Paradigm reanalysis and the representation of morphologically complex words in Turkish

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1 Introduction

In this paper we explore the idea that language change can inform psycholinguistic models (e.g. Bybee 2001a), arguing that recent developments in colloquial Turkish provide evidence bearing on the representation of morphologically complex words. Specifically, there are several instances in which pairs of frequently co-occurring suffixes are in the process of becoming fused together. We argue that the data motivate two proposals: firstly, that some of the adjacent pairs of suffixes must have constituted 'units' for speakers; and secondly, that there are analogical processes involved which are distinct from standard morpheme-combining operations.

Turkish is renowned for its highly regular and productive agglutinating morphology. Verbs are inflected for tense, aspect, mood, polarity, agreement and numerous derivational categories, and nominals are inflected for number and case, among other possibilities. Although there are several productive phonological processes such as vowel harmony, voicing assimilation and so on, there are very few morphological irregularities in written Turkish or in standard spoken Turkish. A striking example of this crystalline morphological system can be seen in this famous word/sentence from Lewis (1967):

(1) Avrupa-li-laʃ-tır-ıl-a-mı-jabil-en-ler-den-miʃ-siniz.[1]
Europe-QUAL-INCH-CAUS-PASS-ABIL-NEG-POSS-SBJPRT-3PL-ABL-EVID-2PL
'You seem to be one of those who may be incapable of being Europeanized.'

The transparency of the morphology seems at first sight to favor a psycholinguistic model in which words are completely decomposed into their constituent morphemes (e.g. Taft and Forster 1975), in line with standard structural and generative analyses. It is certainly clear that the opposite extreme, full listing of all inflected forms in the mental lexicon, is not possible for this language, as attested by the productivity of forms such as (1).

Recently however, several researchers have proposed models involving partial decomposition, and simultaneous, overlapping representations of forms

[1] Examples are given in broad IPA transcription. The following abbreviations are used in the glosses: ABIL abilitative, ABL ablative, ANT anterior, CAUS causative, COND conditional, EVID evidential, FUT future, INCH inchoative, NECC necessitative, NEG negative, NOMZ nominalizer, NONFUT nonfuture, PASS passive, PAST past, PL plural, POSS possibility, PROG progressive, Q question, QUAL quality, REPPAST reported past, SBJPRT subject participle, SG singular.

varying in the extent to which they are decomposed, with frequency being an important factor (e.g. Bybee 2001a, 2001b; Baayen and Schreuder 1999). According to this view, some inflected forms, or perhaps sequences of morphemes which do not make up a whole word but which nevertheless consist of more than one morpheme, are stored. Frequency is an important factor in determining whether or not multimorphemic sequences are stored. These listed forms coexist with the means to productively generate new forms, whether through the rule-like combination of listed morphemes as in the standard view, or through analogy based on fully listed forms, as Bybee (2001a) proposes. In this paper, we argue that the diachronic changes in progress in Turkish support such a layered, frequency-sensitive model, and we provide evidence suggesting that analogy is a relevant mechanism in productive processes.

2 Reductions across future tense and agreement

The standard Turkish future tense paradigm is shown in (2a). In colloquial speech in many dialects, including that of the first author, reduced forms are used as shown in (2b).

(2) Future declarative paradigm for *sor-* 'to ask'

Subject		a. Standard	b. Colloquial	Gloss
Sg.	1	sor-adʒa-ɨm ask-FUT-1SG	sor-dʒam ask-FUT.1SG	'I will ask'
	2	sor-adʒak-sɨn ask-FUT-2SG	sor-dʒan ask-FUT.2SG	'you (sg.) will ask'
	3	sor-adʒak ask-FUT.3SG	sor-dʒak ask-FUT.3SG	'he/she/it will ask'
Pl.	1	sor-adʒa-ɨz ask-FUT-1PL	sor-dʒaz ask-FUT.1PL	'we will ask'
	2	sor-adʒak-sɨnɨz ask-FUT-2PL	sor-dʒak-sɨnɨz ask-FUT-2PL	'you (pl.) will ask'
	3	sor-adʒak-lar ask-FUT-3PL	sor-dʒak-lar ask-FUT-3PL	'they will ask'

The reduced forms in (2b) are in free variation with the standard forms. Although they may be considered inappropriate in formal contexts, they are used highly frequently by speakers of all social classes and in many regions.

