

Reduction of word final schwa in Danish – Rhythmic and syntactic factors

Ruben Schachtenhaufen
IBC, CBS
ruben@schwa.dk

Abstract

A recent study (Heegård 2012) documents that word final schwa in Danish is overwhelmingly more likely to be reduced in verbs than in homonymous adjectives. Heegård concludes that word class is a highly relevant factor in determining the probability for schwa reduction. In this paper another explanation is sought. Instead of looking at the word containing a final schwa in isolation, it is suggested that certain prosodic or grammatical properties of the succeeding word may explain much of the different propensity for schwa reduction seen in different word classes. At first a metrical pattern known from other contexts to be an impetus for syllable reduction is examined. However, this metric effect turns out to be just part of the matter. Also the grammatical properties of the succeeding word seem to be highly relevant. On the basis of this it is suggested that schwa reduction in verbs could be viewed as initial signs of a grammaticalization process.

1. Schwa in Danish

The phoneme /ə/ in traditional phonological interpretations (Basbøll 2005, Grønnum 2005) is by any measure extremely common in Danish. Historically, all originally Old Norse unstressed vowels have been weakened to /ə/. Hence, most polysyllabic words, by type and by token, contain a post-tonic /ə/. However, while common at the phonological level of description, in actual speech schwa is very likely to undergo a process commonly referred to as *schwa assimilation*, which according to a corpus analysis (Schachtenhaufen 2010b) happens in roughly 50% of all cases. This process can be described, depending on interpretational preferences, either as /ə/ completely assimilating to an adjacent sonorant while retaining only the syllabic feature, or as a loss of schwa with compensatory syllabication and optional lengthening of an adjacent sonorant. Either way

the result is the same. Some examples of the output of schwa assimilation are given below:¹

['sø:ə]	→	['sø:ø]	<i>søge</i>	('seek')
['gæ:ðə]	→	['gæ:ð]	<i>gade</i>	('street')
['sgo:lə]	→	['sgo:l]	<i>skole</i>	('school')
[semʔbəl]	→	[semʔb]	<i>simpel</i>	('simple')

Schwa assimilation is not equally likely to occur in any phonological context. Schachtenhaufen (2007, 2010b) has investigated schwa assimilation in the DanPASS corpus quite thoroughly. Generally schwa-assimilation is highly dependent on phonological syllabification and on the vocoid vs. contoid nature of adjacent phonemes. Assimilation can be considered obligatory in certain phonological contexts. Thus, schwa assimilation almost always occurs in the following context, except in hyper-distinct pronunciation:

- Before a tauto-syllabic sonorant, e.g. /'kat.ən 'syk.əl/ → ['kadŋ 'syg] *katten, cykel* ('the cat', 'bicycle').
- After a hetero-syllabic vocoid, e.g. /'pi:ə 'ga:d.ə 'fly:v.ə 'sto:r.ə/² → ['pi:i 'gæ:ð 'fly:v 'sdo:v] *pige, gade, flyve, store* ('girl', 'street', 'fly (vb.)', 'big').
- In the first post-tonic syllable in pro-paroxytone stems adjacent to a sonorant, e.g. /'mənəskə 'fø:ləlsə/ → ['mənŋsgə 'fø:l] *menneske, følelse* ('human', 'feeling').

A final schwa after a contoid is not normally assimilated in distinct, isolated pronunciation, e.g. /lilə/ [lilə] *lille* ('small'). However, in connected speech schwa assimilation can occur after contoids as well, e.g. [lil]. In connected speech it is also very common that schwa is entirely lost instead of assimilated (roughly this happens 25% of the time according to Schachtenhaufen 2010b). Schwa can be lost in almost any position. However, if schwa loss would result in a phonotactically odd structure, it is

¹Phonetic transcriptions are based on IPA standardized to Danish, based on the broad transcription conventions used by Grønnum (2005). Note that [p t k] are aspirated, and [b d g] are voiceless in this convention.

² The phonemes /d g v r j/ are vocoid in coda position after vocoids.

generally prevented, e.g. /'gamlə/ *gamle* ('old') is unlikely to lose schwa, *['gaml], since [ml] in coda is an unknown structure in Danish.

