs. We believe, however, that diminutives are especially helpful, just because the diminutive derivation tends to be particularly long and salient, as it often comprises one or even multiple syllables (e.g., Russian: *vodichechka* [water-Dim-Dim]). Indeed, a new set of experiments has provided cross-linguistic evidence for this claim by showing that targets modeled after Russian masculine nominative diminutives exert a similarly facilitating effect compared to targets resembling Russian masculine nominative simplex nouns (Kempe, Brooks, Gillis & Samson in press).

But what if word endings remain variable due to inflectional changes as it would happen, for example, with the case-marked forms of Russian masculine nouns? Adding the diminutive suffix *-ik* may result in word endings like *-ika* (gen. sg.), *-iku* (dat. sg.), *-ike* (loc. sg.), *-iki* (nom. pl.) or *-ikam* (dat. pl.) etc., depending on number and case of the noun. Thus, ending invariance here is confined to the final syllable onset while the rhyme changes systematically according to whatever inflectional paradigm the noun belongs to. Would usage of diminutives in CDS still facilitate word segmentation in highly inflected languages where the diminutive suffixes precede systematically changing inflectional morphemes? The interaction between training and onset invariance in the word segmentation experiment described above suggests that invariant phonemes or phoneme clusters right before the inflectional endings might be sufficient to support the discovery of word boundaries. Based on this finding, we would predict that diminutivization should aid word segmentation even in highly inflected languages.

3. Diminutives aid morphology acquisition

In addition to learning to segment the speech stream into words, language acquisition entails mastering the complexities of the underlying structure governing the use of these words. This encompasses learning the regularities within words, i.e., the domain of morphology, and the regularities of how words are combined together, i.e., the domain of syntax. Below we want to focus on how diminutives may aid the acquisition of morphology.

In order to appreciate the potential impact of diminutives on morphology acquisition it is important to have an understanding as to what the particular challenges in this domain are. Morphology acquisition has been at the center of hot theoretical debates regarding the architecture of language representation in the brain, and the developmental processes shaping this architecture. Unfortunately, much of this debate has been informed by a fairly narrow empirical basis constrained to the study of a few languages, the most prominent being English with its rather impoverished morphological structure. The two aspects of English inflectional morphology that have received most of the attention are past tense formation in verbs and plural formation in nouns. Both of these structures consist of a regular pattern of high type frequency and a small number of irregular exceptions. Consequently, there is a research tradition that describes the acquisition of inflectional morphology in terms of two qualitatively distinct processes: a procedural route underlying the acquisition of a rule governing the formation of the regular pattern, and a memory-driven process accounting for the representation of the irregular exceptions in the lexicon (Pinker 1999). However, as soon as researchers started looking beyond the confines of simple English morphology by studying more complex morphological systems in which frequency and regularity are not confounded (e.g., German plural formation), the situation became more complicated: In such systems, the learner may have to acquire a multitude of inflectional patterns all of which differ in frequency, phonological similarity and neighborhood density (Hahn & Nakisa 2000; Plunkett & Nakisa 1997). Although there are assertions that even complex systems inevitably have a regular default pattern at their core, even if it is a low frequency pattern, (Marcus, Brinkmann, & Clahsen 1995), it is clear that in many instances the simple rules vs. exceptions dichotomy does not apply (Dąbrowska 2004). Unfortunately, research on the acquisition of more complex inflectional systems is scarce, and our understanding of the processes underlying their acquisition is just emerging. In this context, investigating the effects of a form as pervasive as the diminutive may shed light on the acquisition of complex morphological systems.

