Fixed expressions and the production of idioms

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Fixed expressions and the production of idioms

een wetenschappelijke proeve
op het gebied van de Sociale Wetenschappen

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door
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Preface

There are very many pages in this little book that took me hours, days, weeks, even years to write. Now there's only the quick "preface", and then I'm done. Or so it seems... But writing the big THANK YOU is by no means a trivial task. During the 3.5 years that I spent as a PhD-student at the Max Planck Institute for Psycholinguistics I met many people who had a major impact on my project, my life, or both. I'm truly greatful to my two supervisors, Pim Levelt and Gerard Kempen, who found the right balance of letting me work at my own pace and pushing me when necessary. At times I disagreed with them, but never with both of them at the same time, indicating that they were a great team. Their ideas have had a major influence on the way I think about language production and language processing, and the work that is reported in this thesis is clearly shaped by these ideas. I very much enjoyed spending some time as part of the team.

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The fact that Hedderik van Rijn is going to defend his thesis three months later than me is really my fault. It is because of the time he invested in all-night discussions with me on models, R and awk programming, Latex design issues, proof reading, etc. THANKS is only a vague description of what I mean to say.

Simone.

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Introduction

Chapter 1

The articulation of our thoughts and ideas in the form of spoken words is the result of a complex, multi-facetted process. It is dependent upon our knowledge about the meaning of words, their syntactic features, and their soundforms. When speaking our mother tongue, we use and integrate this knowledge in a seemingly effortless fashion. We choose the words that represent our ideas, combine them according to the rules of grammar, and articulate them quickly and fluently.

The network of representations that lies at the heart of this process is commonly referred to as the *mental lexicon*. It comprises the speaker's knowledge about the semantic, syntactic and morphological words that is necessary to build more complex utterances, such as phrases and sentences.

Accordingly, we usually think of phrases and sentences that we produce as compositional units. They are combined out of words that each have their own meaning and we assume that each of the words of a sentence has been chosen exactly because of the meaning it conveys. For example, the sentence *She was sent to the shop for bacon and beans* means that the subject of the sentence was sent to the shop to buy bacon and beans. The fact that the sentence can easily be expanded (e.g., *She was sent to the shop for bacon, beans, and a pint of ice cream*) stresses its compositional nature.

However, the simple rule that every word means what it says does not always hold. Especially when utterances are meant to express the speaker's personal attitude, wit, or social affiliation, literal language is complemented with non-literal language. The creative use of, for example, irony or metaphors can add multiple layers of meaning to the words and

phrases we produce. In the course of history, many of such metaphors or catch phrases have become an established part of our vocabulary in the form of idioms, proverbs and sayings. They have preserved the form and structure of the original phrases, but their message is not simply a function of the individual words that belong to them. Instead, the message is tied to the overall *configuration* of the words of the phrase. For example, in Dutch *voor spek en bonen* ("for bacon and beans") is an idiom that roughly means "count for nothing, not seriously". Neither bacon nor beans are part of the underlying message. Yet, both have to be present in order to form the idiom, and the phrase structure is fixed. Thus, the literal Dutch translation of *She was sent to the shop for bacon and beans* is an idiomatic sentence, expressing that the subject of the sentence was sent to the shop on the basis of false pretence. In contrast, the literal translations in Dutch of the following variants express that someone was actually sent to the shop for groceries: *She was sent to the shop for bacon and peas* or *She was sent to the shop for bacon, beans, and a pint of ice cream.*

In English, similar examples can be given that illustrate the non-compositional character of idioms. Consider for example the idiom *Never look a gift horse in the mouth*[1]. When *horse* is replaced by *donkey*, the phrase looses its idiomatic meaning and a reader or listener will probably interpret the phrase literally. Likewise, the idiom *get lost!* is bound to a single grammatical form. Any modification yields a phrase that can only be taken literally (e.g., *He got lost (on his way to the hotel)*).

Concepts that are matched by a complete phrase instead of an individual word are actually a common phenomenon that is not restricted to idioms (or related non-compositional units such as sayings and proverbs). Examples of those "restricted collocations"[2] in English are *black coffee*, *to pay attention to*, *to appreciate deeply* or *to look after*. There is no additional layer of meaning involved in these phrases. Yet they are "special", because they represent the correct way to express concepts such as "coffee without milk". Thus, in addition to individual words, languages comprise phrasal units that are tightly bound to specific concepts. In the following, these phrasal units will be referred to as

[1] A warning not to question the quality or usefulness of a lucky chance or gift.

[2] Fixed, idiosyncratic combinations of words that are typically used in a language to express a certain concept.

Fixed Expressions or FEs. As native speakers we can easily use and understand FEs, despite the fact that they often cannot be taken literally. This phenomenon poses interesting questions to theories of language processing: How are FEs represented in the mental lexicon? Which are the units of processing, and is FE processing different from "normal" language processing? In the present thesis, I will discuss these questions from the speaker's point of view and try to shed light on the phenomenon of FEs as a unit of language processing by trying to track the flow of information during the production of FEs. This will be done against the background of theories of FE production, or, more precisely, idiom production.

In Chapter 2 a corpus study is presented that explores the frequencies of more than 1000 Dutch FEs. It provides insight into the kinds of FEs that can be found in written corpora. This corpus study shows that FEs form a relevant part of language use. The frequency data provide the basis for an estimate of the number of FEs that are part of a native Dutch speaker's active lexicon. The data show that about 7% of all words in a large (written) corpus of Dutch belong to a FE.

Chapter 3 presents an experimental study on the processing of idiomatic expressions. This study uses a priming paradigm to show significant differences between the processing of idiomatic expressions and literal utterances during production. The results are discussed against the background of the available literature on idiom processing. In addition, the Superlemma theory of idiom processing is introduced. This theory is based on Levelt et al.'s language production theory (Levelt, 1989; Levelt, Roelofs, & Meyer, 1999). The Superlemma theory proposes a hybrid account of idiom processing, allowing for both unitary and compositional features of idioms at the same time.

In Chapter 4 an experimental study on the activity of literal word meanings during idiom production is presented. The effects found in this study illustrate the compositional aspect of idioms and stress the contributions of an idiom's simple lemmas during its production.

Chapter 5 concludes this thesis by summarizing the empirical findings and discussing their implications for theories of language production.

Note on the definition of Fixed Expressions

> Fixed Expressions refer to specific combinations of two or more words that are typically used to express a specific concept. Typical examples of FEs that are referred to in the literature often have an opaque meaning or a deficient syntactic structure, for example, *by and large* or *kick the bucket*. However, these properties are not essential. The defining feature of a FE is that it is *a word combination, stored in the Mental Lexicon of native speakers, that as a whole refers to a (linguistic) concept*. This makes FEs "non-compositional" in the sense that the combination and structure of their elements need not be computed afresh, but can be retrieved from the Mental Lexicon. However, the degree of lexical and syntactic fixedness can vary.

