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Stem Complexity and Inflectional Encoding in Language Production

Dirk P. Janssen,[1,3] Ardi Roelofs,[2] and Willem J. M. Levelt[2]

Three experiments are reported that examined whether stem complexity plays a role in inflecting polymorphemic words in language production. Experiment 1 showed that preparation effects for words with polymorphemic stems are larger when they are produced among words with constant inflectional structures compared to words with variable inflectional structures and simple stems. This replicates earlier findings for words with monomorphemic stems (Janssen et al., 2002). Experiments 2 and 3 showed that when inflectional structure is held constant, the preparation effects are equally large with simple and compound stems, and with compound and complex adjectival stems. These results indicate that inflectional encoding is blind to the complexity of the stem, which suggests that specific inflectional rather than generic morphological frames guide the generation of inflected forms in speaking words.

KEY WORDS: inflectional frames; language production; morphology.

INTRODUCTION

It has been proposed that mental processes underlying thought and language are guided by scripts, schemata, or frames that specify the order of events or states of affairs and their nature. For example, a restaurant script specifies what is involved in going out for dinner (e.g., Miller, 2000; Schank & Abelson, 1977). Similarly, it has been proposed that frames guide the production of language (e.g., Dell, 1986; Garrett, 1975; Levelt, 1989; Shattuck-Hufnagel, 1979). An important issue concerns the amount of detail that is made explicit by frames, for example, whether phonological frames make explicit subsyllabic structure (Dell, 1986) or not (Levelt, 1992). Recently, we have provided chronometric evidence that

[1] Psychology Department, University of Kent, Canterbury, UK.
[2] Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands.
[3] To whom all correspondence should be addressed: Department of Psychology, Keynes College, University of Kent, Canterbury, CT2 7NP, UK. email: d.janssen@kent.ac.uk

the production of past and plural inflections is driven by frames (Janssen *et al*., 2002), which corroborates earlier evidence from speech errors (e.g., Garrett, 1975). In the present study, we address the issue of what exactly is made explicit by the frames.

Take, for example, the verb *canalize*, which has a complex stem that is derived from the noun *canal* and the verbal suffix *-ize*. The question we address in this paper concerns the frame that guides the generation of the past tense *canalized*. This frame could include two stem slots to accommodate the morphemes *canal* and *-ize*, henceforth referred to as a *generic morphological frame*. Alternatively, the frame could only hold a single slot for both stem morphemes, referred to as a *specific inflectional frame*. Figure 1 illustrates the generic morphological (a) and specific inflectional (b) views. In either view, the past tense suffix occupies a slot of its own.

On the generic-morphological-frame view, a morphological frame exists that makes the full morphological structure of a word explicit (cf. Selkirk, 1982). This type of frame allows for a gradual distinction between inflection and derivation, as has been argued for by Bybee (1995) on theoretical grounds. It is also compatible with experimental evidence that failed to find a difference between inflections and derivation (e.g., Raveh & Rueckl, 2000; Zwitserlood *et al.,* 2000). On the specific-inflectional-frame view, there is a distinction between inflection and derivation insofar as morphological frames are specific to inflectional suffixes. On this view, the constituent structure of a stem is not made explicit in the frames that direct inflectional processes.

The chronometric study of Janssen *et al*. (2002) revealed that speech preparation effects are larger when a word is produced in the context of other words of identical inflectional structure. When the inflectional struc-

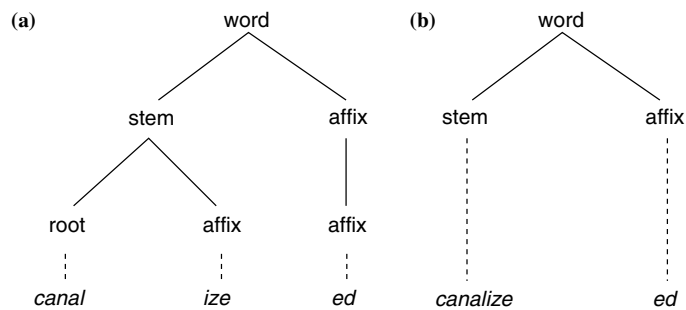

Fig. 1. Generic morphological frames (a) and specific inflectional frames (b). The dashed lines denote slot-filler associations.