Diminutivizing a word means that the morphological status of that word may be altered. This implies that inflectional changes applying to the simplex and to the diminutive form of a word may not be identical. Consider the Russian noun *mysh'* 'mouse', a feminine noun of the third declension type which is the rarest declension type in Russian used only with a small class of feminine nouns, many of which end in palatalized consonants. Case-marked forms of the nominative *mysh'* are *myshi* for genitive, dative, and locative, and *mysh'ju* for instrumental. In contrast, the diminutive *myshka* uses the

second declension type, which is much more frequent and results in forms like *myshki* (genitive), *myshke* (dative), *myshku* (accusative), *myshkoj* (instrumental) and *myshke* (locative). Two points are noteworthy with respect to this example: Firstly, the diminutive *myshka* has an ending that clearly identifies it as feminine nominative since most feminine nominative nouns in Russian end in *-a* or its allomorph *-ja*. If a noun contains the dominant form of feminine noun endings it should be easier to select the appropriate gender agreement. Gender agreement in Russian is important as it is obligatory for adjectives, past tense verbs and pronouns. Secondly, the declension applying to the diminutive *myshka* clearly differentiates all six Russian cases thus making it easier to identify the underlying semantic role of the noun, unlike its simplex counterpart for which three cases (genitive, dative, and locative) take one ending, two cases (nominative and accusative) take the null morpheme, and only the instrumental case has a unique ending (*-ju*). Clearly, this creates much more ambiguity as the noun form itself does not provide reliable information about case. Consequently, high frequency of diminutives in the input of Russian children should facilitate the acquisition of gender and case marking.

Table 3. Familiar and novel simplex and diminutive nouns used in the Russian gender elicitation experiment (Kempe et al., 2003) (Stressed syllables are marked by capitalized letters. All nouns were counterbalanced across two lists except the items marked by asterisks which remained the same in both lists. One half of the children were presented with list 1 and the other half with list 2)

masculine		feminine	
simplex	diminutive	simplex	diminutive
		familiar nouns	
jozh [porcupine]	jozhik	belka [squirrel]	belochka
zhiraf [giraffe]	zhirafik	lisa [fox]	lisichka
zhuk [beetle]	zhuchok	obez"jana [monkey]	obez"janka
slon [elephant]	slonik	ptica [bird]	ptichka
kit* [whale]	petushok* [roosterDIM]	cherepakha* [turtle]	babochka* [butterfly]
		novel nouns	
zurUn	zurUnchik	mYrva	mYrochkva
zhabUl	zhabUl'chik	vIgla	vIglochka
pusOt	pusOtik	sUra	sUrochka
cOkor	cOkorik	krjOfa	krjOfochka
farzjAk	farzjAchik	tImza	tImzochka
narAp	narApchik	gljUsha	gljUshechka

We have studied the effects of diminutives on the acquisition of Russian gender (Kempe, Brooks, Mironova & Fedorova 2003). In a gender elicitation experiment, we pre-

sented forty-six Russian children (2,9 to 4,8) with 24 novel and familiar simplex and diminutive nouns (see table 3). We used only masculine and feminine nouns as the neuter category is much smaller thus making it difficult to select balanced stimulus materials. Also, masculine and feminine nouns are of particular interest as it is these gender categories within which a significant degree of irregularity exists: Most Russian masculine nouns tend to end in consonants, feminine nouns in *-a* or its allomorphs, and neuter nouns in *-o* or its allomorphs. But there is also the abovementioned class of nouns ending in palatalized consonants that can be either masculine (*pen'* 'stump', *gost'* 'guest') or feminine (*pech'* 'oven', *mysh'* 'mouse') because the nominative does not contain any morpho-phonological features providing cues to gender category membership. Based on estimates from the 200 most frequent Russian nouns (Zasorina 1977), these non-transparent nouns comprise about 10% of noun types. In the gender elicitation study, children were presented with the names of familiar and unfamiliar animals, along with pictures of the animals. Children were encouraged to talk about each animal, with the experimenter carefully avoiding any use of gender agreement in their own speech, so that the only cue to the gender of the animal was its name. The first instance of gender agreement produced by the child in their description of the animal, which tended to be either pronominal agreement or adjective agreement, was coded and analysed for errors. The error rates are depicted in figure 2.