With our current knowledge, assimilation and loss of final schwa after contoids is rather unpredictable. Generally, these phenomena are correlated with other reduction phenomena and may be considered as such, hereafter together named *schwa reduction*. Thus, factors that tend to give rise to distinct pronunciation, such as words that are pragmatically and contextually important, also seem to prevent schwa reduction, while the opposite give rise to more schwa assimilation or loss. Certain properties are also known to prevent assimilation and loss of word final schwa, i.e. (Schachtenhaufen 2007, 2010b):

- A sonorant onset consonants in the last syllable, e.g. /'gam.lə 'fjɛr.nə/ *gamle, fjerne* ('old', 'remove').
- A proparoxytone stem, i.e. words with phonological stress on the antepenultimate syllable, e.g. the final schwa of /hu:sənə nɛmɛstə/ *husene, nemmeste* ('the houses', 'easiest') is rarely reduced, while the middle schwa may very well be reduced, resulting in [hu:snə nɛmɛsdə].
- A schwa is less likely to be reduced in phrase final³ and pre-pause position.

A recent study (Heegård 2012) shows that schwa loss is considerably more likely in verbs than in adjectives, which is consistent with Schachtenhaufen (2007). However, even though the different propensity for schwa reduction for the two word classes is both great in magnitude and firmly documented, Heegård (as well as Schachtenhaufen) offer no sufficient explanation for this difference. Heegård refers to a previous study by Jensen (2006) where it is shown that listeners judge verbs slightly less prominent than adjectives. Heegård also argues that adjectives typically carries more contextually important semantic weight, while verbs more often has the simple role of making a grammatical connection between the arguments of a sentence. While this reasoning in itself seems plausible, it cannot explain all schwa reductions or the lack thereof. The slight difference in prominence detected by Jensen (2006) in no way corresponds in magnitude

³ *Phrase final* refers to the prosodic phrases annotated in the corpus.

to the different propensity for schwa reduction. Furthermore, if schwa reduction was just a matter of intrinsic properties of the words or word classes, we would expect schwa reduction to be spread more evenly and independently of the context. This is, however, not the case. Schwa reduction in any given verb is much less likely in some contexts than others, e.g. in phrase final or pre-pause position as mentioned above.

In this paper a further explanation is sought for the different reduction patterns of different word classes. This is inspired by some general metric patterns in phonetic reductions in Danish, which is described in further detail in the next section. The interaction between word class, metric structure and schwa reduction in Middle English as suggested by Minkova (1991) also acts as inspiration for the current study. Here it is suspected that schwa reduction to some extent – in addition to the arguments provided by Heegård – may be connected to a very similar interaction between metric patterns that are associated with different word classes.

2. Rhythm and syllable loss in Danish

The influence of rhythm on phonetic reduction in modern Danish has not been thoroughly investigated yet. But by looking at some well known examples we may suspect that a certain phonotactic-metric preference exercises a pressure for syllable reduction. Overall, it may seem that the Danish⁴ sound structure has a preference for a strong-weak alternation. This means that a syllable is often weakened to a schwa-like syllable after a stronger syllable, e.g. ['sʌdan kʁoko'dilə] → ['sʌdŋ kʁogə'dilə] *sådan, krokodille* ('such', 'crocodile'). More relevant for the current study, two weaker syllables are collapsed to a single syllable after a stronger syllable. Some common examples of this are given here:

Loss of the first posttonic schwa in proparoxytone words

There is a very strong tendency for loss of a schwa in the first posttonic syllable in proparoxytone words, while the second posttonic syllable is less likely to be reduced, e.g. /'hu:sənə 'ri:məli 'mənəskə 'tjɛ:nəstə 'ɔfəntli 'klɔstərəd/ → ['hu:snə 'ʁi:mli 'mənsgə 'tjɛ:nsdə 'ʌfni 'klʌsdʁæð] *husene, rimelig, menneske, tjeneste, offentlig, klosteret* ('the houses', 'fair', 'human',

⁴ At least in the dialect spoken in and around the Copenhagen area. This metrical preference may differ from other dialects.

'service', 'public', 'the cloister') (Schachtenhaufen 2010b).

Loss of the second of three pretonic syllables Words with three pretonic syllables are likely to drop the middle vowel in certain phonotactic structures, e.g. /lokomo'ti:ʔv rɛpara'sjo:ʔn litɛra'tu:ʔr/ → [logmo'tiwʔ kɛbka'ɛo:ʔn lidka'tuɔʔ] *lokomotiv, reparation, litteratur* ('locomotive', 'reparation', 'literature') (Brink & Lund 1975).