This "empirical" definition of FEs stands in contrast to a multitude of alternative definitions that have been proposed in the literature and that often aim at identifying the boundaries between different subclasses of FEs (for an extensive overview see Cowie, 1998). As the great variety of definitions suggests, formally defining FEs is not a trivial task. The empirical definition should therefore be regarded as a "working definition", well suited for an explorative study of FE processing. It should not be regarded as an addition to the existing set of definitions.

The psycholinguistic literature on FE processing has focused on *idiom* processing. Idioms are of special interest in this domain, because of the earlier discussed gap between literal and idiomatic meanings. Although my research clearly follows this tradition, I do not presume a fundamental difference between the processing of idioms and other kinds of FE.

A frequency analysis of Fixed Expressions

Chapter 2

Introduction

Though it might seem intuitively evident that Fixed Expressions (FEs) constitute relevant units in language use, few hard figures are available to test this claim. One approach to quantify "relevance" in this domain is to examine how often speakers of a language actually come across FEs. Such a *frequency count* ideally should reveal how many different FEs there are in a language (*type frequencies*), and how often these FEs are actually used (*token frequencies*). The psycholinguistic relevance of FEs is directly related to matters of frequency. If FEs are exceptional in natural language use, then there is little need to take them into account in a core theory of language production. If, however, FEs are frequently occurring phenomena, standard accounts of language production have to be able to explain how FEs are realized.

Estimates of FE frequencies that can be found in the literature are typically estimates, not actual counts, and they range from several tens of thousands of items to several hundred thousands (e.g., Mel'čuk, 1995; Pawley & Syder, 1983; Jackendoff, 1995; Weinreich, 1969). The large variability in these numbers is due to a general lack of agreement on how FEs should be defined, and this makes it difficult to compare the different figures. For example, Jackendoff (1995) estimates that there are about 40,000 FEs in English.

This number is based on the "Wheel of Fortune" corpus[1] that comprises, among others, proverbs, idioms, song titles, and famous quotes.

There seems to be a general agreement that FEs are numerous and that estimates of the size of the native speakers' vocabularies need to be corrected with the number of FEs in a language.

The corpus research by Moon (1998) on the frequency of some 6700 English FEs differs from the former approaches, both with regard to the method she employs (frequency counts in a large corpus with lexicographic tools) and with regard to the order of magnitude of her estimates. Her results will be discussed below in more detail.

So far, no frequency data or even estimates of the number of FEs are available for Dutch. The idioms, sayings and proverbs that are listed in several idiom dictionaries allow only a rough estimate: Meulendijks and Schuil (1998) list about 20,000 idioms, sayings and proverbs, the Van Dale dictionary of Dutch idioms (De Groot, 1999) provides some 10,000 items, and the Van Dale dictionary of proverbs (Cox, 2000) comprises 2378 Dutch entries. Again, the great variability in these figures suggests that the underlying criteria for what should be counted an "idiom" (or Fixed Expression) differ widely. Moreover, such dictionaries focus on idiomatic, non-literal language and serve to explain both the semantics and/or the etymology of idioms which are often partly or completely opaque. Accordingly, they usually do not list the large number of restricted collocations that undoubtedly exist in Dutch and that – from a psycholinguistic point of view – should be included in a count of FEs. This general lack of data has set the stage for a count of familiar phrases and sentences that includes both idiomatic and non-idiomatic Dutch FEs.

In this chapter, I will take a first step towards a quantitative analysis of Dutch Fixed Expressions. The main focus will be on the frequency counts within a random sample of 1102 Dutch FEs in a machine corpus of Dutch texts. In addition, I will try to give an impression of the formal characteristics of the FEs in the sample. This will concern the types of words involved in FEs, as well as the syntactic forms that FEs take. It will

[1] The *Wheel of Fortune* is a game show in which participants try to guess familiar phrases on the basis of partial information in the form of single letters.

neither cover issues of syntactic flexibility of particular FEs, nor a detailed typology of FEs, as this was beyond the scope of the project. Detailed analyses of these issues have been provided for English by, e.g., Moon (1998) and Cowie (1998).

The present analysis yields an estimate of both type and token frequencies of Dutch FEs. Both figures together allow for a preliminary estimate of the proportion of Dutch language use that is covered by FEs. The results are compared to alternative estimates and discussed against the background of language production processes.

The dictionary as a starting point

Estimating the number of FEs in a language ideally starts with collecting all FEs that appear in conversations, books, newspapers and the like. For a few languages this work has been started by lexicographers. The results of their work can be found in thoroughly edited dictionaries. Consequently, dictionaries serve as an important written source of FEs, be it with a few shortcomings. The reason why FEs are listed in dictionaries is to illustrate a head word's usage that cannot be predicted from meaning or grammar. Thus, FEs are listed as examples of usage, not as individual entries themselves. Therefore the choice of examples that are given often seems somewhat arbitrary and may be incomplete. FE dictionaries only partly fill the gap, because their selection of FEs is subject to more or less strong criteria that differentiate FEs from normal, compositional phrases and that may exclude certain categories of FEs.

Incompleteness also arises from the dynamic nature of language. Especially in spoken language, many FEs are en vogue for some period of time and then disappear again without ever being registered in a dictionary. For example, it is yet to be determined if *ieder nadeel heb z'n voordeel*[2] will ever make it into the Van Dale "Handwoordenboek van Hedendaags Nederlands" (Van Dale Dictionary of Contemporary Dutch; or for short "Van Dale NN").

While aware of these shortcomings, we chose this dictionary (Van Sterkenburg & Ver-

[2] "Every disadvantage has its advantage". An expression coined by Amsterdam soccer player and coach Johan Cruijff.

burg, 1996) as a starting point for the exploration of contemporary Dutch FEs.[3]

Based on the FEs it contains as examples for the usage of its entries, we were able to make a rough (and probably conservative) estimate of the number of FEs in Dutch. More precisely, we took a sample of 77 (of a total of 1227) pages of this dictionary and searched them for FEs. Every page was searched by two raters. A phrase or sentence was considered a FE if it contained two or more words and if it met at least one of the following criteria:

- its meaning was different from, or exceeded, the compositional meaning of its words (e.g., *de vuurproef doorstaan*, 'to pass the trial by fire', i.e., to stand the test)
- it was a metaphor (e.g., *een gevlekte tijger* 'a spotted tiger', i.e., something impossible)
- it qualified for what Cowie (1998) calls "pragmatic specialization": items that are not fully lexicalized, but represent conventional means of conveying specific pragmatic meanings. (e.g., *gepijnde honing* rather than *geperste honing* 'strained honey')
- it was a restricted collocation (e.g., *een cursus volgen* 'to take a course')
- it was a proverb (e.g., *een kinderhand is gauw gevuld* 'a child's hand is filled quickly')
- it was a saying (e.g., *kijken is gratis* 'looking is for free')
- it was a simile (*zoet als honing*, 'as sweet as honey')
- it exhibited some form of defective or outdated grammatical features (e.g., *van ganser harte* 'with all (my) heart').