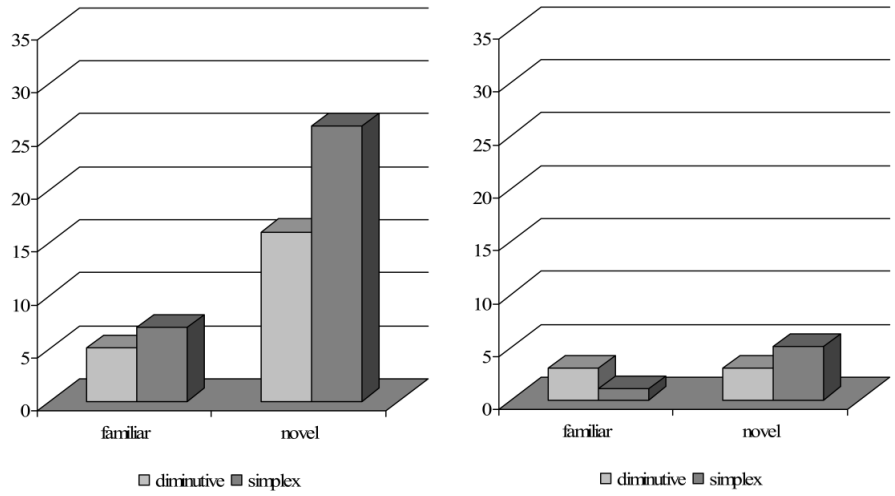

Figure 2. Percent gender agreement errors in Russian children in the gender elicitation task for feminize (left panel) and masculine (right panel) nouns (Kempe et al., 2003)

The results of this experiment demonstrated that Russian children made more agreement errors after novel nouns than after familiar nouns, and after feminine nouns than after masculine nouns. The novelty effect was mainly due to the feminine nouns, as

indicated by an interaction between novelty and gender, suggesting that the masculine gender may be the unmarked form that is acquired first. Another possible reason for an advantage of masculine nouns is that one of the most frequent forms of gender agreement, agreement with adjectives, results in shorter and morphologically less complex masculine forms (e.g., *sinij* 'blue:MAS') compared to the feminine forms (e.g., *sinjaja* 'blue:FEM'). Most importantly, the findings showed a clear difference in errors between simplex and diminutive nouns, such that the children made significantly fewer gender agreement errors when presented with diminutive nouns. Thus, the experiment confirmed the existence of a diminutive advantage with respect to gender acquisition and productive use of gender agreement in 2- to 4- year-old Russian children. We attribute this phenomenon to the pervasiveness of diminutives in Russian CDS: A high frequency of diminutives in the input increases the overall degree of regularity in the gender-marking system because it increases the relative frequency of transparently gender marked nouns, and reduces the relative frequency of non-transparently gender marked nouns. At the same time, a higher frequency of diminutives introduces a very prominent sub-cluster of nouns that is characterized by high phonological similarity due to the overlap in diminutive suffixes.

More recently, Kempe, Brooks, Mironova, Pershukova and Fedorova (in press) demonstrated a similar diminutive advantage in children's production of Russian case marking. Preschool children were introduced to a variety of novel objects, with their nonce names introduced in the diminutive form, the simplex form or both (i.e., a 'word-play' condition). To elicit dative and genitive case marking, children were asked questions concerning the movements of an elephant towards or away from the object. Russian children produced a higher percentage of correctly case-inflected forms for nouns heard in the diminutive form, with best performance in the 'word-play' condition. Dąbrowska (2006) also reported a diminutive advantage for children acquiring Polish case marking, and argued that the diminutive advantage in morphology acquisition be attributed to children's acquisition of low-level schemas. That is, children tend to acquire inflectional changes first for salient sub-clusters of nouns before generalizing to a wider range of noun types. The results of the gender-agreement elicitation experiment described above may reflect the operation of both tendencies: increased frequency of regular gender marking and increased frequency of a phonologically similar sub-cluster of nouns that constitutes a prominent low-level schema. To tease apart these two consequences of increased diminutive frequency in the input, we conducted a micro-genetic gender-learning experiment contrasting an entirely regular system consisting solely of diminutives with input consisting of both regular and irregular patterns (Kempe & Brooks 2001). Obviously, contrasting these two situations is not possible in the study of first language acquisition. Thus, in order to systematically control the input, and to follow the trajectory of learning in the laboratory, we tested adult native speakers of English learning a subset of Russian noun morphology.

