Choosing between the Dutch past-tense suffixes *-te* and *-de*[*]

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1. Introduction

In Dutch, past-tense forms are created by suffixing *-te* [tə] or *-de* [də] to the verb stem. The suffix *-te* is added when the stem ends in an underlyingly voiceless obstruent, while *-de* is suffixed elsewhere (e.g. Booij 1995:61). This is illustrated in (1).

(1)

Verb stem			Past-tense form		
kook	/kok/	"cook"	*kookte*	[koktə]	"cooked"
klop	/klɔp/	"knock"	*klopte*	[klɔptə]	"knocked"
zaag	/zaɣ/	"saw"	*zaagde*	[zaɣdə]	"sawed"
sloof	/slov/	"drudge"	*sloofde*	[slovdə]	"drudged"

This description is not completely correct, since speakers sometimes suffix *-te* after underlyingly voiced obstruents, and *-de* after underlyingly voiceless ones. For instance, 838 out of the 1086 tokens of the past-tense form of *glans* /ɣlanz/ "gleam" present on the internet on 8 February 2001 were spelled as *glanste*, instead of *glansde*, and 52 out of the 424 tokens of the past-tense form of *krab* /krab/ "scratch" were spelled as *krabte*, instead of *krabde* (search engine: AltaVista). Apparently, the choice between *-de* and *-te* is not only directed by the underlying [voice]-specification of the stem-final obstruent.

In this paper, we investigate violations of the standard description, henceforth referred to as "rule", that *-te* follows underlyingly voiceless obstruents and *-de* all other types of segments. First, in Section 2, we describe an experiment that we

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carried out in order to determine for which verbs speakers tend to create past-tense forms that violate the rule. This experiment shows that the percentage of speakers forming a past-tense form that violates the rule for a certain verb is correlated with the type of the stem-final obstruent, and with the frequency of occurrence of the past-tense form. In Section 3, we hypothesize that speakers sometimes choose a suffix because this suffix occurs with phonologically similar words. In Section 4, we investigate the interaction of this systematic, lexically-driven, analogical effect with the effects of the type of the stem-final obstruent and the frequency of occurrence of the past-tense form. We show that systematic analogy is a highly relevant factor in the formation of past-tense forms. Finally, in Section 5, we summarize and discuss our results.

2. The data

We carried out the following experiment in order to ascertain which past-tense forms speakers use with which verbs. Twenty-eight participants, who were all native speakers of Dutch and studied at Nijmegen University, listened through closed head-phones (Sony MDR-55) to phrases consisting of the pronoun *ik* [ɪk] "I" and an existing verb in the first person singular present-tense form. Examples of these phrases are [ɪk tʏrf] ik turf "I score", [ɪk dʏp] *ik dub* "I waver", and [ɪk dɛins] *ik dɛins* "I wince". The final obstruents of the verb forms all sound as voiceless, as a result of Final Devoicing (e.g. Booij 1995: 22). The participants' task was to write down as accurately as possible the past-tense forms of the verbs. We presented the participants auditorily with the verb forms in order to make sure that they took the whole word into account, and did not base their choice between *-te* and *-de* just on the last letter of the verb stem. We asked the participants to write the forms, instead of to pronounce them, because if they had pronounced the forms, we would have been obliged to transcribe the alveolar stop of the past-tense suffixes as voiced or voiceless, which is a time-consuming and error-prone activity (cf. Ernestus 2000: 78). The experiment was self-paced. Participants were presented with a new phrase only after they had indicated that they were ready by pushing a button.

We used all common monomorphemic Dutch verbs that end in an obstruent and that are attested in the Dutch section of the CELEX lexical database (Baayen et al. 1995). These 178 verbs are listed in the Appendix. We did not present verbs ending in /k/, since we do not expect violations for these verbs. The phoneme /k/ has no voiced counterpart in Dutch, and all verbs ending in a velar stop consequently take *-te*. The phrases were recorded by a female speaker in a soundproof room by means of a portable DAT-recorder Aiwa HD S100 and a Sony microphone ECM MS957. The recordings were stored as .wav files (sample rate: 48 KHz) on a

computer by means of the speech analysis package *Praat* (Boersma 1996). They were presented in one of three random orders to the participants, with two intervening breaks. The actual test phrases were preceded by 9 practice phrases.