This set of criteria was designed in order identify all those items in the dictionary that are unpredictable from grammar or that, for some other reason, have to be learned as *wholes* by non-native speakers. Particle verbs were not included in the count.[4] Only

[3] Certainly, the results that are reported in the remainder of this chapter will have to be tested against future collections of (spoken) FEs that cover an even broader spectrum of FEs and more closely mirror actual language use. However, no such collection is available yet for Dutch FEs.

[4] Due to orthographic conventions, the citation form of Dutch separable verbs is printed as one word and is listed separately in the dictionary. Accordingly, frequency values for particle verbs can be found in lists of word frequencies like CELEX (Baayen, Piepenbrock, & Van Rijn, 1993).

phrases marked by both raters were counted, resulting in a total number of 1102 FEs. The average number of FEs per page was 14.3 (with a minimum of 1 FE per page and a maximum of 73).[5]

Based on these figures, one can conlude that the complete Van Dale NN contains an estimated 17,500 FEs. If we take the total number of approximately 66,000 entries in this dictionary as a reasonable estimate of the number of current Dutch words, and then add the number of FEs that we counted, we come to the preliminary conclusion that FEs make up about one fifth of the total Dutch lexicon: 17,500/(66,000+17,500) = 0.2.

Of course, a contemporary dictionary should not be confused with the mental lexicon, and the same caution applies when estimating the number of FEs that speakers know and actually use. Only the latter group of FEs is interesting for a theory of language production. It is therefore necessary to explore to what extent the FEs that we find in the dictionary actually play a role in spoken Dutch. Such an estimate might not be sufficient to fully indicate how many of these FEs speakers actually *know* (in the sense of "recognize"), but it might very well illustrate how frequently speakers make use of FEs in their own language.[6] This can be accomplished by counting how often a FE can be found in a linguistic corpus. For the present purposes this would be done ideally for a corpus of spoken Dutch. Such a corpus is currently being assembled and annotated, but not yet fully available (Corpus Gesproken Nederlands, 2003). However, given this restriction, the written corpus of the Dutch Institute for Lexicography (INL) in Leiden offers the closest approximation to this aim presently available. In cooperation with the INL and Theo Vosse (of Q-GO company, Amsterdam), we searched a part of the INL database, which covers some 52,600,000 words (for comparison: CELEX is based on a 42,300,000 words corpus). About half the database consists of newspaper articles that appeared in the *NRC Handelsblad* newspaper. The other half of the corpus consists of newspaper articles, but also of texts that were written to be read aloud, books, magazines, and reported speech from the Dutch parliament. All material stems from the last three decades of the

[5]The inter-rater reliability (defined as the number of agreements divided by the sum of the number of agreements and the number of disagreements) between the two raters was .7. This implies that the eventual count is a rather conservative one, given the selection criteria.

[6]It is generally difficult to determine whether speakers passively know a FE, because their meanings might be (partially) computed from its words or the context that they appear in. Thus, speakers might confuse FE recognition with an online computation of its meaning.

twentieth century. The content areas are mixed, leisure, health, humanitities, science, and society.

We utilized a search tool developed by Vosse to search for occurrences of the 1102 FEs in the corpus. The program takes regular expressions as input and returns the number of instances of the expression in the corpus, together with a random sample of occurrences in their sentential context. The size of the search window was variable, since it covered every word from the beginning to the end of a sentence. The regular expressions were composed such that they covered the key words of an expression. If necessary, variations of word order and syntactic flexibility were taken into account. For every FE in the sample, a decision had to be made with respect to its possible forms and flexibility.[7] For example, the query for *NP aan een toets onderwerpen* 'to subject NP to a test' had the form 'aan, toets, [onderwerpen]'. In this notation, the commas separate the three elements *aan*, *toets* and *[onderwerpen]*. Separated elements may appear in the sentence in any order, but they all *have to* be part of the same sentence in order for the program to return a hit. The brackets around the verb *onderwerpen* indicate that it must be read as a placeholder for all the various forms that this verb can take (e.g., the singular past tense form *onderwierp*). Thus, 'aan, toets, [onderwerpen]' can return sentences like *Zij werd aan een toets onderworpen* 'She was subjected to a test', but also sentences like *Zij onderwerpen jaarlijks tientallen studenten aan deze toets* 'Every year, they subject dozens of students to this test.', where the verb is in second position and the determiner is not *een* 'a' but *deze* 'this'. The latter is possible, because the determiner is not part of the query. The separation of *aan* and *toets*, and the fact that no determiner has been specified, also enables the search for those cases where there is an adjective in front of *toets*, as for example *NP aan een zware toets onderwerpen* 'to subject NP to a difficult test'.

As a result of this flexibility, the occurrence of a certain combination of words in a particular order was often not sufficient to identify only the desired FE. For example, a query like *in de wind, [slaan]* 'into the wind, [hit]' (i.e., to reject or dismiss an idea, advice, etc.) will return any sentence that contains the cluster *in de wind* and a form of

[7]These decisions are subjective choices made by the researcher, some of which might be debatable.

the verb *slaan*, in any order. Thus, in addition to "valid" hits like, e.g., *Het advies wordt vaak in de wind geslagen* 'The advice gets often rejected', the search can also return false alarms like, e.g., *De webben bewogen in de wind en in de regen, die bijna dagelijks tegen het raam sloeg.* 'The webs were moving in the wind and the rain, that clattered almost daily on the windows.'[8] Moreover, the search tool does not make a distinction between words that are of a different syntactic class, as long as they share their orthographic form. For example, *vis* is ambiguous between the first person singular form of the verb *vissen* 'to fish' or the singular form of the noun *vis* 'fish'. Therefore, the query *achter het net, [vissen]*, 'fish behind the net', (i.e., be too late to reach one's objectives) can return a hit for a sentence like *De bal had in de sloot achter het net gelegen en stonk nu naar vis* 'The ball had been lying in the ditch behind the net and now it stank of fish'. In this case, the cluster *achter het net* has been combined with the verb *liggen* 'to lie'. However, due to the presence of *vis* the search tool will return this sentence as a valid hit.

As the examples indicate, the output of the search had to be subjected to human inspection in order to correct the frequency values that the program had returned. The size of the output was set to a maximum of 50 occurrences per query. Thus, whenever a query resulted in 50 occurrences or fewer, the complete population could be inspected. When the number of hits was higher than 50, the 50 occurrences that were given as output were a random sample from the total number of occurrences of this query.[9] In the former case, the number of false alarms could directly be subtracted from the total number of hits. In the latter case, the total number of hits was corrected for false alarms. For example, the total number of occurrences for the FE *(een) cursus, [volgen]* 'to follow a course' as counted by the search tool was 300. However, inspection of the output revealed that 12 occurrences (of 50) were false alarms (i.e., 24% of the output). Accordingly, the frequency count was corrected by 24%, yielding 228 valid occurrences per 52.6 million words. For the complete sample of FEs, a total of 16,560 output sentences were inspected. They contained 3,360 false alarms (i.e., 20% of the complete output). These false alarms were not evenly distributed over the sample. Only 25% of all queries returned one or more false alarms. In the majority of these cases (63% of all queries with

[8]Real example taken from the corpus.