Morphological loss of schwa after unstressed vowels The plural and definite forms of adjectives take a ə-suffix, e.g. *gul* 'yellow' (sing.indef.) vs. *gule* (def./plur.). However, in stems that already end in a short unstressed vowel this suffix is omitted, e.g. *lilla, bange* 'purple', 'afraid' (sing./plur./def./indef.) (Heltoft & Hansen 2011).

Syllable loss in small function words. Strings of monosyllabic function words are often reduced to the strong-weak pattern of isolated disyllabic words, e.g. /de ɛr dɛnʔ/ → [dedɳ] *det er den* ('that is the'), /de vel si:ə/ → [dewsi] *det vil sige* ('that is to say') (Schachtenhaufen 2010a, 2012a).

It seems from this that weak, unstressed syllables are more likely to be reduced adjacent to other weak syllables, than if they occur in a context alternating evenly between strong and weak syllables. In this way these reductions may be seen as assimilation to a specific metric pattern. If we consider Danish as a stress timed language, it seems reasonable to suspect that this timing exercises a reduction pressure on strings of unstressed syllables. Likewise, in compounds we often insert a schwa after a monosyllabic stem, e.g. *hund+e+hus, jul+e+salme* ('doghouse', 'Christmas carol'). This schwa has no apparent morphological function, but it results in a more metrically homogenous sound structure.

When focusing on the single word schwa reduction in verbs seems to deviate from the general strong-weak metrical pattern. However, if we look beyond the word boundaries, we hope to find that both reduction in verbs as well as the lack thereof in adjectives can be explained from the extended context. The inspiration for the current study is an intuitive feeling that verbs more often than adjectives are followed by deaccentuated syllables or words. Moreover, from a purely introspective point of view certain

constellations of verbs + unstressed words sound more natural with syllable reduction, e.g. /skulə du, sætə de/ → ['sgu ru, 'səd de] *skulle du, sætte det* ('should you', 'put it'), while the more distinct pronunciation ['sgulə ru, 'sɛrə de] sounds unnatural and perhaps even a little odd. It is therefore suspected that the metrical pattern enveloping the verb and the following syllable may explain the tendency for schwa reduction in verbs as opposed to other word classes. It is important to note that such a metric factor of course is not the only relevant factor in predicting syllable loss and other reductions. Probably there are many other competing forces that may work in the same or the opposite direction of such a metrical pressure. Counterexamples to this pattern may therefore also occur.

3. Material

This investigation is based on material from the DanPASS corpus (Grønnum 2009). This corpus consists of approximately 73.000 running words from non-scripted monologues and dialogues, spoken by a total of 27 speakers of standard Copenhagen Danish dialect. The speakers are given different tasks that must be solved verbally, mainly map tasks. The corpus is annotated with phonetic and phonological transcriptions, as well as Part-of-Speech-tags, Focus/Topic-tags and different layers of prosodic annotation.

The investigation focuses on phonological structures where the metric pattern is suspected to have an effect. Therefore, tokens with certain properties are excluded from this investigation. As mentioned in section 1, certain phonological structures and phrasal contexts seem to prevent schwa reduction to a large degree. Thus, this investigation includes only tokens with all of the following properties:

- The word must have stress or secondary stress on the penultimate syllable. Otherwise the word does not fit the metric pattern investigated here. Secondary stress is not annotated in the corpus. In this investigation all full vowels are considered to have secondary stress. This is mostly relevant for compounds, e.g. /'gul(,)mi:nə/ *guldmine* ('gold mine').
- The last syllable must consist of either just /ə/ or /p t k s/ + /ə/. A tautosyllabic sonorant prevents schwa reduction since schwa loss

often would result in an unnatural syllabic structure, e.g. /'gam.lə/ → *['gaml]. However, /p t k s/ can always form a natural coda with the preceding syllable, at least in the words included here, e.g. /hus.kə/ → [husg] *huske* ('remember'). Thus, schwa reduction after tautosyllabic /p t k s/ seems just as likely as after heterosyllabic /p t k/.