Across both paradigms, the tense and agreement morphemes are fused together in the colloquial forms for 1SG, 1PL and 2SG. In some dialects, this extends to 2PL as well:

(3) sor-dʒanɨz
ask-FUT.2PL
'you (pl.) will ask'

We will argue that the phonological processes which have reduced these forms have applied specifically to the particular pairs of morphemes involved. First we present evidence that the processes are not general, then we discuss morphosyntactic evidence for the unithood of the fused future + agreement suffixes.

One alternative to our claim that the fused forms are units would be to claim that the future tense morpheme has been reduced to *-dʒA*. (The [*A*] represents a low vowel archiphoneme subject to vowel harmony. Throughout the paper, capital letters in forms indicate archiphonemes.) However, there are two arguments against this view. Firstly, the agreement paradigm which would then have to be proposed (*-m*, *-n*, *-k*, *-z*, *-ksInIz*, *-klAr*) is not attested elsewhere in the language. Turkish does have several series of agreement suffixes which differ subtly from one another, but none of them contain [*k*]s in the third person forms, or in the second person plural. These [*k*]s clearly relate to the future morpheme and would have to be analyzed as such. Secondly, in other morphological contexts, the future suffix cannot be reduced in this way. For instance, this reduction is impossible in compound tenses:

(4) a. sor-adʒak-tɨ-m
ask-FUT-PAST-1SG
'I was going to ask'
b. *sor-dʒa-dɨ-m

These arguments suggest that the reductions evident in (2b) do not reflect simply a change affecting a single morpheme.

Another possibility is that the operations which produce the reduced forms are general phonological processes. However, we can show that this is not the case, but rather that the reductions are restricted to only a few particular pairs of suffixes. Almost certainly the reductions originated with the first person forms, since it seems unlikely that the salient [*ks*] sequence in the 2SG form would be subject to phonological erosion. The standard first person forms have sequences of adjacent vowels which are the result of an earlier historical process of intervocalic velar deletion. An example of a proto form is given in (5a). The velars were devoiced syllable-finally, giving rise to the [*k*]s still found in the paradigm, but intervocalically they were lenited, eventually to zero, as in (5b), which is the standard form. In the novel colloquial forms, the VV sequence is then simplified by deleting the second vowel, as in (5c).

(5) a. Proto form
sor-adʒag-ɨm ‘I will ask’
b. Standard form (consequence of intervocalic velar deletion)
sor-adʒa-ɨm ‘I will ask’
c. Colloquial form (consequence of hiatus resolution)
sor-dʒam ‘I will ask’

Note that the initial vowel of the future suffix is also lost, but we will not focus on that in this paper.

Crucially, resolution of hiatus by deletion of a vowel is not a productive phonological process in Turkish. Four examples of relevant environments in which the process does not occur are [*k*]-final nominals with possessor agreement (6), predicative [*k*]-final nominals (7), nominalized nonfuture verbs (8), and nominalized future verbs (9).

(6) a. kœpek ‘dog’
b. kœpe-im ‘my dog’
c. *kœpe-m

(7) a. kœpe-im ‘I am a dog’
b. *kœpe-m

(8) a. sor-du-um soru
ask-NONFUT.NOMZ-1SG question
‘the question that I asked’
b. *sor-dum soru

(9) a. sor-adʒa-ɨm soru
ask-FUT.NOMZ-1SG question
‘the question that I will ask’
b. *sor-dʒam soru

In all four of these cases, the deletion of intervocalic velars brings pairs of vowels together, but in no case is deletion of either vowel possible. The example in (9) is particularly striking, as it involves morphemes with the exact same shapes as those which do allow reduction in (2). However, the process does not apply in this construction.[2]

[2] There are several other alternations in Turkish which could plausibly be seen as hiatus resolution by vowel deletion, for instance the ordinal number suffix -(*I*)*ndʒI*:

(i) a. beʃ ‘five’
b. beʃ-indʒi ‘fifth’
c. altɨ ‘six’
d. altɨ-ndʒɨ ‘sixth’
e. *altɨ-indʒɨ ‘sixth’

It can be concluded that the phonological process which reduces the 1SG and 1PL forms in (2) applies only to these particular pairs of morphemes. This can best be accounted for by proposing that these pairs of frequently adjacent suffixes constitute units for speakers, overlapping with fully decomposed representations. Because these sequences are processed as autonomous units, the fluency with which they are produced increases over repeated usages, just as is the case with procedural learning in general, linguistic and otherwise (Boyland 1996). As fluency increases, the second vowel in the VV sequence is deleted. Without the assumption that the pairs of suffixes in question are units, there is no apparent explanation for why the process applies only to these particular pairs of suffixes.