[9]The number of hits in the output retrieved either from the NRC Corpus or from the other sources was proportional to the total number of hits that were found in these corpora.

false alarms), the total number of hits was lower than fifty, so that the true number of hits could be determined by means of substraction. In the remaining 37% of false alarm cases (i.e., 9% of the complete sample), the frequency value had to be estimated.

The results of the corpus analysis

The overall distribution of frequencies

The overall frequency distribution for the complete sample (see Table 2.1) shows that many of the word combinations that we took from the dictionary do not appear at all in our corpus, suggesting that they are not part of the active Dutch lexicon (as it is used in Dutch written texts). A total of 36% FEs of our sample had a frequency of 0. The overall distribution of the frequencies of the remaining 64% of our sample can be seen in Figure 2.1. It shows that, in general, the frequency of the fixed expressions is relatively low. The average FE in our sample occurs 1.3 times per 1 million words. For the subgroup of FEs with a frequency larger than 0, the average is 1.8 occurrences per 1 million words. In the domain of word frequencies, this must be considered as very low. For example, in English words like "inhale" or "zoologist" have a frequency of 1 and 2, respectively. The maximum of our distribution, 144 occurrences per million for *met name*, with-name, 'namely', suggests caution when comparing frequencies of FEs with word frequencies directly. However, despite the difference in absolute frequency values, Figure 2.2 shows that the frequency *distribution* of the FEs in the sample is very similar to that of word frequencies in that they behave according to Zipf's law (Zipf, 1932; Hörmann, 1979). Appendix 2.A shows a few examples that illustrate the frequency spectrum of FEs.

Table 2.2 shows a comparison of the overall frequency pattern found in the Van Dale sample with that found by Moon (1998). It is important to note, that – although the underlying definitions of FEs are rather similar – a direct comparison of the present analysis with that of Moon should remain tentative. Moon's analysis was done on a much larger scale, with different methods, and in much greater detail. Still, a comparison of

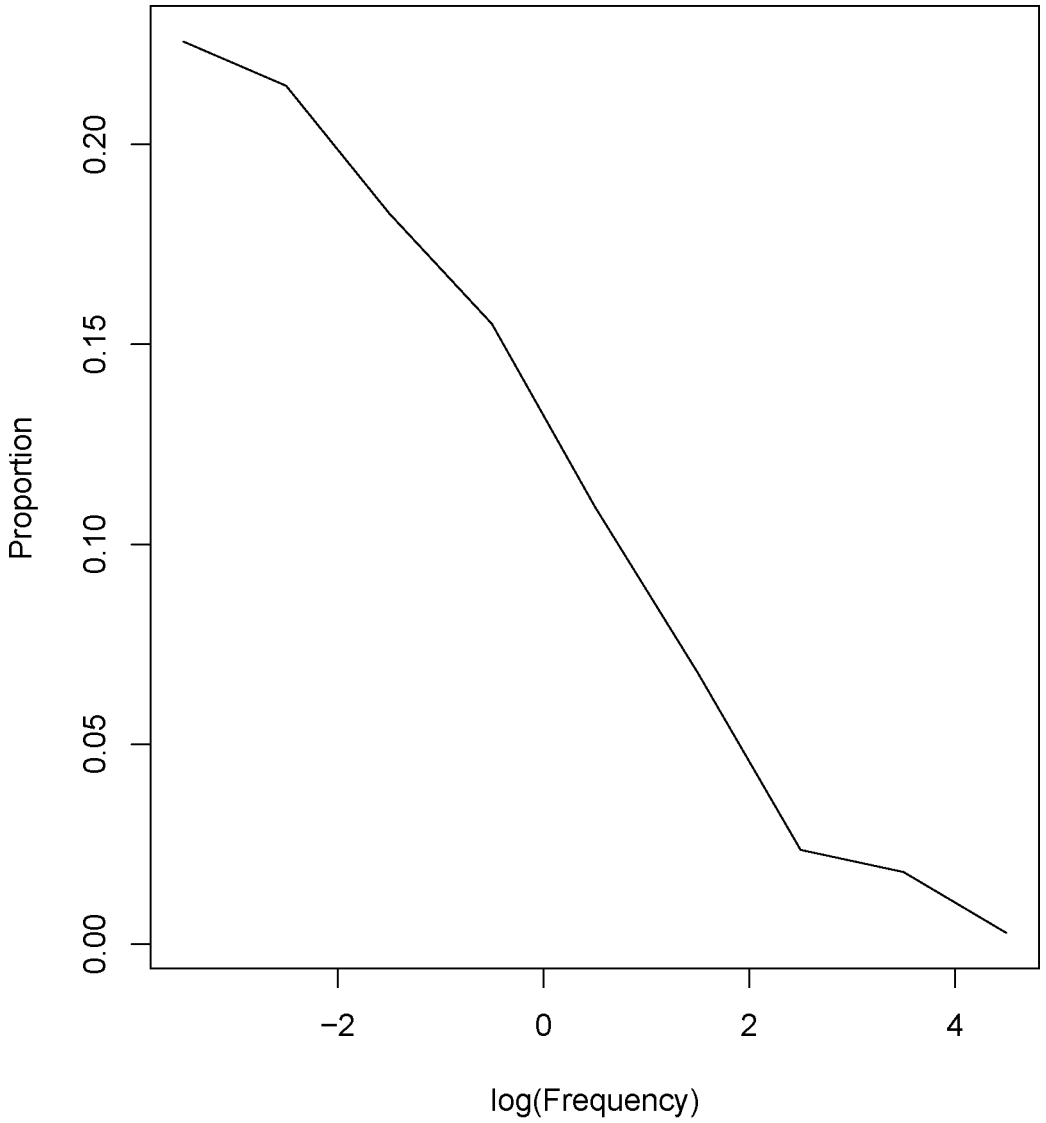

Figure 2.1: Frequency distribution for a sample of Dutch FEs (all FEs with a 5 frequency > 0, per 1 mln words).

Table 2.1: Overall statistics of a frequency count of 1102 FEs. All values are frequencies per 1 mln words.