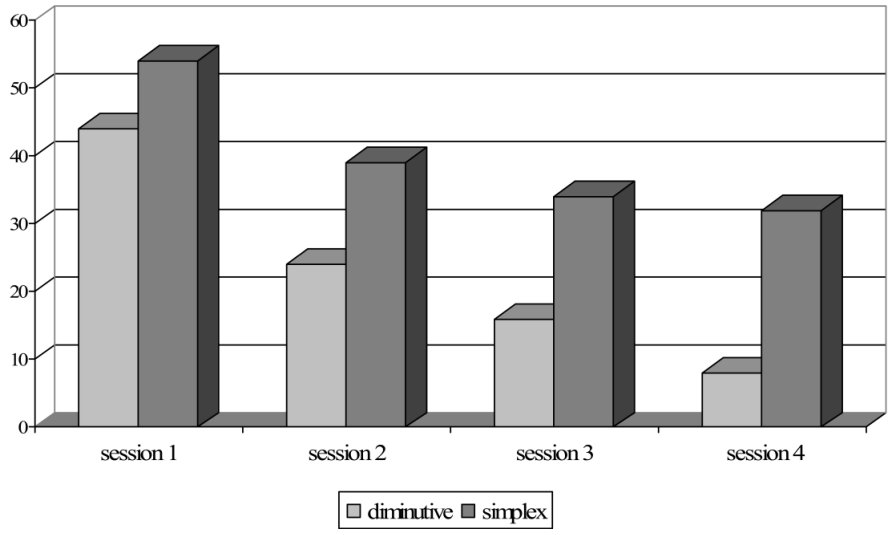

Figure 3. Percent gender agreement errors in L2-learners for transparent nouns over 4 sessions of training (Kempe & Brooks, 2001)

Thirty-six adult native speakers of English with no prior knowledge of Russian were taught the gender of 30 Russian nouns. The training set consisted of 15 masculine and 15 feminine Russian nouns and their corresponding pictures. Five masculine and 5 feminine nouns were non-transparent with respect to gender marking, i.e., they ended in a palatalized consonant. In the diminutive training group, all nouns were presented as diminutives, thus rendering the entire set transparent with respect to gender marking in that all feminine nouns ended in *-a*, and all masculine nouns ended in a non-palatalized consonant. In the non-diminutive training group, the corresponding simplex forms were presented which resulted in a training set consisting of two-thirds transparently gender-marked nouns and one-third non-transparent gender-marked nouns. All nouns were combined with the color adjectives *zholtyj/zholtaja* 'yellow:MAS/yellow:FEM' and *krasnyj/krasnaja* 'red:MAS/red:FEM'. In the training sessions, participants engaged in three tasks designed to expose them to gender agreement and to elicit production of gender agreement. During the Listen and Repeat task, they were shown a red or yellow line drawing of the object and the corresponding adjective-noun phrase which they simply had to repeat. During the Color Choice task, they saw a red and a yellow drawing of the same object, and listened to an adjective-noun phrase denoting one of the colors and the object (e.g., *krasnyj domik* 'red house-DIM'). Participants were asked to select the appropriate drawing corresponding to the named color via button press. The rationale behind this task was to provide additional exposure to the correct adjective-noun gender agreement under the pretence of learn-

ing the color words. Finally, in the Production task, participants were shown a red or yellow drawing of the object, and heard just the noun. Their task was to produce the correct color word, e.g., the Russian word for 'red' or 'yellow'. In doing so, they also had to supply some form of gender agreement at the end of the adjective, which was coded and served as indicator for their mastery of gender. The results indicated that participants in the diminutive training group learned gender agreement faster than participants in the non-diminutive training group (see figure 3). When comparing performance just on the 20 transparently gender-marked nouns, the diminutive group reliably outperformed the non-diminutive training group over the course of training. Furthermore, performance across training sessions improved faster in the diminutive group than in the non-diminutive group.