The participants wrote down past-tense forms ending in *-te* or *-de* in the great majority of cases. We discarded all forms not ending in *-te* or *-de*. In addition, we discarded all past-tense forms the stems of which do not correspond to the stems of the presented stimuli. For instance, we disregarded *stapte* as the past-tense form for *stamp*, and *loefde* as the past-tense form for *loof*. These particular forms are probably not the past-tense forms of the verbs that were presented, but the past-tense forms of slightly different words which the participants thought they had heard. The remaining numbers of past-tense forms ending in *-te* and *-de* for each verb can be found in the Appendix.

Table 1 lists the counts of responses ending in *-te* and *-de* for the verb stems ending in underlyingly voiceless obstruents, and for those ending in underlyingly voiced obstruents. We use the symbols P for voiced and voiceless bilabial stops, T for voiced and voiceless alveolar stops, S for voiced and voiceless alveolar fricatives, F for voiced and voiceless labiodental fricatives, and, finally, X for voiced and voiceless velar fricatives.

Table 1. The absolute and relative (%) numbers of *-te* and *-de* suffixed to underlyingly voiceless and voiced obstruents, broken down by the type of these obstruents

Obstruent	**Underlyingly voiceless**				**Underlyingly voiced**			
	-te		*-de*		*-te*		*-de*	
P	838	98%	18	2%	40	36%	71	64%
T	769	98%	13	2%	33	5%	571	95%
S	631	84%	124	16%	80	20%	312	80%
F	128	76%	40	24%	54	9%	534	91%
X	91	81%	21	19%	7	1%	567	99%
P,T,S,F,X	2457	92%	216	8%	214	9%	2055	91%

The data show that educated speakers of Dutch often violate the rule: they suffix *-de* to stems underlyingly ending in voiceless obstruents, and *-te* to stems underlyingly ending in voiced obstruents, even when they do their best to produce the correct past-tense forms.

Interestingly, the participants violated the rule approximately equally often when it prescribes the suffix *-te* as when it prescribes the suffix *-de* (two-tailed Fisher's exact test, $p=0.19$). They generated 8% of the past-tense forms with underlyingly voiceless stem-final obstruents by suffixing *-de*, and 9% of the past-

tense forms with underlyingly voiced obstruents by suffixing *-te*. The participants apparently did not have an overall preference for one suffix (say *-te*) over the other (*-de*). This may come as a surprise, since word-internal obstruent clusters tend to be voiceless in Dutch (Zonneveld 1983), and we might therefore expect a preference for the suffix that creates voiceless obstruent clusters, that is for *-te*.

A generalized linear regression analysis with a logit-link function of the data in the table reveals a main effect for the type of final obstruent ($F(4,5) = 2893.8$, $p < 0.001$). First, we see that the verbs ending in alveolar stops present the fewest problems (two-tailed Fisher's exact test, $p < 0.001$): These verbs were suffixed with the "wrong" form on average in only 3% of cases. Most mistakes were made with the verb forms *laad* [lat] and *voed* [vut]. The reason may be that these words are homophone to the words *laat* "late" and *voet* "foot", which are highly frequent in Dutch, and end in an alveolar stop with the opposite underlying [voice]-specification. The participants may have thought of these words when creating the past-tense forms. Second, with respect to the verbs for which the rule prescribes *-te*, we find that the participants produced violations of the rule more often if the stem-final obstruent is a fricative than if it is a stop (two-tailed Fisher's exact test, $p < 0.001$; there is no difference between the two types of stops: two-tailed Fisher's exact test, $p > 0.2$; nor a difference between the three fricatives: two-tailed Fisher's exact test, $p = 0.15$). Finally, with respect to the verbs for which the rule prescribes *-de*, in contradistinction, we find that the participants produced violations in particular if the stem-final obstruent is a bilabial stop or an alveolar fricative (two-tailed Fisher's exact test, $p < 0.001$).