Subcorpus	*Min.*	*1st Qu.*	*Median*	*Mean*	*3rd Qu.*	*Max.*
NRC	0	0	0.036	1.133	0.330	117.800
MIXED	0	0	0.039	1.196	0.318	172.800
TOTAL	0	0	0.038	1.163	0.346	144.100
TOTAL >0	0.019	0.057	0.180	1.81	0.874	144.100

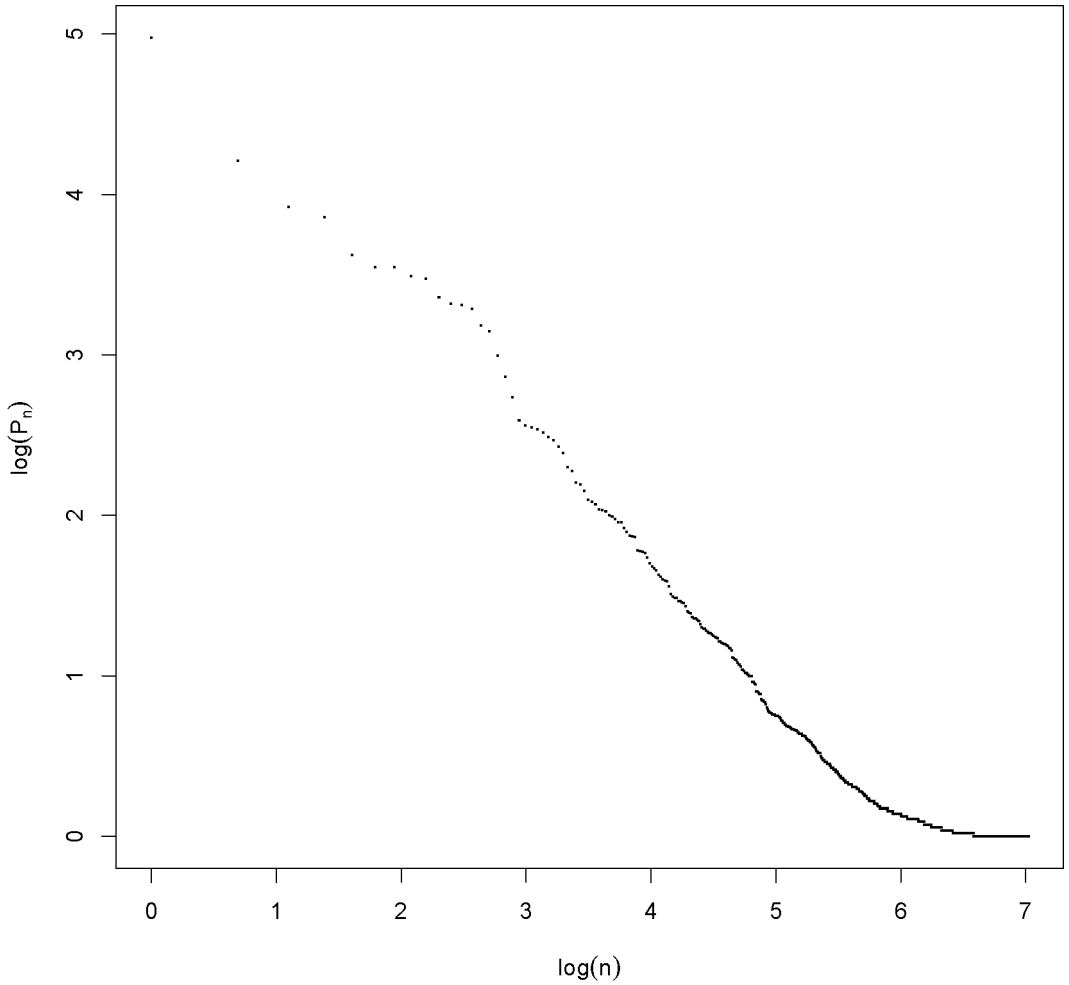

Figure 2.2: Frequency distribution of 1102 Dutch FEs. The x-axis shows the rank sequence n of the FEs in order of decreasing frequency, the y-axis shows the actual FE frequencies, P_n, in the INL corpus. Both scales are logarithmic. The resulting straight line indicates that the product nP_n is a constant (Zipf, 1932; Hörmann, 1979, p. 89).

general trends can be a valuable method for cross-validating the present data. Table 2.2 only shows the data for those FEs that have a frequency higher than zero. Moon's and the present (Van Dale) sample differ strongly with regard to the number zero frequencies (7% vs. 35%). Due to the methodological differences, the reason for this difference must remain unclear.[10] However, the most important factors seem to be the composition of the sample and the inclusion of FE variants and transformations in the counts by Moon. Therefore, Table 2.2 only gives information about the percentage[11] of FEs in a certain frequency band *if they occurred in the respective corpora at all*. The result is a strikingly high similarity of the two frequency distributions. In both counts, the great majority of FEs appears less than once per million words and only very few FEs appear five times or more.

Table 2.2: Comparison of frequencies of FEs in Dutch and English. Only frequencies above zero were included, due to methodological differences with regard to the composition of the sample. The underlying number of cases differs largely, being about six times larger in Moon's analysis.

Frequency band	*% FEs Van Dale sample*	*% FEs Moon*
$<$ 1/million	78	70
1 – 2/million	7	12
2 – 5/million	8	9
5 – 10/million	3	4
10 – 50/million	3	3
50 – 100/million	<1	<1
over 100/million	<1	<1

When comparing the two subcorpora, the distributions of FE frequencies show slight differences in their overall features. The overall statistics in Table 2.1 suggest a tendency toward higher frequencies in the Mixed subcorpus. Differences between subcorpora mirror the various content areas represented. Dependent on topics and style, some FEs are more likely to appear in one corpus than in the other. Thus, overall higher frequencies in the Mixed subcorpus suggest that the FEs of our sample are slightly less representative of the language use that is typical of newspaper articles. In general, the frequency values behave very similarly, which is reflected in a high positive correlation ($r = 0.96$).

[10] But note that the difference in sample size is a likely candidate.
[11] All percentages were rounded to the nearest whole number.

Nevertheless, it is interesting to compare the frequencies of individual FEs in the two subcorpora. Items that show a higher frequency in the NRC corpus are *preferente aandelen* 'preferable share', *op krediet kopen* 'buy on credit', *zich bereid verklaren tot* 'to agree to' and *de rijen sluiten* 'close the lines, stand together', which refer to political and economic issues. In contrast, items with a relatively higher frequency in the Mixed subcorpus are FEs like *ultraviolette stralen* 'ultraviolet rays', *in de bloemetjes zetten* 'to put in flowers', i.e., 'treat someone like a king/queen', *de spanning was te snijden* 'the tension could be cut', which are of a more general nature. However, these differences are subtle and have not been explored in more detail. Because the quantitative differences between the subcorpora are rather small, I will confine myself to the overall frequencies in the following analyses.

Table 2.3 shows the 25 most frequent FEs of the sample, and their frequency per subcorpus. Native speakers of Dutch will most probably recognize the majority of these FEs as typical newspaper language. For an illustration of this relationship, see Table 2.4. It is most obvious for the items *officier van justitie* 'public prosecutor' and *Verenigd Koninkrijk* 'United Kingdom' which are standard names directly related to the field of politics and, in a lesser degree, for the great majority of collocations in the list (such as, e.g., *min of meer* 'more or less'; *de laatste tijd* 'recently'; or *met uitzondering van* 'except for'). None of the FEs in the list can be considered opaque, and the label "idiomatic" is doubtful for even the more figurative items among them (like, e.g., *gang van zaken* 'course of things'). This is in agreement with Moon's (1998) findings for English. She observed that very common FEs are likely to be what she calls "anomalous collocations".