Table I. Schematic Overview of the Preparation Task. All words show phonological overlap (only initial phonemes are indicated here for clarity); the words in the constant condition have identical morphological structure in addition to that.

Constant inflection			Variable inflection		
Word	Affix1	Affix2	Word	Affix1	Affix2
bAU..	Number	–	bAU..	Tense	Number
bAU..	Number	–	bAU..	Number	–
bAU..	Number	–	bAU..	Number	–

ture of the context words was variable, a smaller preparation effect was found. This result was interpreted as evidence for a frame that represents inflectional affixes. Whereas in all experiments of Janssen *et al.* (2002) morphologically simple stems were used, the stems are morphologically complex in the current experiments.

The task used by Janssen *et al.* (2002) and in this study is a preparation task in which participants produce words out of small sets. The words in a set differed in form or they shared initial phonemes, which allows for partial preparation of the responses. Partial preparation gives rise to faster responses (Chen *et al.*, 2002; Meyer, 1990), henceforth referred to as the *preparation effect*. In constant inflectional sets, the words had the same number of inflectional suffixes, whereas in variable sets the number of suffixes differed. A schematic overview of the homogenous conditions with the constant and variable inflectional structures is given in Table I.

In the first two experiments of Janssen *et al.* (2002), Dutch nouns with 2-slot frames were tested together in constant sets. Similar nouns were mixed with 3-slot verbs in variable sets. A much larger preparation effect was observed for the constant than for the variable sets. Control experiments showed that the effect is not due to word class (noun/verb) or phonological differences. The larger effect for constant sets suggests the existence of frames that guide the generation of inflections: In the constant conditions these frames can be prepared and this leads to a larger preparation effect. The evidence also suggests that the frames specify how many inflectional affixes go with the stem of the word, but the number of derivational affixes was not varied in the earlier experiments.

In this paper, we tested the claim of Janssen *et al.* (2002) using words with complex derivational stems, like *canalize*. On the specific-inflectional-frame view, the first slot of a frame is for the insertion of a stem, regardless of the number of morphemes that make up the stem. In contrast, on the generic-morphological-frame view, there may be multiple slots for each morpheme that makes up the stem of a word.

EXPERIMENT 1: NOMINAL COMPOUNDS AND INFLECTED VERBS

Experiment 1 is similar to the first two experiments of Janssen *et al.* with the critical difference that nominal compounds instead of simple nouns were tested. The aim of the experiment is to replicate the frame effect of Janssen *et al.* for words with complex stems.

Method

Participants

Twelve participants took part in this experiment. They were all undergraduate students at the University of Nijmegen, native speakers of Dutch, and randomly taken from the Max Planck subject pool. They were paid for their participation.

Materials

All materials were in Dutch. A total of 12 sets of 3 pairs were created. Each pair consisted of a prompt and a response word: The response words are the words that the subject utters and are critical to our experiment. The prompts were chosen such that they formed strong and unambiguous retrieval cues for the corresponding responses. Prompt–response pairs could not be synonyms, antonyms, or fixed combinations.

There were two frame conditions, variable and constant. Both conditions were built around the verbs *bouw, straf, werk* (to build, to punish, to work). For the response words in a constant set, three bisyllabic, semantically transparent compounds were selected that have a base verb as the first half of the compound (i.e., *bouw+fonds*, build+fund, building society). For the response words of a variable set, two more such compounds were taken, together with the past tense of the base verb *bouw+de* (build+PAST).

The sets described above were used for the homogeneous conditions. For the heterogeneous conditions, prompt–response pairs were regrouped in such a way that a heterogeneous set contained three response words derived from the three different base morphemes. Whereas the response words in a homogeneous set shared the first morpheme (*bouw* in the example), no overlap was present in the heterogeneous conditions.