We suggest that frequency plays a very important role in reducing these particular pairs of suffixes. The collocational frequency of *-AdʒA-Im* 'FUT-1SG' and *-AdʒA-Iz* 'FUT-1PL' is very high. But in the cases in (6) through (9) where reduction does not occur in the same phonological environment, collocational frequencies are much lower. Although possessed nominals (6) and nominal predicates (7) are of course very common, no particular nominal is especially frequent in the construction in its own right, so there are no pairs of morphemes which are consistently adjacent. In (8) and (9) the nominalizing morphemes are always adjacent to the agreement suffixes, however these constructions are much less frequent than the simple future, which we have confirmed by examining child-directed speech in Slobin's (1982) Turkish acquisition data on the CHILDES database (MacWhinney 2000).

We have not commented so far on the forms *-dʒAn* 'FUT.2SG', and the related form *-dʒAnIz* 'FUT.2PL' which is found in some dialects. It is unlikely that these reflect simply phonological erosion, since the standard forms *-AdʒAk-sIn* and *-AdʒAk-sInIz* contain salient [*ks*] sequences which never seem to be lenited. Rather, it appears much more likely that *-dʒAn* and *-dʒAnIz* are formed through a process of analogy. As noted above, Turkish has several series of agreement suffixes, and in two of them (possessor agreement, and the past/conditional paradigm), *-m* '1SG' corresponds to *-n* '2SG' and *-nIz* '2PL'.[3]

It is not entirely clear why the 2SG forms are reduced more readily and in more dialects than the 2PL forms. There is a considerable frequency difference in the forms: *-AdʒAk-sIn* is an order of magnitude more frequent than *-AdʒAk-sInIz* in Slobin's (1982) data. However, it is not obvious what reason there would be for analogy to affect frequent forms more readily.

However, all such cases involve the same harmonizing high vowel (with the exception of the suffix *-(A)v*, which is not productive), so they can equally plausibly be analyzed as epenthesis. But even if reasons are found to treat these cases as vowel deletion, the examples in (6) through (9) still show that the process is certainly not general in the case of VV environments created by intervocalic velar deletion.

[3] Note that this is not simply a change in which set of agreement affixes is used, since both of these paradigms have forms in other persons which do not make their way into the future paradigm. For instance, the 3SG possessor agreement suffix is *-(s)I* but **-dʒA-sI* is impossible, and the 1PL past/conditional suffix is *-k* but **-dʒA-k* is impossible for 1PL future.

Further evidence for the unithood of forms such as *-dʒAm* 'FUT.1SG' can be seen in their morphosyntactic properties. Consider question formation: the standard future interrogative paradigm are shown in (10a) and the colloquial paradigm in (10b).

(10) Future interrogative paradigm for *sor-* 'to ask'[4]

Subject		a. Standard	b. Colloquial	Gloss
Sg.	1	sor-adʒak-mɨ-jɨm ask-FUT-Q-1SG	sor-dʒam-mɨ ask-FUT.1SG-Q	'will I ask?'
	2	sor-adʒak-mɨ-sɨn ask-FUT-Q-2SG	sor-dʒan-mɨ ask-FUT.2SG-Q	'will you (sg.) ask?'
	3	sor-adʒak-mɨ ask-FUT.3SG-Q	sor-dʒak-mɨ ask-FUT.3SG-Q	'will he/she/it ask?'
Pl.	1	sor-adʒak-mɨ-jɨz ask-FUT-Q-1PL	sor-dʒaz-mɨ ask-FUT.1PL-Q	'will we ask?'
	2	sor-adʒak-mɨ-sɨnɨz ask-FUT-Q-2PL	sor-dʒak-mɨ-sɨnɨz ask-FUT-Q-2PL	'will you (pl.) ask?'
	3	sor-adʒak-lar-mɨ ask-FUT-3PL-Q	sor-dʒak-lar-mɨ ask-FUT-3PL-Q	'will they ask?'

In the standard paradigm, agreement is suffixed to the question particle *-mI* for first and second person forms, but in the novel reduced structures, the question particle is simply affixed to the declarative forms. This is a much more common pattern cross-linguistically (Bybee 1985). In non-reduced forms, it is ungrammatical for the question particle to be affixed outside the agreement morpheme:

(11) *sor-adʒa-ɨz-mɨ?
ask-FUT-1PL-Q
'will we ask?'