In addition to the type of the stem-final obstruent, the frequency of occurrence of the past-tense forms themselves affects the probability of violations. We found a correlation between the logarithms of the numbers of occurrences of the past-tense forms in the Dutch section of the CELEX lexical database (Baayen et al. 1995),[1] which are incorporated in the Appendix, and the percentage of produced past-tense forms that violate the rule ($r = -0.34$, $t(176) = -4.8175$, $p < 0.001$). Participants violated the rule more often for past-tense forms of a low frequency than for past-tense forms of a high-frequency.

In summary, even highly educated speakers of Dutch create past-tense forms which violate the rule. The probability of a violation is affected by the type of the stem-final obstruent and the frequency of occurrence of the past-tense form. In the next section, we offer an interpretation of these effects.

3. Interpretation of the results

We have seen that the frequency of occurrence of the past-tense form and the type of the stem-final obstruent affect the percentage of violations. The effect of frequency of occurrence may be interpreted as an effect of computation. The percentage of violations increases when the frequency of the past-tense form decreases. High-frequency complex forms are typically stored in the mental lexicon and can be easily retrieved, whereas low frequency complex forms often have to be computed every time they are needed (Baayen et al. forthcoming). Violations, therefore, appear especially when the speakers have to compute the past-tense forms themselves. Computation appears to favor violations.[2]

The effect of the type of obstruent may be due to systematic, similarity-based analogy, which implies that the form of a word is determined on the basis of all phonologically similar words present in the lexicon (Skousen 1989; Daelemans et al. 1994; Eddington 2000; Krott et al. 2001). Speakers may choose a past-tense suffix because this suffix is present in most phonologically similar past-tense forms. For instance, they may add *-te* to the verb stem *dub*, although this stem underlyingly ends in a voiced obstruent, because most other verbs ending in a bilabial stop take *-te*.

Systematic analogy may well play a part in the creation of past-tense forms for existing verbs, since it plays a part as well when speakers have to create past-tense forms for non-existing verbs. This is clear from an earlier experiment (Ernestus & Baayen 2001) in which speakers had to choose between *-te* and *-de* for pseudoverbs for which the underlying [voice]-specifications of the stem-final obstruents were unknown. Speakers tend to choose *-te* for a given verb if most words ending in the same type of final obstruent (P, T, S, F, X) end in an underlyingly voiceless obstruent, while they choose *-de* if most words ending in the same type of obstruent end in an underlyingly voiced obstruent. Thus, speakers add *-te* to the nonword [daup], which is in accordance with the fact that most stems ending in a bilabial stop are suffixed with *-te*, and they add *-de* to [taux], which corresponds to the fact that most stems ending in alveolar fricatives take *-de*.

The results from the experiment described in the present paper support the hypothesis that systematic lexically-driven analogy also affects the production of past-tense forms for existing verbs in Dutch. Table 2 lists the numbers and percentages of verbs in the experiment, that is all common Dutch monomorphemic verbs that do not end in a velar stop, for which the rule prescribes *-te* and for which the rule prescribes *-de*. It appears that the majority of verb stems ending in a bilabial stop take *-te*. If systematic, similarity-based analogy plays a part, we consequently expect that *-te* is often "erroneously" suffixed to underlyingly voiced bilabial stops (/b/s), whereas *-de* is seldom "erroneously" suffixed to the underlyingly voiceless

counterparts of these obstruents (/p/s). This appears to be the case (see Table 1): Only 2% of the past-tense forms with stem-final /p/ were created with *-de*, whereas as many as 36% of the forms with stem-final /b/ were created with *-te*. Table 2 shows, in addition, that the great majority of verbs ending in a labiodental or velar fricative take *-de*. If analogy plays a part, the participants are consequently predicted to often attach *-de* "erroneously" to such verbs, and to seldom attach *-te* "erroneously". This is also the case: The participants attached the suffix *-de* "erroneously" to voiceless labiodental and velar fricatives in 24% and 19% of cases, whereas they attached the suffix *-te* to the voiced counterparts of these fricatives only in 9% and 1% of cases. Finally, verbs ending in alveolar stops and alveolar fricatives do not have a clear preference for *-te* or *-de* (Table 2), and participants therefore should have no preference for suffixing *-te* or *-de* to these verbs, according to the analogy-based account. This is also in accordance with the data, since the participants erroneously add *-te* to these verbs approximately as often as they erroneously added *-de* (Table 1). The data apparently support the hypothesis that systematic, similarity-based analogy plays a role in the formation of past-tense forms in Dutch.