In all sets, care was taken not to introduce unwanted phonological or semantic overlap between the three response words or between a prompt and any other prompt or response word. All response words were bisyllabic compounds, except for the three past tense forms that were bisyllabic

root–affix combinations. All response words had initial syllable stress and were chosen to be as dissimilar in form as possible. All prompts were nouns or adjectives of approximately the same length in letters and syllables, and were chosen to maximally differ from the other prompts in the set and from the response words. See the Appendix A for the full set of materials.

Four practice sets were created that mimicked heterogeneous and homogeneous sets of the constant and variable condition. The words in the practice sets were not related to any of the words used in the main experiment.

Procedure

The participants were tested individually in a quiet room. They were given written instructions, which stressed the fact that they should respond as fast and as accurately as possible. The experiment consisted of alternating learning and test phases. In the learning phase, subjects were shown the three prompt–response pairs of a set on the computer screen. When they indicated that they had sufficiently studied the pairs (after about half a minute on average), the test phase was started.

The test phase consisted of 15 randomized trials, testing each of the three prompt–response pairs five times. Each trial started with a 500 ms display of the attention sign (asterisk) and a 500 ms pause. Then the prompt was displayed and at the same time the voice key was opened for 1500 ms. At the end of that time or when a response was registered, the prompt disappeared, 2 seconds intertrial time was observed, and the cycle started again.

The experimenter sat in the same room and took note of hesitations, voice key errors, wrong responses and time outs. These trials were removed from the analyses. After each of the practice sets, subjects received feedback when necessary. No feedback was given on the experimental sets. The experiment took about 20 minutes to complete (dependent on subject learning time).

Occasionally, subjects were removed from the study: When they took more than 2 minutes to study an experimental set, when they had an overall error rate of 10% or higher, or when they consistently failed to produce a response word (i.e., when they missed four out of five repetitions of an item in a set). This happened in four cases over all experiments reported in this paper.

The experiment was controlled by a PC running NESU. Stimuli were presented in white on black on a monitor positioned about 50 cm away from the subjects. In the study phase, pairs were presented in a typewriter

font, in the test phase a sans serif font was used. Reactions were registered by a microphone, which fed to a NESUbox voice-key device and a DAT recorder. The recordings were consulted to confirm the experimenter's judgments on the correctness of a response.

Design

The experiment contained four crossed within-subject factors. The first factor was Base (three levels). This factor corresponds to the three verbs that were used as a base for constructing the sets. Each base was used to create a variable and a constant condition. This is the factor Condition (two levels). All words were tested in a homogeneous and a heterogeneous set, this factor is called Context (two levels). In the test phase, subjects responded to each prompt five times, this is the factor Repetition (five levels).

The order in which the sets were presented to the subjects was fully counterbalanced: Variable and constant conditions were blocked, and heterogeneous and homogeneous sets were blocked within those. The order of the sets within the blocks and the order of the prompt–response pairs within the sets were individually randomized for each subject, the latter with the constraint that no repetition of the same pair on adjacent trials was allowed.

Analyses

Analyses were carried out on difference scores obtained by subtracting the average of the repetitions in the homogeneous condition from the average of repetitions in the heterogeneous condition. This procedure removed the factors Repetition and Context from our analyses, factored out any potential effects of prompt–response association strength, and took care of missing observations: When there were missing data points, the average over repetitions was computed on the remaining observations.

The statistical analyses included the remaining two factors, Base and Word Type, and their interaction. Because both subjects and items are random variables, F' (quasi F) ratios were computed on the data. Significance of F' means that a replication of the experiment, with different words and different subjects, is expected to yield the same results (Clark, 1973). The MSE term reported is the interaction of Subjects with the factor at hand.

We routinely did two tests to ensure that the assumptions underlying the ANOVA were met: Tukey's test for non-additivity and Levene's test on the homogeneity of variance (Maxwell & Bray, 1986; Rietveld & Van

Hout, 1993; Santa *et al.*, 1979). The results of these tests are only reported when the assumptions were not met.

The proportion of erroneous trials is very low in these experiments. Error analyses were carried out on all errors, but error interaction terms were not computed because the number of data points is low and variances are artificially small for binary data.