The crucial question is whether learners were able to generalize the gender-marking pattern to novel nouns indicating that they had extracted the regularities in the input. To examine this, participants were given a generalization test after the fourth session, which utilized the same color-adjective Production task, only this time with a different color adjective, i.e., the one that was not presented during training (e.g., if the noun was presented in yellow during training, it was presented in red during testing and vice versa). For generalization, ten additional nouns and pictures were presented together with the 30 familiar nouns. The ten non-transparent nouns from the training set were presented in their simplex form, which was the form familiar to the non-diminutive group while the diminutive group had encountered these nouns as diminutives. Ten of the transparent nouns were presented in their diminutive form, which was the familiar form for the diminutive group while the non-diminutive group had encountered the simplex form of these nouns. The other ten transparent nouns were presented in their simplex form, which was the familiar form for the non-diminutive group while the diminutive group had encountered these nouns in their diminutive form. All ten novel nouns were transparent with respect to gender marking, and were presented in their simplex form. The rationale behind this test was to see whether the diminutive group could generalize gender agreement to the simplex form of the familiar nouns and to novel transparent nouns, and whether the non-diminutive group could generalize to diminutive forms of the familiar simplex forms as well as the novel nouns. The results are depicted in figure 4. For the diminutive nouns, the diminutive group was clearly superior in producing gender agreement. This was expected given that these were exactly the noun forms encountered by this group during training. For the familiar transparent nouns, we also found superior performance in the diminutive group. Notice that in this condition, participants in the diminutive group actually had to supply gender agreement for noun forms they had not encountered before in their simplex form. For the non-transparent nouns, we found an effect of noun gender, which was due to more errors in feminine non-transparent nouns. Recall that in Russian, feminine non-transparent nouns end in a palatalized consonant, and, thus, resemble the overall phonological shape of masculine nouns. Consequently, in this experiment, participants treated them as masculine nouns 42% of the time. This finding suggests that participants in

both groups did not memorize the association between gender and the word stem or the word meaning but were relying on the morpho-phonological marking of gender at the ends of words. Finally, in the novel transparent nouns, the diminutive training group exhibited a smaller error rate although the difference between diminutive and non-diminutive training group fell just short of significance.

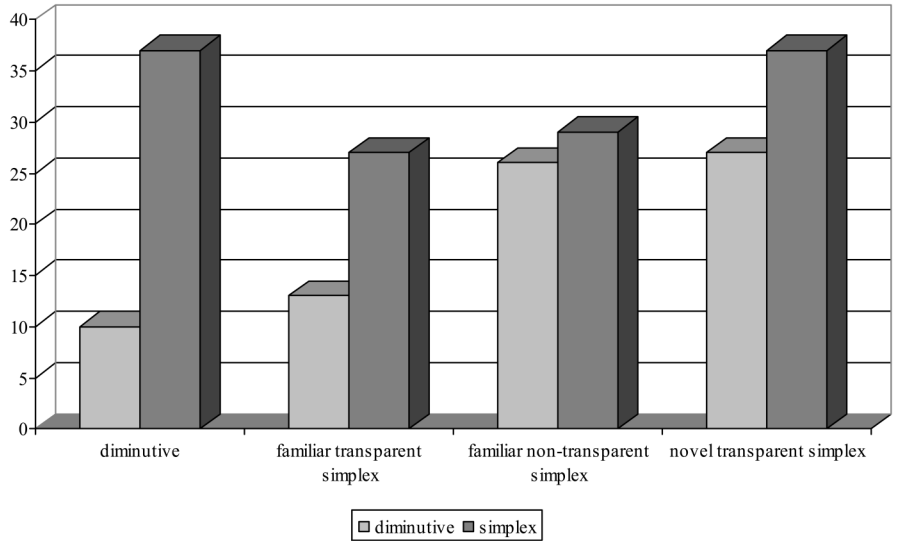

Figure 4. Percent gender agreement errors of L2-learners in the various noun types in the generalization task (Kempe & Brooks, 2001)

Given the overall superior performance of the diminutive group, this experiment suggests that encountering input that is completely regular with respect to gender marking leads to faster learning and better generalization to novel nouns. Note that in the diminutive group, learners could not have isolated a salient sub-cluster of words to be learned first as all the nouns are diminutives and, thus, phonologically very similar to each other. Thus, the crucial difference between the two groups pertains to the regularity of the system the learners encountered: the diminutive group acquired gender based on an absolutely regular system whereas in the simplex group, participants encountered a training set comprising two-thirds regular nouns and one-third irregular exceptions. This clearly demonstrates that regularity supports learning. Note also that the diminutive group outperformed the non-diminutive group despite the fact that the longer and phonologically more complex diminutives should present more of a challenge to adult learners who are not familiar with Russian phonotactics.