- The preceding syllable must have a contoid coda. After a vocoid coda schwa assimilation is close to obligatory and is therefore not considered a reduction here. In these cases the result is a phonetic structure with two adjacent syllabic nuclei, e.g. /'pi:.ə 'ga:d.ə/ → ['pi:i 'gæ:ð] *pige, gade* ('girl', 'street'). These words have a less distinct metrical pattern since there is only a single sonority peak. They may therefore be suspected to be treated metrically differently from double peaked words. In other words, the result of schwa reduction of e.g. /gu:lə/ → [gu:l] *gule* ('yellow (indef./pl.)') is equal to the unreduced starting point of ['gæ:ð] as regards sonority. It is therefore reasonable to suspect that the latter is less susceptible to the metrical effect. Additionally, the less distinct disyllabic structure in words with two adjacent nuclei in itself has a propensity towards syllable loss, and these words may therefore follow entirely different reduction patterns than structures with internuclear contoids.
- The word must occur immediately before another word. The word must not occur in phrase final or prepausal position. Schwa loss is much less common in these positions, and it is reasonable to suspect that such breaks may disrupt the metrical effect. Words with interrupted pronunciation have no phonetic and phonological transcription in the corpus and are therefore not immediately available for investigation. Occurrences before such nonannotated words are therefore ignored.

Following these conditions a total of 1970 relevant word tokens are found in DanPASS, distributed over 163 different word forms. Table 1 shows the most frequent word forms along with their word classes, phonological representation and typical distinct pronunciation (not their actual pronunciation).

ikke/ADV	'ekə	'egə	378	direkte/ADJ	'di'rektə	'di	20
						'kəgdə	
lille/ADJ	'lilə	'lilə	199	fortsætte/V	'fɔrtsetə	'fɔ:dsədə	19
skulle/V	'skulə	'sgulə	103	otte/NUM	'ɔ:tə	'ɔ:də	18
forladte/V	fɔr'latə	fɔ'lədə	87	inde/ADV	'enə	'enə	16
oppe/ADV	'ɔpə	'ɔbə	79	guldmine/N	'gulmi:nə	'gulmi:n	14
						ə	
grønne/ADJ	'grœnə	'gʁœnə	62	ene/ADJ	'e:nə	'e:nə	14
stykke/N	'støkə	'sdøgə	57	aflange/ADJ	'avləŋgə	'ɔwɫəŋə	14
Grønne/PRO	'grœnə	'gʁœnə	55	henne/ADV	'hɛnə	'hɛnə	14
P							
hele/ADJ	'he:lə	'he:lə	51	begge/PRO	'bɛkə	'bɛgə	13
				N			
smule/N	'smu:lə	'smu:lə	47	finde/V	'fɛnə	'fɛnə	13
gule/ADJ	'gu:lə	'gu:lə	43	ville/V	'vilə	'vilə	12
samme/ADJ	'samə	'samə	41	fremme/AD	'frɛmə	'frɛmə	12
				V			
komme/V	'kɔmə	'kɔmə	35	passe/V	'pasə	'pasə	12
denne/PRON	'dɛnə	'dɛnə	33	forestille/V	'fɔ:rɛstɛl'ə	'fɔ:psdɛl	12
						ʔə	
klippe/N	'klepə	'klebə	28	brune/ADJ	'bru:nə	'brɯ:nə	11
afbrændte/V	'avbrɛn	'ɔwbɛrə	27	sommerhuse	'sɔmərhu:	'sɔmərhu:	10
	ʔtə	n'ɔdə		/N	sə	sə	
ligge/V	'lekə	'legə	27	bitte/ADJ	'bitə	'bidə	10
private/ADJ	pri	pɔi	26	sætte/V	'sɛtə	'sɛdə	9
	'va:ʔtə	'væ:ʔdə					
kunne/V	'kunə	'kunə	26	lægge/V	'lɛkə	'lɛgə	8
nogenlunde/A	'no:ən	'no:ɔn	21	vende/V	'vɛnə	'vɛnə	8
DJ	'lonə	'lonə					

Table 1

4. Analysis

The question examined here is whether the reduction of word final schwa is related to the accentuation or de-accentuation of the following syllable. In table 2 the realization of schwa is compared to whether the initial syllable in the following word is realized as stressed or unstressed. Syllables may be unstressed either because they are de-accentuated by syntactical or pragmatical circumstances, e.g. /'smu:lə/ → [ɔsmu:lə] *smule* ('bit') or because they are phonologically unstressed, e.g. /ba'na:ʔn/ *banan*

(‘banana’). The *distinct* realization of schwa includes any vocoid pronunciation of schwa, e.g. [ə ɪ ʏ ʊ]. The precise vowel quality is not considered important. *Assimilated* realizations include instances where the word is transcribed with a syllabic consonant, and *loss* includes all instances where the segment is entirely lost, i.e. these numbers of syllables have been reduced by one. Note that both assimilation as well as loss in the words examined here are considered reductions.

	first syllable of following word is	first syllable of following word is
realization of schwa	stressed	unstressed
distinct	633	226
assimilated	199	91
loss	403	418

Table 2: Realization of schwa according to whether the initial syllable in the following word is stressed or unstressed.