The rearranged paradigm in (10) cannot be explained simply on phonotactic grounds, as attempts to apply standard question formation to the reduced forms yield phonotactically well-formed but ungrammatical constructions, for example:

[4] In Turkish orthography, the question particle *-mI* is written as a separate word. However, since it undergoes vowel harmony, it appears to be as much a part of the phonological word as any of the other suffixes. Actually, many suffixes in Turkish are in fact clitics by syntactic criteria (Kornfilt 1996).

(12) *sor-dʒa-mɨ-m?
ask-FUT-Q-1SG
'will I ask?'

This can be taken as evidence for the unitary nature of the reduced forms, since they apparently resist being separated by the question particle. When questions are based on the new forms, speakers revert to the typologically unmarked option of placing the interrogative particle outside of agreement, rather than maintaining the rather unusual standard pattern.

It is also possible that the rearrangement of the interrogative paradigms might involve analogy to the past and conditional tenses, which already show the interrogative-outside pattern:

(13) a. sor-du-m-mu?
ask-PAST-1SG-Q
'did I ask?'
b. *sor-du-mu-m?
ask-PAST-Q-1SG
'did I ask?'
c. sor-sa-k-mɨ?
ask-COND-1PL-Q
'should we ask?'
d. *sor-sa-mɨ-k?
ask-COND-Q-1PL
'should we ask?'

It is not clear whether this analogy is made, or whether speakers simply follow the most natural option of affixing the interrogative particle to the declarative forms.

In sum, we have argued in this section that phonological reduction affects a few particular pairs of suffixes: *-AdʒA-Im* 'FUT-1SG' becomes *-dʒAm*, and *-AdʒA-Iz* 'FUT-1PL' becomes *-dʒAz*. The fact that the change is restricted to these particular high-frequency environments suggests that the pairs of suffixes must have constituted units for speakers. The change then spread further through the paradigm to the 2SG and in some dialects 2PL forms through a process of analogy. Finally, the reduced forms exhibit novel morphosyntactic behavior consistent with the status as units.

3 Similar processes

Another suffix sequence which optionally reduces in casual speech is *-mIʃ-sIn* 'EVID/ANT/REPPAST-2SG':

(14) a. sor-muʃ-sun
ask-REPPAST-2SG
'apparently you asked'
b. sor-muʃ-un

This reduction of [*ʃs*] to [*s*] is not possible in any other contexts:

(15) a. derviʃ-sin
dervish-2SG
'you are a dervish'
b. *derviʃ-in

In this case, the markedness of the [*ʃs*] sequence probably plays a role. It is not clear whether this is a phonological reduction across a two-morpheme unit (like the case where *-AdʒA-Im* becomes *-dʒAm*) or whether analogy is involved, since the first person form, for instance, is *-mIʃ-Im*, and we have already shown that such an analogy has occurred in the future paradigm.

However, frequency appears to be important in either case, because of the impossibility of forms like (15b). Note that although this construction in (15) is highly frequent, it will not be frequent for any particular given noun, so there is little likelihood of speakers abstracting a unit. But *-mIʃ-sIn* is a commonly occurring sequence, so it can be processed as a unit and subject to reduction accordingly.

More evidence for the importance of frequency comes from another phenomenon involving the future tense. When the future tense follows a vowel-final stem, a [*j*] is inserted in standard Turkish to break up the sequence of vowels:

(16) a. baʃla- 'to start'
b. baʃlı-j-adʒak
start-j-FUT.3SG
'it will start'

Whether this [*j*] is treated as epenthetic or as part of the future suffix is open to debate. Note also that the [*j*] raises the preceding vowel to [*ı*]. We will not be concerned with these details here, but rather with the reductions which are possible and very common with these forms in colloquial speech:

(17) a. baʃlaadʒak
b. baʃladʒak

The [*j*] is often omitted as in (17a), leaving a sequence of vowels. This can be further shortened as in (17b).

The relevance of this phenomenon is that the acceptability of reduced forms such as those in (17) depends upon the frequency of the stem. Thus whereas the reductions in (17) are completely natural, in fact virtually obligatory, reduction is much less likely with less frequent verbs:

(18) a. saala- 'to provide'
b. saal̈-j-adʒak
provide-j-FUT.3SG
'he/she/it will provide'
c. saalaadʒak
d. saaladʒak

While (18c) and (18d) are certainly possible, they are not as natural as the forms in (17). This suggests that sequences of stem + future can also be stored as units, in the same way as we argued that some future + agreement sequences are stored. As units, these sequences would increase in fluency over repeated uses, so the phonological reduction would preferentially apply in frequent forms. Ideally in future work we would like to quantify empirically our observations about the relative naturalness of reduction in (17) versus (18).