A concise grammatical characterization of the sample

As can be seen from the list of criteria mentioned in the introduction, the kinds of FEs that entered the sample varied widely with respect to factors like idiomaticity and syntactic flexibility. The sample will be characterized in terms of the average length of FEs, as well as in terms of the words that make up FEs, their syntactic categories, and the phrase structures in which they appear.

Table 2.3: The 25 most frequent FEs of the Van Dale-sample and their overall frequencies per mln in the two subcorpora.

FE	*Transliteration*	*Translation*	*f nrc*	*f other*	*f overall*
met name	with name	namely	118	173	144
bij elkaar	with eachother	together	64	69	66
aandacht voor	attention for	attention for	38	62	50
op straat	on street	on the street	48	45	46
officier van justitie	officer of justice	public prosecutor	33	40	36
akkoord gaan met	accord go with	to agree with	28	40	34
in elkaar	in eachother	in each other	38	29	34
min of meer	less or more	more or less	38	25	32
verloren gaan	lost go	to get lost	28	34	31
openbaar vervoer	public transportation	public transportation	18	39	28
de laatste tijd	the last time	recently	29	24	27
op tijd	on time	in time	22	31	26
gaan voor	go for	go for	26	26	26
gang van zaken	going of things	course of events	25	21	23
in beeld	in picture	visible	22	23	22
ten goede komen	to good come	be a benefit for	15	23	19
op gang komen	on go come	get going	17	16	17
een beeld geven van	a picture give of	give an impression of	16	12	14
Verenigd Koninkrijk	united kingdom	United Kingdom	17	7	12
met uitzondering van	with exception of	except for	13	11	12
ten tijde van	at-the time of	at the time of	16	7	12
aan de gang	on the go	going, started	10	13	12
al met al	all with all	alltogether	9	14	11
aandacht trekken	attention draw	draw attention	14	8	11
net zo goed	just as well	just as well	13	9	11

Table 2.4: A short fictitious text in Dutch that illustrates how strongly the most frequent FEs in the sample are related to Dutch newspaper language. For those who do not speak Dutch, FE usage is illustrated by means of different font types: words that are *not* part of a FE are typeset in italics. The text has been created with the most frequent FEs of the sample.

"Nadat men akkoord was gegaan met het voorstel van de Officier van Justitie kwamen allen op tijd bij elkaar om de gang van zaken in beeld te brengen. Met uitzondering van de NS slaagde men erin om ten tijde van bezuinigingen de aandacht te trekken en een goed beeld te geven van wat er de laatste tijd in het openbaar vervoer op gang was gekomen. Al met al leek men goed in beeld te zijn, maar op straat had men vooral aandacht voor de tijd die verloren was gegaan, met name in het Verenigd Koninkrijk. Dus zouden allen er net zo goed wel voor moeten gaan."
"*Nadat men* akkoord *was* gegaan met *het voorstel van* de Officier van Justitie kwamen *allen* op tijd bij elkaar *om* de gang van zaken in beeld *te* brengen. Met uitzondering van *de NS slaagde men erin om* ten tijde van *bezuinigingen* de aandacht *te* trekken *en* een *goed* beeld te geven van *wat er* de laatste tijd in *het* openbaar vervoer op gang *was* gekomen. Al met al *leek men* goed in beeld te zijn, *maar* op straat had *men vooral* aandacht voor *de tijd die* verloren *was* gegaan, met name *in* het Verenigd Koninkrijk. *Dus zouden allen* er net zo goed *wel* voor moeten gaan."

Table 2.5: Distribution of the number of words per FE for 1102 FEs.

length	% FE
2	25
3	34
4	20
5	11
6	5
7	2
8-15	3

Length. The average length of the FEs in the sample is 3.6 words. The distribution of FE length (i.e., the type frequency of length) in our sample is shown in Table 2.5. The length of a typical Dutch FE appears to vary between two and five words.

Figure 2.3 shows a strong relationship between the length of a FE and its frequency: the shorter the FE, the more often it appears in the corpus. Again, both results are highly similar to those found by Moon (1998). She reports an average length of 3.56 words and a strong relationship between FE length and FE frequency. Taking into account this relationship in the Van Dale sample, the average length of 3.6 words must be seen as an overestimation. FEs that are actually used in everyday language are very likely to be shorter than that. As can be seen in Figure 2.3, an average length of 2 to 3 words seems a more adequate estimate.

Syntactic structure. As suggested by their average length, the majority of FEs in our sample are short building blocks that can be worked into longer phrases and sentences. In order to learn more about the structural features of these elements, we conducted an analysis of word category and phrase structure.

Word categories. Table 2.6 shows the relative proportions of nouns (N), verbs (V), and adjectives or adverbs (A) as they appear in our collection of FEs and in CELEX.[12] For each of these two sets the words' *token* frequencies are given. That is, for the collection

[12]The analysis was restricted to content words. Adverbs and adjectives have been merged into one category. The reason is that determining whether a word is used as an adjective or as an adverb is not always easy. Notice that in Dutch adverbial or adjectival usage of a word is not marked morphologically (except if an adjective receives an *-e* suffix as a prenominal NP modifier).