In compliance with the anticipation, there is a noticeable difference in the propensity for schwa reduction relative to whether or not the following syllable is stressed. If schwa occurs before a stressed syllable, it is reduced in a little less than half of the tokens. If it occurs before an unstressed syllable, it is reduced in almost 70% of the tokens. We may then conclude that the initial assumption that metric patterns may affect how schwa is realised, seems to be confirmed. However, we would also like to know whether this actually can explain the word class dependant differences noticed by Heegård (see above). Therefore in Table 3 the result is broken down by the word classes: verbs, adjectives, nouns and adverbs. The remaining word classes are represented by too few types or tokens in order to provide a generalizable result and are ignored here.

A Verbs	first syllable of following word is	first syllable of following word is
realization of schwa	stressed	unstressed
distinct	158	39
assimilated	36	28
loss	99	168

B Adjectives	first syllable of following word is stressed	first syllable of following word is unstressed
realization of schwa distinct	306	47
assimilated	108	29
loss	65	20
C Adverbs	first syllable of following word is stressed	first syllable of following word is unstressed
realization of schwa distinct	59	54
assimilated	7	13
loss	186	185
D Nouns	first syllable of following word is stressed	first syllable of following word is unstressed
realization of schwa distinct	53	64
assimilated	14	21
loss	40	32

Table 3 A-D: Realization of schwa according to whether the initial syllable in the following word is stressed or unstressed, broken down by word class.

Verbs show a very convincing correlation between schwa reduction and accentuation of the following syllable. 54% of all tokens have a distinct pronunciation of schwa if it occurs before a stressed syllable, while this only applies for 17% of the tokens before unstressed syllables. Thus, the initial suspicion again seems to be supported by actual findings.

Adjectives show very little tendency to occur before de-accentuated syllables at all. This also is in compliance with the idea of a metric effect. The low frequency of schwa reduction in adjectives compared to verbs can simply be explained by the fact that verbs more frequently occur before unstressed syllables. When adjectives actually do occur before unstressed syllables, there is a slight tendency that this leads to more instances of schwa reduction. Before stressed syllables 64% of the adjectives have a distinct pronunciation of schwa, while before unstressed syllables only 49% are distinctly pronounced.

Adverbs and *nouns* on the other hand show no correlation at all

between schwa reduction and the following syllable. Nouns even show a slight tendency towards the opposite, they are more often distinctly pronounced before unstressed syllable than before stressed. However, the sample size and the difference in distribution are not large enough to determine whether this could happen by chance or not. With regards to adverbs it should be noted that a single word, *ikke*, accounts for 378 of the 504 tokens. It is therefore uncertain to what degree this distribution is representative for adverbs in general.

4. Why are mostly verbs affected?

To sum up, it seems that the realization of word final schwa overall is actually dependent on the stress condition in the following syllable. However, the effect is seen most clearly in verbs, less so in adjective, while in other word classes the effect is negligible. If the loss of schwa in verbs was metrically motivated, as initially suggested, it seems odd that the metric effect affects verbs more than other word classes. This suggests that an explanation referring to metric patterns is flawed, or at least an explanation is required as to why mostly verbs are affected.

To look for such an explanation we may look at the actual word material occurring after reduced vs. unreduced schwa. In table 4 the most frequent words following reduced schwa in verbs vs. adjectives are shown. Only words with an unstressed first syllable are included here. More importantly, the words that tend to follow after verbs are quite different from the ones following adjectives. Also this is expectable, since verbs and adjectives in most cases have different grammatical functions. But these are not just different lexemes, they are also functionally different. For the major part of unstressed words following verbs it can be said that they are both function words and phonologically relatively simple. Adjectives on the other hand are more often followed by longer content words. It is reasonable to suspect that this difference in material following verbs vs. adjectives explains the huge difference in the propensity for schwa reduction in the two word classes. While the properties of the following word seem to have a large influence, it is not just the metrical pattern that matters, but there seems to be an interaction between the metrical structure of the phrase and the grammatical properties of the words.