Given that [*j*] deletion is possible, it is interesting to observe that it does not occur in the paradigm for the necessitative suffix *-mAlI*.

(19) a. sor-mal̈-j̈im
ask-NECC-1SG
'I must ask'
b. *sor-mal̈-m

The necessitative *-mAlI* has the same morphosyntactic properties as the future tense, and so appears to be a candidate for the kind of reductions observed in (2). However, such reductions are impossible. We suggest that this may be a consequence of the fact that *-mAlI* is relatively infrequent.

Finally we turn to the present progressive paradigm, in which reductions have taken place which in many respects parallel those in the future paradigm. In (20), once again, the standard forms are shown in the (a) column and the colloquial forms in the (b) column.

(20) Progressive declarative paradigm for *sor-* 'to ask'

Subject	a. Standard	b. Colloquial	Gloss
Sg. 1	sor-ujor-um ask-PROG-1SG	sor-ujo-m ask-PROG-1SG	'I am asking'

	2	sor-ujor-sun ask-PROG-2SG	sor-ujo-n ask-PROG-2SG	‘you (sg.) are asking’
	3	sor-ujor ask-PROG.3SG	sor-ujo ask-PROG.3SG	‘he/she/it is asking’
Pl.	1	sor-ujor-uz ask-PROG-1PL	sor-ujo-z ask-PROG-1PL	‘we are asking’
	2	sor-ujor-sunuz ask-PROG-2PL	sor-ujo-sunuz ask-PROG-2PL	‘you (pl.) are asking’
	3	sor-ujor-lar ask-PROG-3PL	sor-ujo-lar ask-PROG-3PL	‘they are asking’

Similar to the reduced future forms, while these reductions with the progressive are inappropriate in written Turkish and are not used in formal situations, they are nevertheless very common in colloquial speech.

As for the future paradigm, these reduced progressive forms also show reorganized morphosyntax, with the interrogative particle affixed to the declarative forms:

(21) Progressive interrogative paradigm for *sor-* ‘to ask’

Subject		a. Standard	b. Colloquial	Gloss
Sg.	1	sor-ujor-mu-jum ask-PROG-Q-1SG	sor-ujo-m-mu ask-PROG-1SG-Q	‘am I asking?’
	2	sor-ujor-mu-sun ask-PROG-Q-2SG	sor-ujo-n-mu ask-PROG-2SG-Q	‘are you (sg.) asking?’
	3	sor-ujor-mu ask-PROG.3SG-Q	sor-ujo-mu ask-PROG.3SG-Q	‘is he/she/it asking?’
Pl.	1	sor-ujor-mu-juz ask-PROG-Q-1PL	sor-ujo-z-mu ask-PROG-1PL-Q	‘are we asking?’
	2	sor-ujor-mu-sunuz ask-PROG-Q-2PL	sor-ujo-mu-sunuz ask-PROG-Q-2PL	‘are you (pl.) asking?’
	3	sor-ujor-lar-mɨ ask-PROG-3PL-Q	sor-ujo-lar-mɨ ask-PROG-3PL-Q	‘are they asking?’

At first glance, it appears that these reductions in the present progressive mirror those in the future tense, so a similar analysis might be proposed. However, we will argue that there are several subtle but important differences in how these paradigms came to be rearranged.

Note that in (20b), the third person singular form is reduced by deletion of the final [*r*]. We suggest that this was the first event which triggered the

rearrangement of the paradigm. Unlike the reductions in the future paradigm, which we argued could only be understood as applying to 'units' consisting of more than one suffix, the deletion of this [*r*] can be understood as applying simply to the progressive morpheme *-Ijor*. This can be seen in the fact that it is possible to delete the [*r*] even in compound tenses:

(22) a. sor-ujor-du-m
ask-PROG-PAST-1SG
'I was asking'
b. sor-ujo-du-m

Note the contrast with (4) where this is shown not to be possible for the future tense morpheme.