Table 2. The absolute and relative (%) numbers of verbs for which the rule prescribes *-te* and *-de*, broken down by the type of the stem-final obstruent

Obstruent type	Verbs prescribed to take *-te*		Verbs prescribed to take *-de*	
P	31	89%	4	11%
T	28	56%	22	44%
S	27	66%	14	34%
F	6	22%	21	78%
X	4	16%	21	84%

This analogy account, however, cannot explain all effects of the type of the stem-final obstruent on the percentage of past-tense forms violating the rule. It cannot explain why the participants created fewer violations for verbs ending in alveolar stops than for words ending in other types of obstruents. This effect of the type of the stem-final obstruent possibly results from the fact that the infinitive form reappears in the past-tense forms of verbs ending in alveolar stops. For instance, the past-tense form of *laad* is *laadde* [lad*ə*], which is phonetically similar to the infinitve form *laden* [lad*ə*(n)]. The infinitive forms in the past-tense forms of these verbs possibly prevent the creation of "wrong" past-tense forms.

In summary, the effect of frequency of occurrence on the probability of violations of the rule may be interpreted as an effect of computation. The effect of obstruent type may be interpreted partially as an effect of systematic, similarity-based analogy, and partially as the effect of the intrusion of the infinitive in the past-

tense forms of verbs ending in alveolar stops. The next section provides details on the relative sizes of the effects of frequency, type of obstruent, and analogy, and their interaction.

4. The interaction of frequency, obstruent type, and analogy

We have seen above that the percentage of violations of the rule is affected by the frequency of the past-tense form, the type of the final obstruent, and by systematic analogy. The question arises whether type of obstruent is a factor separate from analogy, and if so, which of the three factors Frequency, Type of obstruent, and Analogy is most relevant, and how they interact.

Analogy favors violations, if it prescribes the suffix -*de*, whereas the rule prescribes -*te*, or vice versa. It is, therefore, not the suffix prescribed by the analogy-account as such that is expected to affect the percentage of violations, but the difference in prediction between the rule-based account and the analogy-based account. Therefore, we investigated the effect of the absolute difference in probability of -*de* according to the rule-based account and the analogy-based account. The rule predicts -*de* with a probability of either 100% or 0%, depending on the underlying [voice]-specification of the final obstruent. We assume that if the suffix is determined by means of analogy, the probability of the suffix -*de* for a given verb equals the percentage of words that ends in an underlyingly voiced obstruent among the words in the Dutch section of the CELEX lexical database that not only end in the same type of obstruent, but end in the same type of final rhyme. Words end in the same type of rhyme if their final syllables are made up of a vowel of the same quantity (phonologically and phonetically long, phonologically and phonetically short, phonologically long and phonetically short), a consonant preceding the final obstruent, if present, of the same sonority (no consonant, sonorant consonant, obstruent), and the same type of final obstruent (P, T, S, F, X). We therefore distinguish 45 types of rhyme, that is 45 groups of words to which a given verb can belong. Our assumption that the percentages of words ending in underlyingly voiced obstruents in these groups reflect the predictions made by the analogy-account is based on our investigation of the Dutch section of the CELEX lexical database, which revealed a strong correlation between the quantity of the vowel of the last syllable, the presence and sonority of consonants preceding the final obstruent, and the type of final obstruent with the underlying [voice]-specification of this final obstruent. Moreover, it is based on our finding that speakers actually use this correlation when interpreting the underlying [voice]-specifications of words unknown to them (Ernestus & Baayen 2001). Some of the 45 groups have identical effects on the choice of the past-tense suffix, since they present approxi-

mately equal distributions of words ending in underlyingly voiced obstruents. These groups can therefore be merged. We determined the resulting groups by means of the technique of Classification and Regression Trees (Breiman et al. 1984), and were left with eight groups of words. The appendix lists for each verb presented in the experiment the percentage of words underlyingly ending in a voiced obstruent among the words belonging to the same of the eight groups, that is, the probability that participants choose *-de* if their choice is completely based on analogy. This is our first independent variable.