after verbs	reduced ə	after adjectives	reduced ə
<i>du</i> 'you'	42	<i>gardiner</i> 'curtains'	11 (22)
<i>jeg</i> 'I'	16 (2)	<i>smule</i> 'bit'	6 (1)
<i>det</i> 'it'	11 (1)	<i>på</i> 'on'	5
<i>til</i> 'to'	10 (2)	<i>i</i> 'in'	3 (1)
<i>en</i> 'a'	9 (3)	<i>det</i> 'it'	2
<i>på</i> 'on'	9 (2)	<i>niveau</i> 'level'	2
<i>den</i> 'the'	7	<i>område</i> 'area'	2
<i>dig</i> 'you'	7	<i>bananpalme</i> 'banana palm'	1
<i>være</i> 'be'	7	<i>centimeter</i> 'centimeter'	1
<i>at</i> 'that'	6 (3)	<i>de</i> 'the'	1
<i>et</i> 'a'	6 (6)	<i>er</i> 'is'	1
<i>der</i> 'there'	5	<i>firkant</i> 'square'	1 (2)
<i>forbi</i> 'past'	5	<i>forbi</i> 'past'	1
<i>i</i> 'in'	4 (4)	<i>forladte</i> 'abandoned'	1
<i>med</i> 'with'	4 (4)	<i>igennem</i> 'through'	1
<i>mig</i> 'me'	4	<i>kornmarker</i> 'cornfields'	1
<i>gå</i> 'go'	3 (1)	<i>med</i> 'with'	1
<i>have</i> 'have'	3 (2)	<i>proportioner</i> 'proportions'	1
<i>man</i> 'one'	3	<i>siger</i> 'say'	1
<i>så</i> 'then'	3	<i>skal</i> 'shall'	1
<i>ham</i> 'him'	2	<i>som</i> 'as'	1
<i>nogle</i> 'some'	2	<i>så</i> 'so'	1
<i>om</i> 'about'	2 (2)	<i>sådan</i> 'such'	1
<i>sådan</i> 'such'	2	<i>trekant</i> 'triangle'	1
<i>ved</i> 'by'	2	<i>vejen</i> 'the way'	1
<i>vi</i> 'we'	2		
+ 20 more	20		

Table 4. This table shows the word forms following verbs and adjectives occurring with reduced schwa. The number of occurrences is shown (the number in paranthesis indicate the number of occurrences without schwa reduction in the preceding word, if any). The English equivalents are subject to some uncertainty, especially in the function words.

Instead of looking at the word class of the word with final schwa, we may take a look at the word class of the following word. In Table 5 we see how schwa is realized when succeeded by pronouns compared to when it is succeeded by nouns. We see here that schwa is very prone to reduction before a pronoun, regardless of whether this pronoun is stressed or not. Before nouns schwa is instead most likely realized distinctly, regardless of the stress condition of the noun. This demonstrates that the metric effect disappears if we isolate the word class of the succeeding word. The metric effect seems to be an illusion that arises from the fact that de-accentuation and word class as well as the word class of two successive words are interdependent of each other.

All words	followed by pronoun	followed by pronoun
realization	stressed	unstressed
distinct	18	16
assimilated	6	17
loss	47	111
All words	followed by noun	followed by noun
realization	stressed	unstressed
distinct	408	49
assimilated	104	20
loss	75	21

Table 5 Realization of schwa according to whether the initial syllable in the following word is stressed or unstressed, broken down by word class.

5. Discussion

This investigation was set off by an intuitive feeling that a remarkable difference in the propensity for reduction of final schwa in verbs vs. adjectives should not (?) only be explained with reference to the word class, but also to a metric pattern including the following words. While this intuition to some degree is confirmed by actual data, it is also evident that the stress patterns in successive words cannot immediately be separated from the grammatical properties of those words. To sum up, adjectives are most often followed by stressed content words for which they function as attributives, whereas verbs quite often are followed by pronouns, articles,

prepositions and other words that are characterized by being phonologically simple, unstressed function words. Here it will be argued that this combination of a metric, phonological and syntactic pattern may explain why word final schwa in verbs is likely to be reduced.