Results and Discussion

Subjects were overall faster in the homogeneous than in the heterogeneous condition, but this difference was much larger for the constant Word Type than for the variable Word Type condition (122 vs. 36 ms difference, see also Table II. The overall preparation effect (homogeneous vs. heterogeneous) is statistically reliable, $F'(1, 19) = 31.28$, MSE = 31518, $p < .001$, as is the difference between the preparation effects for variable and constant Word Types: $F'(1, 23) = 17.54$, MSE = 13842, $p < .001$. In a simple main effects analysis, both levels of Word Type showed a significant preparation: For the variable condition $F'(1, 21) = 4.47$, MSE = 21461, $p = .043$; for the constant condition $F'(1, 21) = 48.48$, MSE = 21461, $p < .001$.

Overall, 4.7% errors were made (101 cases). There were slightly more errors in the variable-homogeneous condition than in all other conditions. This resulted in a significant effect for Word Type in the error data: $F'(2, 23) = 4.18$, MSE = 0.29, $p = .039$. Because most errors were made in the slower of the two homogeneous conditions, the errors cannot be due to a speed–accuracy trade off.

The experiment shows that preparation effects for words with polymorphemic stems are larger when they are produced among words with constant inflectional structures compared to words with variable inflectional structures and simple stems, which replicates the earlier findings for monomorphemic stems obtained by Janssen *et al.* (2002). The next two experiments test whether simple and complex stems differentially affect the preparation effect when inflectional structure is held constant.

Table II. Mean Production Latencies (ms), Error percentages, and Preparation Effects (delta) for Experiment 1: Compounds and Verbs

	Homogeneous		Heterogeneous		Delta
Variable	672	6.9%	708	4.1%	36
Constant	619	3.2%	741	4.6%	122

EXPERIMENT 2: NOMINAL COMPOUNDS AND SIMPLE NOUNS

The results of the first experiment suggest that frames guide the encoding of words with morphologically complex stems. If these frames contain separate slots for the morphemes that make up a stem of a nominal compound, differential preparation effects should be obtained for nominal compounds vs. nominal compounds mixed with simple nouns. In contrast, if stem complexity is not made explicit for compounds, no difference between constant and variable sets should be obtained. This is tested in this second experiment.

Method

We refer to the materials section of Experiment 1 for a detailed description of the design, procedure, and analysis.

Participants

Nine subjects participated in this experiment. None of them had participated in another experiment related to this paper in the 3 months prior to experimentation. Subjects were paid for their efforts.

Materials

Three compounds were selected that were bisyllabic, stress-initial, and contained two parts that were easily discernible, familiar words. To maximize the chance of obtaining an effect of the complex stem, only transparent compounds were used. The three compound words used were *windvlaag* (lit. wind+gust, gust of wind), *hakblok* (lit. chop+blok, chopping block), *potgrond* (lit. pot+soil, potting soil).

Matching monomorphemic nouns were taken from the Celex database (Baayen, *et al.*, 1993). For each compound, five simple nouns that shared the initial consonant and vowel with the compound were taken. The variable condition contained two such nouns and the compound; the constant condition contained the remaining three nouns (nouns were randomly assigned to conditions).

Results and Discussion

Overall, 3.0% errors were made. There was a significant overall preparation effect $F'(1, 18) = 7.37$, MSE=18214, $p = .013$, see also Table III. There were no other significant effects. Crucially, the effect of Word

Table III. Mean Production Latencies (ms), Error Percentages, and Preparation Effects (delta) for Experiment 2: Compounds and Simple Nouns

	Homogeneous		Heterogeneous		Delta
Variable	650	2.8%	696	2.8%	46
Constant	669	4.8%	698	2.2%	30

Type (constant vs. variable sets) was not significant with $F'(3, 17) = 0.98$, MSE=3586, $p = .414$.

Levene's test for heterogeneity was significant, $F(5, 12) = 3.70$, $p = 0.029$. This means that there was a considerable difference in variance between the six subsets defined by WordType and Base. The items set derived from *hakblok* showed a relatively small preparation effect compared to the other two sets (13 vs. 47 and 53 ms). But averages computed over the other two sets (constructed from *windvlaag* and *potgrond*), show a similar pattern of results: 55 ms preparation effect for variable, and 44 ms for constant sets.