The other independent variables in the analysis are the logarithm of the numbers of occurrence of the past-tense forms in the Dutch section of the CELEX lexical database, and the type of stem-final obstruent (P, T, S, F, X). The dependent variable is the percentage of violations created for each verb in our experiment.

We analyzed the effects of the frequency of occurrence of the past-tense forms, the type of final obstruent, and analogy on these percentages by means of a Classification and Regression Tree Analysis (Breiman et al. 1984). Figure 1 shows the resulting cost-complexity pruned classification tree. The vertical length of the branches reflects the relevance of the factors, that is, the explained "variance" (technically the reduction in node heterogeneity).

We see that the difference between the predictions of the rule-based account and the analogy-based account, |R-A|, is highly relevant. Participants created fewer violations in case the difference between the two predictions is smaller than 23%, than if the difference is larger. Among the verbs for which the rule and analogy accounts make approximately the same prediction, the words ending in alveolar fricatives appear to be the most problematic (13% of violations against 2.1% of violations for verbs ending in other types of obstruent). A possible explanation is that, apart from the alveolar stops which appear to be unproblematic possibly because of the intrusion of the infinitive, the alveolar fricative is the only obstruent which is approximately equally often underlyingly voiced as voiceless (see Table 2), and is consequently approximately equally often followed by *-te* and *-de*. The choice between *-te* and *-de* is wide open for verbs ending in this type of final obstruent.

Among the verbs for which the two accounts make very different predictions (|R — A| > 23%), the verbs ending in alveolar stops are the least problematic (only 5.6% of violations). We have made this same observation in Section 3, where we related it to the intrusion of the infinitive. The verbs ending in other types of obstruent are problematic especially if the frequency of their past-tense forms is low (33.9% of violations). The numbers of violations for the verbs with high-frequency past-tense forms is affected by whether the difference in predictions made by the rule-based and analogy-based accounts is larger than 63%.

In conclusion, the difference in prediction between the rule-based account and the analogy-based account, the type of the stem-final obstruent, and the frequency

of occurrence of the past-tense form all affect the percentage of violations. The difference in prediction between the rule-based account and the analogy-based account is a very important factor: Violations appear to occur especially if the rule and analogy make very different predictions. That is, large percentages of violations mainly appear if the resulting violating forms are those forms that are expected under the analogy-based account. If the difference in prediction between the rule-based and the analogy-based account favors violations, the type of the obstruent and the frequency of the past-tense form emerge as co-determining the percentages of violations.

5. Conclusion and discussion

Our data show that speakers do not always suffix -*te* to verb stems ending in underlyingly voiceless obstruents and -*de* to verb stems ending in underlyingly voiced ones. Speakers sometimes produce forms violating the rule, induced by

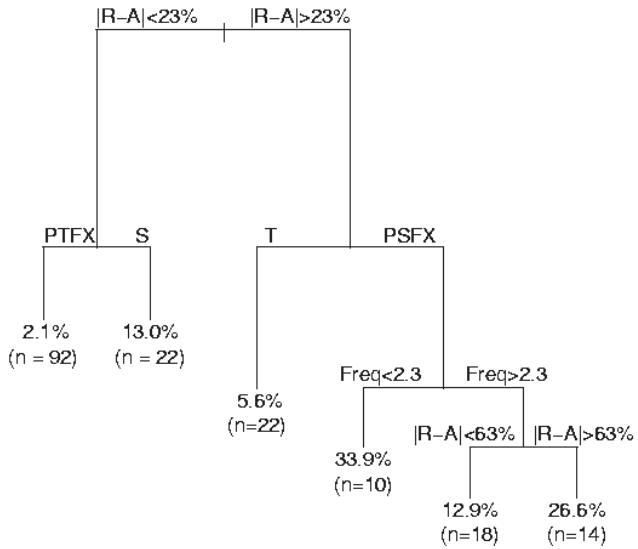

Figure 1. CART analysis of the percentage of violations. The term |R-A| indicates the absolute difference in probability of -*de* according to the analogy-based account and the rule-based account, while Freq stands for the frequency of the past-tense form. The numbers in parentheses indicate the numbers of verbs falling in each class as identified by the CART tree.

systematic, similarity-based analogy. That is, they sometimes "erroneously" choose a certain affix because the words that are phonologically similar to the given verb take this affix as well.