The experiments described in this section show that when diminutives regularize an inflectional pattern this provides an advantage for the learner. However, in the

case of Russian gender marking, regularity and frequency are confounded: Diminutives increase the frequency of the already more frequent regular pattern of gender marking, and this does improve learning. It does, however, not exclude the possibility, that Russian children, who encounter both simplex and diminutive nouns in their language input, may start to apply inflectional patterns to diminutives first because diminutives are a perceptually very salient cluster of nouns (Dąbrowska 2006). This supports item-based views on language learning: Children appear to move from learning morphological patterns for single words, to learning morphological patterns applying to narrow clusters of fairly similar words, and eventually to wider generalizations (Lieven, Pine, & Baldwin 1997; Tomasello 1992, 2003), encompassing groups of words commonly labeled as grammatical categories.

4. Why so many diminutives? Towards an explanation of the nature of CDS

In this chapter, we summarized some of our research on the beneficial effects of diminutives in CDS on language learning. We have described evidence from Dutch and Russian showing that diminutives aid word segmentation and morphology acquisition. Similar predictions have been formulated for the effect of diminutives in other languages. For example, in Finnish, diminutivization results in a reduction of allophony associated with the case marking of nouns, thus rendering the declension system more transparent (Laalo 1998). In Lithuanian, diminutives fall into only three declension types out of twelve possible ones, thus exposing the learner to a simplified case-marking system (Savickience, 2003). At present, the claim that diminutives aid morphology acquisition has been tested in several other languages, including Serbian (Ševa, Kempe, Brooks, Mironova, Pershukova & Fedorova in press), Lithuanian (Savickienė, Kempe & Brooks submitted), and Polish (Dąbrowska 2006), with consistent observations of better performance for diminutives over their simplex counterparts.

However, the conclusion that diminutives aid morphology acquisition does not hold universally across languages. The language that stands out as a counterexample is German. German diminutive nouns, which are formed by adding the suffixes *-chen*, *-lein*, *-le* (found in some German dialects) and *-ie*, are infrequent in CDS although dimnutivization of nouns is as productive as in Russian, Dutch or Spanish. In Kempe, Brooks and Pirott (2001), we compared the frequency of diminutives in CDS between a Russian, a Spanish, and a German mother, and found that only about 3% of nouns were diminutivized in German CDS, in comparison to 44% of Russian nouns and 42% of Spanish nouns. Similarly, Korecky-Kroell and Dressler (2004) also found only 3% nouns produced as diminutives in German CDS, despite the fact that their sample was based on a Southern German dialect that is considered to use diminutives more widely than other German dialects. In terms of pragmatic usage, one would not expect differences in diminutive frequency across languages, assuming that German mothers are as keen to express endearment and affection towards their children as mothers who

speak other languages. Furthermore, productivity of the German diminutive derivation is not a limitation: German diminutives can be derived from a large number of inanimate and animate nouns and are comparable in productivity potential to Russian or Spanish diminutives. So what then accounts for the cross-linguistic differences?