Many small grammatical words in Danish (and probably in many other languages) have a tendency to form a phonetic, phonological or prosodic unit with surrounding words via phonetic reduction, e.g. several monosyllabic words may be reduced to form a single phonetic syllable or something that resembles a single phonological word. This can be viewed as the initial steps of a grammaticalization process, where small words with mainly grammatical function tend to become cliticized before they become actual affixes (Hopper & Traugott 2003). It is therefore very reasonable to suspect that this ability to form a unit with preceding words plays an important part in whether or not de-accentuation has an effect on schwa loss. It should be noted that many of the involved small function words here have a phonological structure of a single syllable with a short vowel in an open syllable, e.g. /du de sɔ/ *du det så* ('you', 'it', 'so'), or achieve this structure through reductions that are common specifically in these words, e.g. /jaj tel pɔ:ʔ daj at deɹʔ i:ʔ mɛð/ → [ja te pɔ da a da i mɛ] *jeg, til, på, at, der, i, med* ('I', 'to', 'on', 'that', 'there', 'in', 'with'). It should also be noted that this specific monosyllabic structure with a short vowel in an open syllable only occurs in such small function words in Danish. Furthermore, in polysyllabic words, except for certain loan words, the only syllables with a short vowel in an open syllable in Danish are grammatical affixes and syllables with phonological schwa. As such these small function words morpho-phonologically behave very much like either true affixes or as post-tonic syllable in an isolated phonological word.

Let us take a step back and look at words that are conservatively treated as proparoxytonal, e.g. /'mɛnɛskə 'fø:lɛlsə/ *menneske, følelse* ('human being', 'feeling'). According to the rules for schwa assimilation described by Schachtenhaufen (2010b) schwa assimilation of the middle schwa is obligatory in these words, ['mɛnɛsgə 'fø:l|sə]. This is not counted as a reduction; that is how the words are pronounced in distinct pronunciation, while unassimilated forms ['mɛnɛsgə 'fø:lɛlsə] sound highly artificial. Moreover, not only are these middle schwas assimilated, but they are very inclined to be entirely dropped, especially in words without

consonants they can be assimilated to, e.g. /'løk.ə.li 'hu:s.ə.nə/ → ['løgli 'hu:snə] *lykkelig, husene* ('happy', 'the houses'). If we suggest that function words with the phonological form CV are prone to cliticization with a previous verb, we can see that schwa behaves very much as predicted. As an example a syntactic constellation like /'fenə 'de/ *finde det* ('find it') would form a new phonological word /'fenəde/. Schwa would now be the first of two post-tonic syllables in a pro-paroxytonal word, and according to Schachtenhaufen (2010b) schwa assimilation would be obligatory. Furthermore, schwa would very likely be dropped entirely. As the preceding analysis shows, this is exactly what happens, ['fenn̩de ~ 'fende]. This explains why schwa is prone to reduction in exactly this position. This also explains why the pronunciations like ['fenn̩de ~ 'fende] sounds perfectly natural to a native Danish speaker, and why the more distinct, from a prescriptive point of view, pronunciation ['fenə de] does sound hyper-distinct and perhaps even a little odd. In addition, the likelihood of verbs to occur before these words explains why verbs are so much more prone to schwa reduction than adjectives. It is not just because verbs are intrinsically less prominent and intrinsically more likely to be reduced (which of course still may be a factor), but also because they more often have the opportunity to form an intimate grammatical connection with successive pronouns and other small function words. We may see the behavior of word final schwa in verbs not so much as reductions, but as phonetic and phonological integration that reflects a grammatical integration.

As such this description is at least in compliance with the existing description of schwa assimilation for isolated words, which to some degree documents that this description has predictive power. As the author of the existing description this seems of course awfully convenient. It would therefore be interesting to see whether this idea of interpreting the small function words as enclitic has support outside the effect on schwa reduction. Besides the fact that the words in question have the grammatical content universally prone to grammaticalization, and a phonological form that, when compared to the rest of the lexicon, looks more like a suffix than an isolated word, there is admittedly and unfortunately no tradition in grammatical literature on Danish to describe the behavior of these words as clitical. Actually Schachtenhaufen (2012b) launches the idea of considering

these small function words as clitics, i.e. forming a phonological word or domain for certain phonological rules with adjacent words in order to explain certain phonological anomalies in these words. Many small function words exhibit radical pronunciation variation and reduction patterns that are not comparable to the behavior of other phonologically equivalent words. Moreover, this variation seems strongly connected to the word in question being adjacent to certain other words with which they can be said to form a phonological unit, and perhaps a grammatical one too (see also Schachtenhaufen 2012a). Though the analysis by Schachtenhaufen (2012a) and the current paper support each other, they obviously cannot be used to prove each other. The grammatical aspect of these phenomena has only superficially been examined by looking at adjacent words. The importance of the deeper grammatical connection between the words has yet to be examined. The prediction here is that a more insightful grammatical analysis would reveal that the closer the grammatical bond between two words is, the more likely schwa reduction is to occur.