Speakers tend to create past-tense forms by analogy especially if the frequency of occurrence of the past-tense form is low. Low frequency past-tense forms are computed more often than low frequency forms. If a past-tense form is computed, speakers can base their computation on the rule but also on analogy, giving analogy a chance to co-determine the past-tense form.

The finding that the choice between *-de* and *-te* is affected by analogy may come as no surprise. It has been noted before that completely regular past-tense forms may become irregular as a result of analogy (van Haeringen 1940). For instance, the past-tense form of *brei* [brɛi] "knit" is sometimes realized as *bree* [bre], instead of the regular *breide* [brɛidə], in analogy to the past-tense forms [re] and [ɣle] of the stems *rijd* [rɛi] en g*lijd* [ɣlɛi], which are phonologically similar to [brɛi]. Note that in the case of [bre], irregular verbs affect a regular verb. Speakers sometimes seem to be uncertain whether *brei* is regular or irregular, they may opt for irregular, and, since there is no rule for the formation of the past-tense forms of irregular verbs, they form an irregular past-tense form in (idiosyncratic) analogy to phonologically similar, irregular verbs. The kind op systematic analogy discussed in this paper is of a different type. The participants knew that the verb is regular, since otherwise they would not have chosen to create the past-tense form with *-te* or *-de*. Although they knew that the verb is regular, they did not form the past-tense form by applying the rule, but by means of analogy. This shows that even if a simple rule is available and applicable, speakers nevertheless form morphologically complex forms by systematic analogy.

Systematic, similarity-based analogy is clearly a more important process in language production than has been assumed so far, and we have to take it seriously as part of the grammar.

Notes

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1. We added 1 to all frequency counts to avoid taking the logarithm of zero.

2. The correlation cannot be explained by the hypothesis that low-frequency verbs have instable representations in the lexicon, and that, for instance, participants "erroneously" added *-te* to the verb stem *dub*, because they did not know that the final obstruent of this stem is underlyingly voiced. This hypothesis does not find support in the data, since the participants nearly always wrote down the correct final obstruent, which indicates that they

knew the underlying [voice]-specification of the stem-final obstruents, at least of the final stops and velar fricatives. For instance, most participants who "erroneously" added the suffix *-te* to *dub* wrote down *dubte*, whereas we would expect *dupte*, if they created a violation because they did not know that the final obstruent of *dub* is underlyingly voiced.

References

Baayen, R.H., Piepenbrock, R. and Gulikers, L. (1995) *The CELEX Lexical Database (Release 2) [CD-ROM]*. Linguistic Data Consortium, University of Pennsylvania [Distributor], Philadelphia, PA.

Baayen, R.H., Schreuder, R., De Jong, N.H. and Krott, A. (forthcoming) 'Dutch Inflection: the Rules that Prove the Exception'. In S. Nooteboom, S.F. Weerman and F. Wijnen, eds., *Storage and Computation in the Language Faculty*. Kluwer, Dordrecht.

Boersma, P. (1996) 'Praat: Doing Phonetics by Computer'. Ms. University of Amsterdam.

Booij, G.E. (1995) *The Phonology of Dutch*. Oxford University Press, Oxford.

Breiman, L., Friedman, J.H., Olshen, R.H. and Stone, C.J. (1984) *Classification and Regression Trees*. Chapman & Hall, New York.

Eddington, D. (2000) 'Spanish Stress Assignment within the Analogical Modeling of Language'. *Language* 76, 92–109.

Daelemans, W., Gillis, S. and Durieux, G. (1994) 'The Acquisition of Stress, a Data-Oriented Approach'. *Computational Linguistics* 20, 421–451.

Ernestus, M. (2000) *Voice Assimilation and Segment Reduction in Casual Dutch, a Corpus-Based Study of the Phonology-Phonetics Interface*. LOT, Utrecht.

Ernestus, M. and Baayen, R.H. (2001) 'Phonological Interpretation of Neutralized Segments in Unknown Words'. Ms. Interfaculty Research Unit for Language and Speech, University of Nijmegen and Max-Planck Institute for Psycholinguistics.