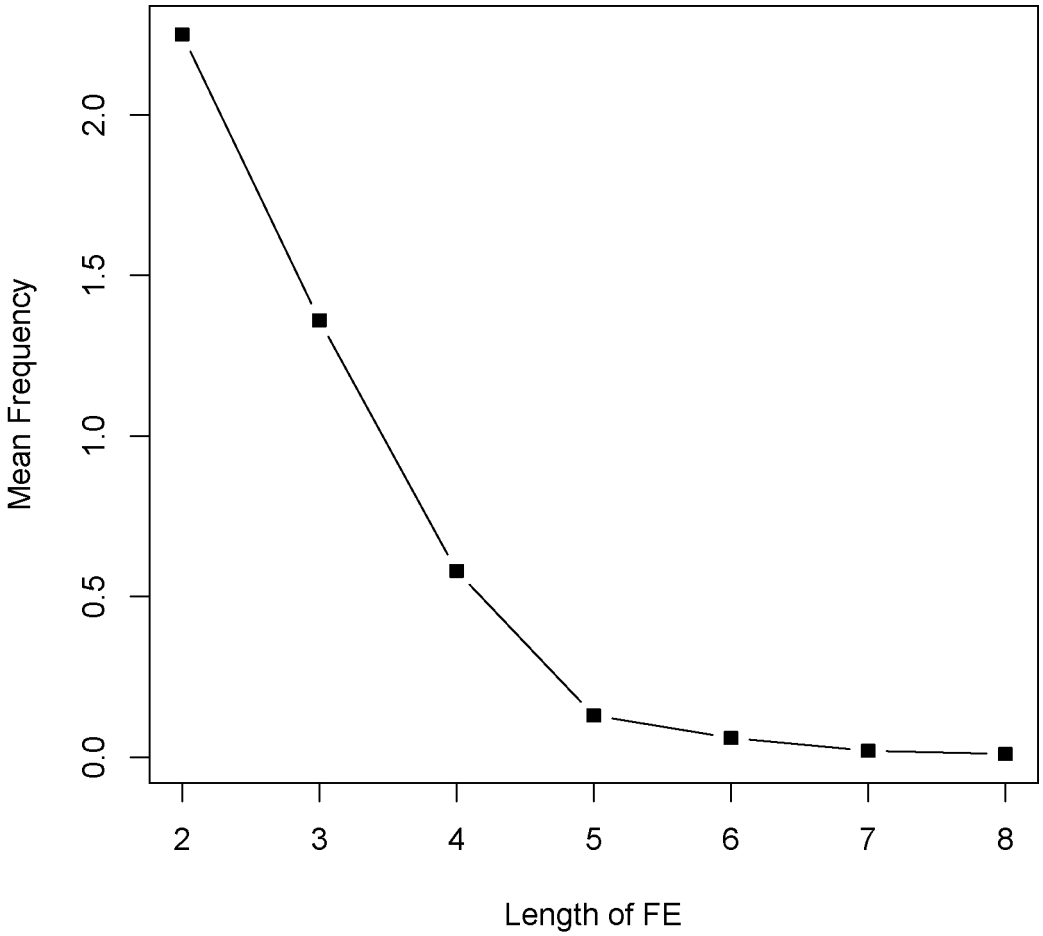

Figure 2.3: The relationship between the length of a FE and its Frequency.

Table 2.6: Proportions of different types of content words in the Van Dale sample, compared with CELEX. Proportions are given in % of all content words. See text for further detail. *Prop*= proportion, *w*=weighted, N = nouns, V = verbs, A = adverbs and adjectives.

class	*w. prop. sample*	*w. CELEX prop.*
N	*44%*	*36%*
V	*18%*	*32%*
A	*38%*	*32%*

of FEs the *type* frequency of a word category was weighted with the frequencies of the FE the words belong to. For the content words of CELEX, their type frequencies were weighted with their respective CELEX lemma frequencies. Both values are expressed as percentage of content words. Together, both figures allow a comparison to be made between the actual usage of the different word categories within FEs and within the language as a whole.

The weighted proportions show that, in actual language use, nouns are the primary elements of FEs. The comparison with CELEX suggests that this is a structural feature of FEs, because the overall pattern of the weighted proportions in CELEX predicts an equally strong role for the three kind of content words. Overall, there is a frequency shift in favour of nouns and adjectives/adverbs. Verbs are structurally underrepresented in the FEs.[13]

Another feature of words that can help to get a better idea of the "specialness" of FEs is word frequency. The prototypical FE in the literature is syntactically frozen and opaque ("kick the bucket"), suggesting that FEs are rather "old" word groups whose origins have been forgotten. This is most obvious in the so called "Cranberry collocations" (see Moon, 1998) which preserve words that otherwise have disappeared from everyday language. One might therefore hypothesize that FEs in general contain relatively many low-frequency words, or that FEs make use of a special segment of the frequency spectrum. Figure 2.4 compares the content words in FEs with content words in CELEX. It shows that, on average, the words that are used in the sample of FEs have anything but a low

[13] Partly, this may be due to way the sample of FEs was taken. In dictionary entries of FEs support verbs are often left out.

frequency of occurrence. The special frequency segment that they make use of is that of the mid-range frequency words.

The relationship between word frequency and FE frequency

Another method that can shed light on the kinds of words involved in idioms is to compare the frequencies of the single words with those of the FEs themselves. If FEs are typically composed of words that do not appear outside the FEs, the *predictive value* of these words for the idiom is expected to be relatively high. In other words, if one encounters a word with a high FE-predictive value, one can be relatively certain of actually dealing with a FE. If, however, FEs make use of the standard lexicon, no such special relationship is expected.

We computed the predictive values for the content words of the FEs of the sample according to the following equation:

$$\frac{freq_{\text{INL}}(FE)}{freq_{\text{CELEX}}(word)}$$

where $freq_{\text{INL}}(FE)$ is the frequency of the FE the word belongs to, and $freq_{\text{CELEX}}$ is either the CELEX lemma frequency or the word form frequency of a content word. The latter was decided on an individual basis. For example, the FE *op gang [brengen]* 'get going' does not include the plural form of *gang*, but it includes all forms of the verb *brengen*. Accordingly, in the present analysis *gang* was assigned its word form frequency and *brengen* was assigned its CELEX lemma frequency. Only those content words were included, that actually had a frequency in CELEX.[14] All frequencies reported here are frequencies per 1 million words.

Table 2.7 gives an overview of the predictive values that were computed for nouns, verbs and adjectives or adverbs. It shows that overall, the predictive values are very low. At least 90% of all content words have a predictive value below 0.1. The great majority

[14] CELEX is corpus-based and does not comprise the complete Dutch Lexicon.