As part of a standard procedure for evaluating F' under heterogeneity of variance, we consulted the simulations done by Santa *et al.* (1979). One of their simulations has variance parameters and between-group heterogeneity that are almost identical to ours, and this simulation results in an observed alpha of .073. This means that in our test, the absence of a significant difference between the conditions is statistically very reliable.

The experiment shows that the preparation effect is equally large for nouns with simple and compound stems. This supports the view that specific inflectional rather than generic morphological frames guide the generation of inflected forms in speaking words.

EXPERIMENT 3: NOMINAL COMPOUNDS AND DERIVED ADJECTIVES

The results of the first two experiments suggest that a frame contains a single slot for the stem morphemes of a compound. This supports the specific-inflectional-frame view rather than the generic-morphological-frame view. However, stem formation in a language may occur through compounding as well as through derivation (e.g., Spencer, 1991). Thus, it is important to test whether the conclusion that specific inflectional frames exist also holds for derivations rather than for compounds only. Dell (1986) has suggested that frames contain separate slots for the morphemes that make up a derived stem. The third experiment is a further test between inflectional and general morphological frames, this time using

compound and derived stems. If frames contain separate slots for the morphemes that make up a stem of a derived word, differential preparation effects should be obtained for compounds vs. compounds mixed with derivations. In contrast, if stem complexity is not made explicit for derivations, no difference between constant and variable sets should be obtained.

The derivations in the experiment are adjectives formed through the combination of a verb (e.g., Dutch *lees*, to read) and an adjective-forming affix (Dutch *-baar*, -able). Like nouns, adjectives in Dutch take one inflectional affix. Thus, under the specific-inflectional-frame view, the frames for the nominal compounds and the derived adjectives should be the same. In contrast, if the constituent structure of derived stems (like Dutch *leesbaar*, readable) is coded in the frame, nominal compounds and derived adjectives should have different frames (given that Experiment 2 suggested that simple and compound nouns have the same frame).

Method

This experiment was run and analyzed in the same way as Experiment 1.

Participants

Twelve subjects from the MPI subject pool were randomly selected and paid for their efforts, none of them had participated in the previous experiments.

Materials

Three base morphemes were selected and experimental sets were constructed from these. These were: *lees, brand, draai* (to read, to burn, to turn). For the variable sets, an adjective was formed from the base with the suffix *-baar*. This suffix is comparable to English *-able* and creates an adjective from a verbal stem. The adjectives used were *leesbaar, brandbaar, draaibaar* (readable, inflammable, turnable). For each set, two bisyllabic compounds were chosen, which contained the base as their first morpheme. For the constant sets, three additional such compounds were selected. See the Appendix A for the full set of materials.

Results and Discussion

After removal of the errors (4.8% of all data points), difference scores were computed. The mean reaction times are reported in Table IV.

Table IV. Mean Production Latencies (ms), Error Percentages, and Preparation Effects (delta) for Experiment 3: Compounds and Adjectives

	Homogeneous		Heterogeneous		Delta
Variable	676	5.2%	768	6.0%	92
Constant	675	4.5%	752	3.7%	77

There was a preparation effect both in the variable and the constant sets, $F'(1, 17) = 29.31$, MSE=41758, $p < .001$. The preparation effect in the variable condition seems slightly larger than in the constant condition (92 vs. 77 ms), but this was not significant, $F'(3, 21) = 1.13$, MSE=5469, $p = .354$, and in the wrong direction to affect our conclusions. The interaction between Word Type and Base was not significant ($F'(3, 27) = 2.50$, MSE=7604, $p = .0842$).

The experiment shows that the preparation effect is equally large with compound and complex derived stems. This again supports the view that specific inflectional rather than generic morphological frames guide the generation of inflected forms.