Haeringen, C.B. van (1940) 'De Taaie Levenskracht van het Sterke Werkwoord'. *De Nieuwe Taalgids* 34, 241–255.

Krott, A., Baayen, R.H. and Schreuder, R. (2001) 'Analogy in Morphology: Modeling the Choice of Linking Morphemes in Dutch'. *Linguistics* 39, 51–93.

Skousen, R. (1989) *Analogical Modeling of Language*. Kluwer, Dordrecht.

Zonneveld, W. (1983) 'Lexical and Phonological Properties of Dutch Devoicing Assimilation'. In M. van den Broecke, V. van Heuven & W. Zonneveld, eds., *Sound structures: Studies for Antonie Cohen*. Dorecht: Foris, 297–312.

Appendix

The experimental items. Each item is followed by the percentage of phonologically similar words that end in an underlyingly voiced obstruent, the logarithm of the number of occurrence of its past-tense form in the Dutch section of the CELEX lexical database plus 1, the number of past-tense forms in the experiment created with *-te*, and the number of forms created with *-de*.

Verbs prescribed to be suffixed with *-te*

blaat 20% 2.303 27 1; *blaf* 51% 5.568 25 3; *blus* 20% 2.639 26 2; *boet* 20% 2.079 27 0; *dans* 20% 6.772 24 4; *doop* 0% 4.718 27 1; *dop* 20% 2.197 22 1; *dors* 20% 0.693 25 3; *eis* 75% 6.586 23 5; *frons* 20% 5.956 21 7; *gaap* 0% 5.100 28 0; *gis* 20% 2.485 23 5; *glip* 20% 5.333 27 1; *gris* 20% 4.990 24 3; *groet* 20% 6.153 28 0; *haat* 20% 6.351 28 0; *hap* 20% 4.970 28 0; *heers* 75% 0.000 22 6; *heet* 20% 7.767 27 0; *hoop* 0% 7.367 28 0; *juich* 99% 5.308 15 13; *kaap* 0% 2.398 28 0; *klamp* 20% 5.257 24 3; *klap* 20% 6.223 28 0; *klit* 20% 2.485 28 0; *klop* 20% 7.305 27 1; *knap* 20% 4.700 28 0; *knars* 20% 4.635 25 3; *knip* 20% 6.111 28 0; *knoop* 0% 5.829 27 1; *kras* 20% 4.762 25 3; *krijs* 75% 5.278 23 5; *kruis* 75% 5.501 19 9; *kuch* 99% 5.298 25 3; *kus* 20% 7.224 26 2; *lach* 99% 8.644 28 0; *las* 20% 2.565 21 7; *let* 20% 6.590 28 0; *loens* 75% 2.197 9 19; *loot* 20% 1.099 22 6; *los* 20% 5.394 24 4; *mis* 20% 6.653 28 0; *mot* 20% 4.905 24 4; *pas* 20% 7.076 28 0; *pers* 20% 5.308 23 5; *piep* 0% 5.050 28 0; *plant* 20% 5.094 28 0; *pleit* 20% 5.366 28 0; *plof* 51% 4.828 23 5; *poch* 99% 3.466 23 5; *poep* 0% 2.708 27 1; *pof* 51% 1.386 21 7; *praat* 20% 7.569 28 0; *put* 20% 5.529 28 0; *raap* 0% 5.677 28 0; *rep* 20% 4.625 27 1; *schat* 20% 5.964 28 0; *schep* 20% 5.347 28 0; *schimp* 20% 2.708 28 0; *schop* 20% 5.994 25 2; *schors* 20% 2.485 25 3; *schraap* 0% 5.855 27 0; *sis* 20% 5.956 26 2; *sleep* 0% 6.310 27 1; *slis* 20% 2.639 25 3; *slof* 51% 4.727 24 4; *slorp* 20% 1.792 24 2; *snap* 20% 5.170 28 0; *spat* 20% 5.384 28 0; *spot* 20% 5.106 28 0; *stamp* 20% 5.328 26 0; *stap* 20% 8.101 28 0; *start* 20% 5.759 28 0; *step* 20% 1.386 26 2; *stoot* 20% 6.777 28 0; *stop* 20% 7.594 27 1; *stort* 20% 6.534 28 0; *stuit* 22% 5.642 28 0; *stunt* 20% 0.000 28 0; *stut* 20% 1.946 28 0; *suf* 51% 2.079 22 6; *surf* 51% 0.000 13 15; *trap* 20% 6.133 28 0; *uit* 20% 5.775 28 0; *vat* 20% 6.446 28 0; *vent* 20% 2.079 26 2; *vis* 20% 5.136 26 2; *vit* 20% 2.565 28 0; *vors* 20% 1.792 21 7; *wals* 20% 2.639 20 8; *was* 20% 5.778 27 1; *wens* 20% 7.201 22 6; *wip* 20% 5.572 28 0; *zet* 20% 8.983 28 0; *zweet* 20% 5.017 28 0; *zwiep* 0% 4.615 28 0.