Forms such as *-Ijo-m* 'PROG-1SG' are presumably based on the reduced form *-Ijo*. However, the form taken by the agreement suffixes provides clear evidence for an analogical process rather than the combination of existing morphemes. If the existing progressive agreement suffixes were simply affixed to *-Ijo*, the following forms would be obtained:

(23) a. *sor-ujo-jum
b. sor-ujo-sun
c. sor-ujo
d. *sor-ujo-juz
e. sor-ujo-sunuz
f. sor-ujo-lar

The epenthetic [*j*] in (23a) and (23d) would have to occur because it does in all other instances where this series of agreement suffixes are attached to vowels. An example can be seen with the necessitative in (19a). Furthermore, although (23b) and (23e) are possible, it is also possible to further reduce these forms to *sor-ujo-n*, shown in (20b), and *sor-ujo-nuz*, which is used in some dialects.

Therefore speakers do not simply continue to attach the same agreement suffixes, letting the phonology take its course. Rather, most of the agreement forms in (20b) match those in the past/conditional paradigm. It appears that *sor-ujo-m*, for instance, is based on *sor-ujo* in the same way that *sor-du-m* 'I asked' is based on *sor-du* 'he/she/it asked'. The one exception is the first person plural, for which the past/conditional agreement form is *-k*, as can be seen in (13c), but the most common progressive form is *-z*, as in (20b). However, some dialects do in fact allow *-k* in the progressive:

(24) sor-ujo-k
ask-PROG-1PL
'we are asking'

But the more common *-z* which is normally found in this form probably reflects the standard progressive agreement paradigm where *-m* '1SG' relates to *-z* '1PL'.

In short, colloquial reductions in the progressive look a lot like those in the future, but closer examination reveals that the novel forms can be satisfactorily explained by assuming a change in a single morpheme, followed by analogical processes. This contrasts with the future tense, where we argued that the change can only be understood if speakers sometimes derive units which are larger than a single morpheme.

4 Psycholinguistic implications

We have argued that some cases of reductions in colloquial Turkish can best be accounted for by proposing that pairs of frequently adjacent suffixes such as *-AdʒA-Im* 'FUT-1SG' constitute units for speakers, overlapping with fully decomposed representations. We suggested that general principles of procedural learning apply to these forms, leading in this case to the deletion of a vowel.

Similar arguments about fusional processes have been made for many other languages (Bybee 2001a). One of the best-studied cases is the English past tense. It is well-known that there is a strong correlation between frequency and irregularity: most of the irregular verbs in English are highly frequent. This is almost certainly due to the fact that frequent forms were memorized as units in the past, so they resisted the change to the *-ed* past tense (which seems to have been based on the verb *did*). Bybee (1985) studied a set of irregular verbs that survived in Modern English and found that those which are still irregular today are vastly more frequent than those which have since become regularized.

Sometimes effects such as these occur between adjacent words rather than morphemes, as in the case of French liaison discussed by Bybee (2001b). Very roughly, the generalization can be made that liaison consonants are preserved in syntactic contexts which occur with high frequency. For instance, final consonants of determiners are preserved in determiner + noun sequences.

What these diachronic facts all suggest, including the Turkish data presented in this paper, is that speakers do not necessarily break down everything that can be broken down. Rather, sequences of forms which co-occur with high frequency can be represented as units, as evidenced by their ability to maintain archaic patterns in the face of change (the English past tense), maintain phonological material which is being lost to reductive processes in other environments (French liaison), or to undergo automatization and hence internal reduction, as in our Turkish data.

Several psycholinguistic studies have also provided evidence that speakers store regular forms, at least to some extent (e.g. Burani, Salmaso and Caramazza 1984; Sereno and Jongman 1997). For instance, Sereno and Jongman (1997) found that relative frequency of (regular) plural versus singular forms of nouns had some predictive value in a lexical decision task. If it were the case that all regular forms were derived by online rule application, only the frequency of the

singular should be relevant, so these results suggest that regular plurals are stored to some extent.[5]

The data presented in this paper confirm and provide support for these kinds of experimental findings. The question arises as to what kind of model can give rise to overlapping representations varying in terms of their specificity. Connectionist models would be worth exploring in this respect, since they have the ability both to detect regularities as well as to encode larger units, depending on the structure of the input (e.g. Plaut et al. 1996). Dual-route models such as Baayen and Schreuder (1999) also allow for the possibility of overlapping representations. In any case, the data suggest a usage-based model sensitive to frequency which posits flexibility in the granularity of representations and has mechanisms for dynamic processes such as pattern-matching and analogy-making.

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[5] Gürel (1999) presents some experimental evidence for lack of full decomposition in Turkish, although in her experiment this takes the form of a null result which we would want to be somewhat cautious in interpreting.

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