The phonematic quality of the following word hasn't not been considered here. It may however be discussed whether the initial consonant of the following plays a significant role. As can be seen from table 4 most of the words following a reduced schwa contain one or more alveolar consonants (*du, det, til, en, den, dig, at, et, der, så* etc.). This is perhaps not surprising since this is simply the most common structure of small function words. However, the alveolar consonants /d n s t/ are also extremely common in Danish suffixes. We might speculate that these alveolars in unaccentuated syllables have an inherent grammatical feel to them, which may further motivate the phonological and grammatical integration of the affected words. Less speculatively, the commonness of alveolars in post-tonic syllables as well in function words leads to frequent constellations of somewhat similar syllables. In this view, schwa reduction may be the result of haplology, a strategy to avoid reduplicative structures like [sede de, sgulo ru] *sætte det, skulle du* ('put it', 'should you'). If this is the case, we might expect a higher tendency for schwa reduction in other constellations, regardless of the grammatical qualities, e.g. *bygge garage, smukke gardiner* ('build a garage', 'beautiful curtains'). The material is too sparse on such constellations in order to say anything conclusive about this, but it

may be an inspiration for future investigations.

Another issue that can not be investigated here is the possibility for phonetic patterns to be emancipated from their original motivation. The common constellation of e.g. verb + pronoun (or other small function words) may very well be the original motivation for schwa reduction. The resulting common phonetic form of the verb may however be reanalyzed as an inherent quality of the verb itself, and the reduced form of the verb may then spread to any syntactic context. The fact that schwa reduction seems more common in verbs, even in context without an apparent motivation, may in this way be a consequence of an ongoing rephonologization from a paroxytone structure to an oxytone structure, e.g. /lɛkə pasə/ → /lɛk pas/ *lægge, passe* ('lay', 'fit').

6. Conclusion

This investigation originated from an idea that the higher propensity for schwa reduction in verbs compared to other word classes to some degree could be explained with reference to a general metric pattern in Danish. This pattern suggests that a weak syllable, e.g. a syllable with a nuclear schwa, is more likely reduced when succeeding a strong syllable and preceding another weak syllable, than elsewhere. According to this, schwa reduction in verbs could perhaps be explained by a higher tendency in verbs to be succeeded by de-accentuated syllables.

Overall it is demonstrated that the nature of the succeeding word indeed seems to have a noticeable effect on whether or not a word final schwa is reduced. At first it seems to be confirmed that schwa adheres to a metrical pattern, but on closer inspection schwa reduction can more consistently be connected to the word class of the succeeding word. To sum up, verbs are considerably more often than e.g. adjectives succeeded by pronouns or other small function words, less often by nouns and other content words. These small grammatical words are typically de-accentuated, while content words are typically accentuated. However, accentuated pronouns are shown to have roughly the same reductive influence on a preceding schwa as de-accentuated pronouns have. Likewise schwa is equally unlikely reduced before de-accentuated nouns or nouns with pre-tonic syllables as it is before accentuated nouns. This overrules any metrical effect, and thus the initial intuition about a metrical pattern

could not be confirmed. Instead it is suggested that schwa reduction in the context of a succeeding pronoun or other function words could be seen as the initial signs of a grammaticalization process.

Regardless of how the results are interpreted, this study uncovers a previously unnoticed but rather systematic pattern in the phonetic realization of word final schwa in paroxytone Danish words. The behavior of schwa in this specific context has until now been considered somewhat unpredictable. The current paper demonstrates that schwa reduction is highly predictable from the phonological, prosodic and grammatical properties of the following word. More specifically schwa is very likely reduced when followed by phonologically simple function words. Reduction is much less likely in any other context. Thus, the predictability of the phonetic realization of schwa is greatly expanded by this study.

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