Verbs prescribed to be suffixed with *-de*

beef 99% 6.078 0 28; *blief* 51% 2.197 16 12; *bloos* 75% 5.670 2 26; *bons* 20% 5.451 11 17; *braad* 20% 2.833 0 28; *brand* 20% 6.844 0 28; *deins* 75% 5.308 8 20; *deug* 95% 4.836 0 28; *dood* 20% 5.380 0 28; *doof* 99% 5.371 1 27; *draaf* 99% 5.100 0 28; *dreig* 95% 6.942 0 28; *droog* 95% 5.328 0 28; *dub* 20% 1.386 12 16; *duid* 20% 4.927 3 25; *duld* 20% 4.934 0 28; *durf* 51% 7.748 3 25; *glans* 20% 5.905 7 21; *grens* 20% 4.828 3 25; *grijns* 75% 6.727 4 24; *hijg* 95% 6.087 1 27; *hoef* 51% 7.884 5 23; *klaag* 95% 6.033 0 28; *kleed* 20% 6.306 0 28; *kleef* 99% 5.371 2 26; *kneed* 20% 4.304 0 28; *krab* 20% 5.687 13 15; *laad* 20% 4.836 10 17; *land* 20% 5.389 0 28; *leef* 99% 7.902 2 26; *leg* 99% 8.826 0 28; *leid* 20% 7.888 0 28; *loof* 99% 3.555 0 28; *loos* 75% 3.091 3 25; *luid* 20% 6.574 0 28; *meld* 20% 6.397 0 28; *peins* 75% 4.868 2 26; *plaag* 99% 5.371 0 28; *pleeg* 99% 5.220 0 28; *plons* 20% 3.714 15 13; *pluis* 75% 1.386 7 21; *poog* 99% 5.352 2 26; *proef* 51% 5.673 2 26; *raas* 75% 5.366 4 24; *red* 20% 6.597 0 28; *reis* 75% 6.023 1 27; *roof* 99% 3.714 1 27; *schaad* 20% 2.773 0 27; *scheid* 20% 5.659 1 21; *schrob* 20% 3.178 9 18; *schroef* 51% 4.710 2 26; *schud* 20% 8.258 2 26; *slaag* 99% 7.113 0 28; *smeed* 20% 3.638 7 20; *smoes* 75% 2.565 13 15; *snoef* 51% 2.565 1 27; *spreid* 20% 6.192 0 28; *spuug* 95% 5.425 0 25; *stoof* 99% 1.609 3 25; *streef* 99% 5.389 0 28; *terg* 95% 2.565 1 24; *tob* 20% 3.526 6 22; *troef* 51% 1.609 2 26; *turf* 51% 1.386 5 23; *veeg* 99% 6.969 0 26; *verg* 95% 5.081 1 27; *vlag* 95% 0.000 0 28; *voed* 20% 4.779 8 19; *voeg* 95% 7.521 0 24; *volg* 95% 8.301 1 27; *vrees* 75% 6.648 0 28; *waad* 20% 4.431 0 28; *waag* 99% 6.075 0 28; *wend* 20% 7.312 1 25; *wied* 20% 2.079 1 27; *wieg* 95% 5.323 1 27; *wuif* 99% 6.366 2 26; *zalf* 51% 2.398 3 25; *zeef* 99% 1.386 3 25; *zoog* 99% 2.398 0 26; *zorg* 95% 7.124 0 28; *zweef* 99% 6.246 1 27.