One candidate explanation is that German diminutives change the gender of nouns to neuter thereby, in essence, obscuring gender differences. This should hinder gender acquisition as the system becomes more difficult to learn because (a) the frequency of masculine and feminine nouns decreases, and (b) learners have to cope with changing gender for similar word stems depending on the noun's morphological status (simplex vs. diminutive). A system in which diminutivization alters the gender class of a noun, has been reported for other languages such as Dizi and Swahili (Corbett 1991). Unfortunately, no data on the frequency of diminutives are available for those languages. Thus, we have no means of verifying whether the morphological repercussions of the diminutive derivation are linked to the frequency of this form in CDS. In other words, are diminutives more frequent in the CDS registers of languages where they contribute to the simplification and regularization of some aspect of the morphological system, and less frequent in languages where the morphological system is being rendered more complex and irregular? The answer to this question is complicated for a number of reasons. Firstly, diminutivization obscures gender differences not just in German but also in Dutch, where all diminutives are neuter. But Dutch is a language with a high frequency of diminutives in CDS, as we have argued above. We can only speculate that the difference between these two languages may be related to the fact that in Dutch, gender agreement is not as pervasive as in German. For example, German case marking follows the gender distinction, and is ubiquitous in the language while Dutch does not have case marking. Furthermore, German requires gender agreement with adjectives while Dutch does not. Thus, one could argue, grammatical gender is a more important feature in German than in Dutch, and obscuring the gender distinction may therefore have more detrimental consequences for language learning in German. Secondly, as we have tried to show, diminutivization may exert effects on other aspects of language learning besides morphology such as word segmentation or word class categorization. It is difficult to assess what the net gain or net loss of frequent use of diminutives for the learner in any given language might be. German diminutives, even though they obscure gender distinctions, still may be beneficial for word segmentation as they may have the potential to regularize metrical stress patterns and provide substantial ending invariance. At the same time, they may hinder learning of noun classes as they do not represent typical German noun forms. Unlike in Dutch, where diminutives end in unstressed schwas, and unstressed vowels are typical Dutch noun endings, the diphthong in the German *-lein*, the fricative in the German *-chen*, and the long vowel in the German *-ie* all represent atypical German noun endings. This may be an additional factor that renders German diminutives unhelpful for the language learner. However, these explanations have to be tested empirically in future research.

Despite the many open questions, we want to conclude this chapter with a few thoughts on the factors responsible for diminutive usage, and the beneficial nature of CDS in general. The explanation we have pursued so far was based on the assumption that the net benefit of any given linguistic form for language acquisition may be responsible for the frequency of that form in CDS. Aside from the fact that more evidence is needed to support this assumption, it leads to the question as to why adult speakers shape CDS the way they do, and whether they are aware of the potential effects of their way of speaking on the child. In a recent study, Burnham, Kitamura and Vollmer-Conna (2002) demonstrated that mothers show the same changes in vocal features such as raised pitch and increased pitch range when speaking to their pets, and when speaking to their children. This can be taken as support for the idea that CDS has evolved as an affective register (Fernald 1992). Interestingly, however, the mothers tested in the Burnham et al. (2002) study hyper-articulated vowels only when speaking to their children but not when speaking to their pets. Hyper-articulation is another feature that may aid language acquisition as it helps learners to discriminate phonemes (Kuhl et al. 1997). This finding suggests that when speaking to children, adults employ features that benefit language learning, thus providing a form of didactic support. But how do they know which features are helpful in their language? Surely, it is unlikely that parents routinely engage in the kind of elaborate structural analyses of their language of the sort presented here. With respect to diminutives, it has been suggested that the frequency of diminutives in CDS in languages like Russian, Polish or Spanish can largely be attributed to the adults' attempts at imitating the child (Dąbrowska 2006; King and Melzi 2004). Thus, in a recent analysis of CDS of Peruvian mothers of 3- and 5-year-olds, King and Melzi (2004) observed that the frequency of diminutives in mothers' speech was best predicted by the frequency of diminutives in their child's speech and vice versa. Most interestingly, however, was their finding that mothers imitated the diminutive use of the child more frequently than the children imitated the diminutive use of the mother. The authors suggest that these mother-to-child imitations represent an attempt on the mothers' part to maintain emotional responsiveness and rapport with the child, which in turn has been demonstrated to benefit language development (Nicely, Tamis-LeMonda & Bornstein 1999; Tamis-LeMonda, Bornstein, Baumwell 2001). Still, what is unclear is how children come to prefer diminutives in the first place so as to produce a linguistic form that then can be imitated by the adult interlocutor to maintain discourse coherence and rapport. We would like to propose the following account, which can offer a tentative explanation for the frequent occurrence of beneficial linguistic forms in CDS.