GENERAL DISCUSSION

In Janssen *et al.* (2002), we provided chronometric evidence that frames guide the generation of inflections in speech production. The evidence suggests that the frames specify how many affixes go with the stem of the word. However, since only words with simple stems were tested in that study, it remained unclear whether specific inflectional or generic morphological frames guided the generation of inflected forms. On the specific-inflectional-frame view, the first slot of a frame is for the insertion of a stem, regardless of the number of morphemes that make up the stem, and the later slots are for the insertion of suffixes. In contrast, on the generic-morphological-frame view, there are multiple slots for the morphemes that make up the stem of a word.

Experiment 1 showed that preparation effects for words with polymorphemic stems are larger when they are produced among words with constant inflectional structures compared to words with variable inflectional structures and simple stems. This replicates the earlier findings for monomorphemic stems. Experiments 2 and 3 showed that when inflectional structure is held constant, the preparation effects are equally large with simple and compound stems, and with compound and complex adjectival stems. These results suggest that specific inflectional rather than generic morphological frames guide the generation of inflected forms in speaking words.

Of course, accepting that there is no difference between the constant and the variable conditions in Experiments 2 and 3 amounts to accepting a null hypothesis. The fact that the size of the preparation effects is constant across the constant and variable conditions suggests that stem complexity is entirely irrelevant. But there may have been a very small differential effect (which would support the generic-morphological-frame view) which has gone undetected. Empirically, however, the preparation effects in Experiments 2 and 3 were numerically (though not statistically) larger in the variable than in the constant conditions. Thus, the numerical differences are in the wrong direction for the generic-morphological-frame view.

On the view that specific inflectional frames guide inflectional planning, morphological preparation is only possible when inflectional frames are shared among the words in a response set. When inflectional frames are not shared, only phonological preparation is possible, which yields a reduced effect compared to when morphological preparation is possible. In Experiments 1–3, initial segments were shared, which allows for phonological preparation. In the constant sets of Experiment 1, initial morphemes and frames were shared, which gives rise to phonological and morphological preparation, bringing the preparation effect to a total of 122 ms. In the variable sets, the initial morphemes were shared but the frames were not. There can therefore not be any morphological preparation and the total preparation effect was only 36 ms. In Experiment 2, initial morphemes and frames were shared in both the constant and variable sets, allowing for morphological preparation. The experiment yielded an average preparation effect of 85 ms. In Experiment 3, frames were shared but initial morphemes were not, blocking morphological preparation. The average preparation effect for this experiment was only 38 ms. The size of these preparation effects agrees with those from earlier studies, where phonological preparation effects ranged from 30 to 45 ms and additional morphological preparation increased the preparation effects to be in the range of 75–120 ms (Roelofs, 1996, 1998).

The previous and current evidence supports the following view of inflectional encoding in speech (cf. Janssen, 1999; Janssen *et al.,* 2002; Levelt, 1989; Levelt *et al.,* 1999; Roelofs, 1996, 1998), illustrated in Fig. 2 for the compound noun *bouwwerk* (building). To achieve inflectional encoding, the mental lexicon stores the word as a lemma node plus nodes for diacritics in a spreading activation network. The diacritics specify fixed values such as word class or variable values such as number (singular, plural), which need to be set in encoding a word form. The lemma node is connected to one or more stem morphemes (<bouw> and <werk> in the figure), with links marking the serial order of the morphemes. The variable

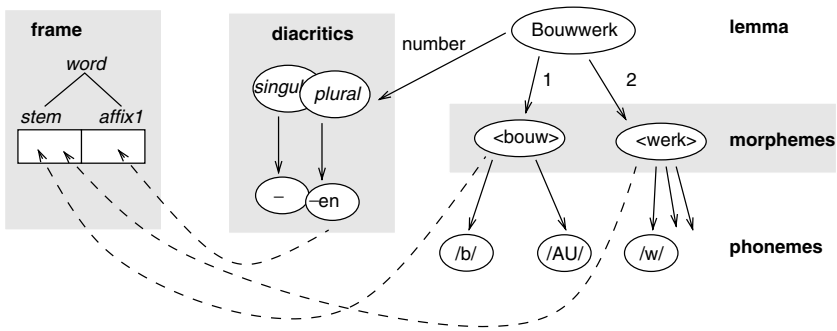

Fig. 2. Frame and fragment of a lexical network underlying inflectional encoding of a plural compound noun. The frame and its fillers are highlighted.

diacritics are connected to affix nodes. In inflectional encoding, the word class (here, noun) triggers the retrieval or computation of an inflectional frame, with a stem slot and slots for affixes. The stem and affix nodes activated in the lexical network are then associated to the corresponding slots of the frames (indicated by the dashed lines in Fig. 2).