From the outset, parents develop a close emotional attachment to their child. In their interactions, they use a speech register that is characterized by vocal expressions of positive affect (Trainor, Austin & Desjardins 2000, Singh, Morgan & Best 2002) and loaded with linguistic forms that have strong affective connotations. This affective mode of communication may have evolved to regulate infant emotion and arousal (Fernald 1992) in order to maintain contact with the child over physical distances (Falk

2004). As the parents produce such highly affectively colored speech, the child, using associative and statistical learning mechanisms (Gomez and Gerkin 2000) will start to extract whatever distributional regularities the language input contains. If some of the affectively colored linguistic features, such as diminutives, happen to increase statistical regularity on any level, they will have a greater chance of being extracted and ultimately produced in the first utterances of the child. The adult caretaker, then, in an attempt to maintain emotional involvement, rapport, and communicative continuity with the child, will start imitating those features as they elicit greater responsiveness from the child. Thus, we propose that it only takes a small initial statistical benefit from some affectively colored element of speech to engage a communicative feedback loop that will amplify the frequency of that feature in subsequent adult-child conversation. If, on the other hand, an affectively colored feature slightly deviates from dominant patterns of statistical regularity, as in the case of German diminutives, it is less likely to be extracted and produced by the child and, consequently, less likely to be imitated by the parent thus fading into communicative oblivion despite its positive affective connotations. Such a dynamic view emphasizing mutual influences between language learning and adult-child interaction can explain why features that are beneficial from a learner's point of view may be amplified in CDS without any deliberate didactic attempts or even conscious awareness on the side of the adult speaker. In addition, as these patterns of interaction will tend to be similar across different speakers, they might ultimately become conventional in the speech register of a community of speakers. This would enable any speaker to use basic elements of the CDS register without much effort or prior interactions with a child. On this account, if, in a given language, diminutives regularize, simplify or highlight important structural aspects, they will end up being more frequent in CDS than in ADS.

From this perspective, diminutives provide a unique window into the interaction of affective, pragmatic, structural and statistical features of CDS, and the way the interaction between adult and child fosters the development of linguistic and communicative abilities. The view outlined above is compatible with a view that postulate a primacy of affective communication (Locke 2001) and echoes approaches that try to understand development as emerging out of the non-linear dynamic properties of the interaction between the developing organism and the environment (Thelen & Smith 1994). However, much more research is needed to get a full understanding of the factors shaping CDS in general, and diminutive usage in particular, and the mechanisms underlying their effect on language learning. Firstly, researchers need to broaden the cross-linguistic evidence for descriptions of CDS. So far, all data, including those presented in this chapter, stem from mostly a handful of Indo-European languages. Secondly, these descriptions of CDS need to include systematic comparisons with ADS to differentiate the sociolinguistic and cultural norms in a language community from features that are truly unique to CDS. Thirdly, descriptions of CDS should include interactions with children of various ages to map out the trajectory of changes of language input and interaction patterns over the course of language development. And

finally, more empirical evidence is needed to demonstrate specific effects of CDS on the process of language learning. This empirical evidence should be gathered not only from child first language learners but also from adult second language learners, as the latter studies allow the systematic manipulation of input to test its effect on learning. Together, this research will improve our understanding of the dynamic nature of CDS as being shaped by and shaping the child in a way that is optimal for language learning and development.

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Notes

1. Diminutive frequency appears to vary considerably across English dialects with greater prevalence in Australian English, than in American or British English.

2. Note that all these languages also possess a set of lexicalized diminutives, i.e. diminutive nouns or modifiers which have no simplex counterpart like the Russian *banka* 'can' or diminutives the meaning of which has shifted away from the simplex such as in the Russian *vodka* which denotes the well-known spirit rather than being the diminutive form of the simplex *voda* 'water'. In what follows we will only consider productive, i.e. non-lexicalized diminutive forms.

3. Melzi and King (2003) estimated the frequency of diminutive usage in Spanish as 9% of all diminutivizable words including nouns, adjectives and adverbs. However, as they do not provide the total number of nouns, it is impossible to compare their and our estimates directly. Another reason for potential differences in the estimates for Spanish might have to do with the fact that Melzi and King based their calculations on data from 32 mothers speaking to three-year-old children in Limeño Spanish whereas in Kempe, Brooks and Pirott (2001), we used data from one mother speaking Mexican Spanish.

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