To conclude, as with other mental processes underlying thought and language, inflectional encoding in speech production is guided by frames. The present study provided evidence on the information made explicit by these frames. The evidence suggests that the frames are specific inflectional rather than generic morphological in that the constituent structure of compound and derived stems is not encoded in the frames.

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APPENDIX A

Prompts and response words for the homogeneous sets. Heterogeneous sets were created by recombining pairs from different homogeneous sets.

Materials for Experiment 1

Prompt	Response	Prompt	Response
Variable sets			
Huis	Bouwde	House	Build *past*
Auto	Bouwjaar	Car	Year of construction
Lego	Bouwdoos	Lego	Box of building blocks
Misdaad	Strafte	Crime	Punish *past*
Voetbal	Strafschop	Soccer	Penalty
Score	Strafpunt	Score	Penalty point
Arbeid	Werkte	Labour	Work *past*
Stress	Werkdruk	Stress	Workload
Opdracht	Werkboek	Exercise	Workbook
Constant sets			
Geld	Bouwfonds	Money	Building society
Stijl	Bouwkunst	Style	Architecture
Trap	Bouwlift	Stairs	Lift used for construction work
Advocaat	Strafrecht	Lawyer	Criminal law
Brief	Strafport	Letter	Surcharge
Sovjet	Strafkamp	Soviet	Prison camp
Honing	Werkbij	Honey	Worker bee
Overleg	Werkgroep	Consultation	Work group
Garage	Werkplaats	Garage	Workshop

Materials for Experiment 2

Prompt	Response	Prompt	Response
Variable sets			
Storm	Windvlaag	Gale	Squall
Jenever	Whisky	Gin	Whiskey
Bedrijf	Winkel	Business	Shop
Aarde	Potgrond	Soil	Potting soil
Tango	Polka	Tango	Polka
Brief	Porto	Letter	Postage
Slager	Hakblok	Butcher	Chopping-block
Cavia	Hamster	Cavia	Hamster
Ridder	Harnas	Knight	Harness

(Continued)

Constant sets			
Vlag	Wimpel	Flag	Streamer
Zomer	Winter	Summer	Winter
Tent	Wigwam	Tent	Wigwam
Regencape	Poncho	Raincoat	Poncho
Maaltijd	Portie	Meail	Serving
Dijk	Polder	Dike	Polder
Zadel	Halster	Saddle	Halter
Markt	Handel	Market	Trade
Station	Halte	Station	(Bus)stop

Materials for Experiment 3

Prompt	Response	Prompt	Response
Variable sets			
Handschrift	Leesbaar	Hand writing	Readable
Buro	Leeslamp	Desk	Reading lamp
Voordracht	Leesbeurt	Lecture	Lecture
Droogte	Brandbaar	Dryness	Combustible
Focus	Brandpunt	Focus	Focus
Uitgang	Branddeur	Exit	Fire exit
Stoel	Draaibaar	Chair	Revolving
Telefoon	Draaischijf	Telephone	Dial
Zee	Draaikolk	Sea	Whirlpool
Constant sets			
Bieb	Leeszaal	Library	Reading room
Vakantie	Leesvoer	Holiday	Reading matter
Ogen	Leesbril	Eyes	Reading glasses
Kazerne	Brandweer	Barracks	Fire brigade
Stempel	Brandmerk	Stamp	Brand
Juwelen	Brandkast	Jewels	Safe
Winkel	Draaideur	Shop	Revolving door
Film	Draaiboek	Film	Script
Speelgoed	Draaitol	Toys	Top

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