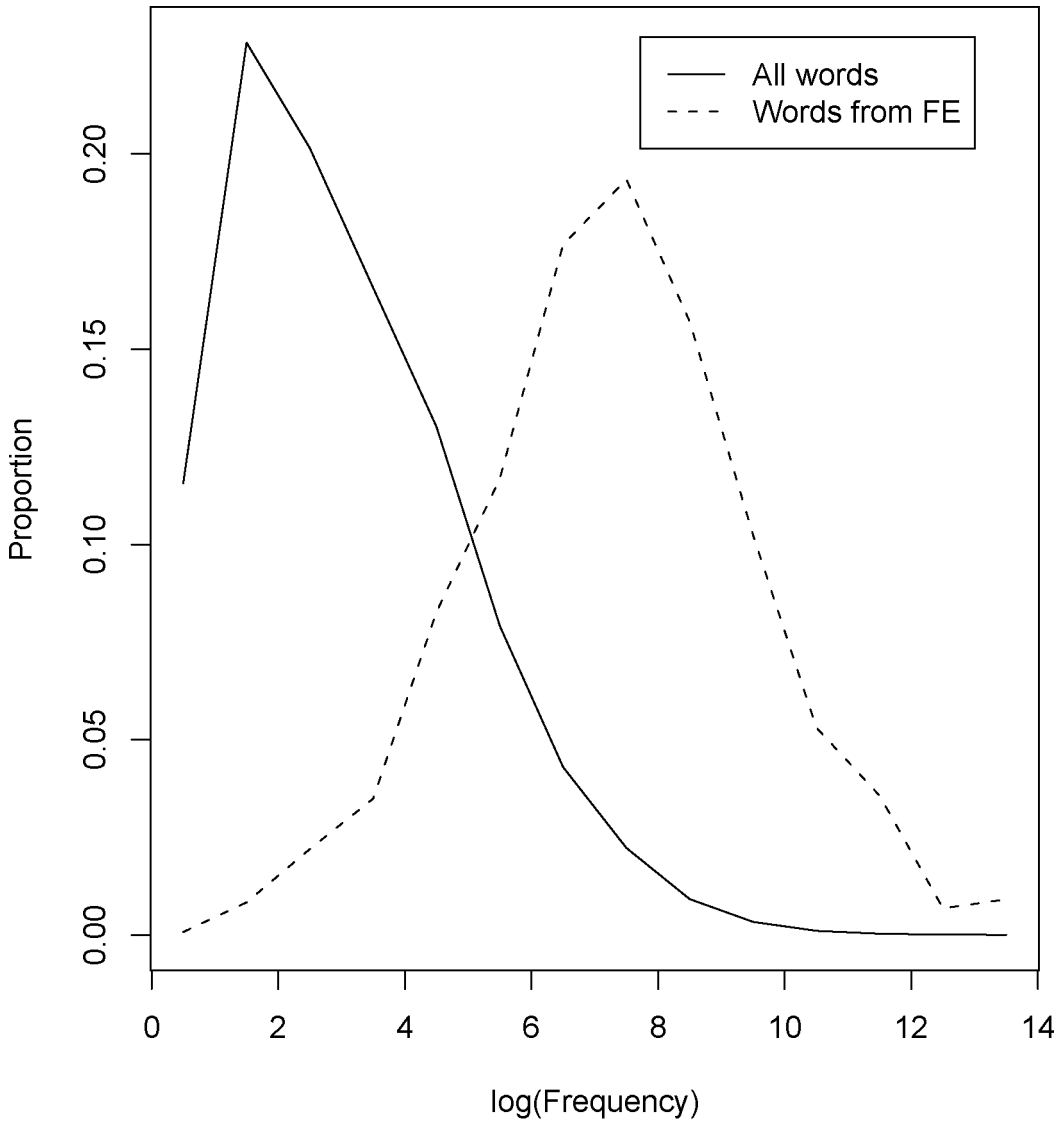

Figure 2.4: Comparison of word frequencies for the content words of the sample and those in CELEX.

of words is by no means special to its FE. However, there are a few exceptions. About two percent of the nouns have a FE-predictive value that is 1 or higher.[15] In view of the overall low values, these cases are of particular interest, because they indicate a strong relationship between a content word and the FE it appears in. Therefore I will discuss this group of words in more detail.[16]

Appendix 2.B shows the items concerned. Most words are readily recognized by native speakers as parts of a FE. In many cases, the FE seems the only possible context in which the word can occur. This is the case for, e.g., *fabelen*, *memento* or *preferente*. Some FEs appear in more than one category (*verwaande kwast, openbaar vervoer, de penningmeester dechargeren, pertinente leugens*), with all elements being highly predictable. A closer look at the verbs and adjectives/adverbs suggests that they are very likely to be part of a restricted collocation, whereas the FEs comprising the nouns cover a broader spectrum of idiomaticity (compare e.g., *openbaar vervoer* with *op de proppen komen*).

I tested the predictive character of the words in Appendix 2.B in a paper and pencil task. Seven native speakers of Dutch were asked to form simple sentences with the words in the list. The numbers in the last column represent the number of participants who used the word within the FE given in the second column. A "+" sign indicates that, in addition to the form expected, participants used variants of the FE. For example, *pluimage* was used as *van allerlei pluimage* or *van velerlei pluimage*, with *allerlei* en *velerlei* being synonyms of *diverse* 'diverse'. Overall, the participants' scoring shows a lot of variation between items. Some, like *name*, seem to be invariably bound to a FE, while others show no such special relationship. In the case of *mispel* and *dechargeren*, this is due to the fact that some participants simply did not know the word. A total of 19 words was used within the target FE in more than half of the responses.

In addition to the words that are rather closely tied to the use of FEs, one might want

[15] Note that the CELEX corpus and the INL corpus that was used for my frequency counts are different. Therefore predictive values can exceed 1. This happens if the CELEX word frequency is lower than the INL FE frequency. Therefore the order of magnitude of the predictive values is more informative than the precise value.

[16] Of course, FE-predictive values that are close to but smaller than 1 are also to be considered high. However, given their low frequency, a discussion of the extreme values suffices to describe the phenomenon.

Table 2.7: Cumulative type frequencies of different predictive values for nouns, verbs, and adjectives or adverbs, in % of wordclass.

pred. value	% N	% V	% A
$>= 1.0$	2	1	1
$>= 0.9$	2	1	1
$>= 0.8$	3	1	1
$>= 0.7$	3	1	2
$>= 0.6$	3	1	2
$>= 0.5$	4	1	2
$>= 0.4$	4	2	3
$>= 0.3$	5	2	3
$>= 0.2$	7	3	5
$>= 0.1$	10	4	6
< 0.1	90	96	94

to have a closer look at those words that actually dominate FEs due to their high type frequencies. Examples for nouns with a high type frequency in the FE sample are given in Table 2.8. They typically are short, concrete nouns. Moon (1998) finds the same for the metaphors in her sample. Also, the Van Dale idiom dictionary (1999) reports a list of the ten most frequent words in contemporary Dutch idioms. In this list, seven out of ten words denote a body part. Again, all words are short and refer to concrete, everyday entities. This suggests that it may not be the strange, uncommon nouns that are typical for FEs. It fits well with the observation made earlier, that the frequency range of the words in the sample suggests that we are dealing with very normal, even high-frequency, language use. The list of frequently occurring verbs in Table 2.8 consists of support verbs that have little content and bear no relationship whatsoever with any specific genre.[17]

Phrase structure

In a global analysis of phrase structure, we classified every FE with respect to its general phrase type. These types collapse various complex constructions, which will not be discussed in detail. There are a few structures that occur very frequently in the sample. These will be highlighted.

[17] Interestingly, all verbs but one (*maken*) are strong verbs.

Table 2.8: The ten nouns, verbs, and adjectives/adverbs with the highest frequency in the Van Dale sample.

N		*V*		*A*	
tijd	*time*	gaan	*go*	niet	*not*
kop	*head*	zijn	*be*	goed	*good*
kind	*child*	staan	*stand*	er	*of them, there*
vuur	*fire*	geven	*give*	dik	*fat*
lucht	*air*	zetten	*put*	zo	*so*
God	*God*	krijgen	*get*	wel	*well, rather*
hond	*dog*	komen	*come*	vol	*full*
rijm	*rime*	hebben	*have*	rijk	*rich*
school	*school*	maken	*make*	nog	*still*
gang	*way*	houden	*hold*	daar	*there*

Table 2.9 shows the distribution of different phrase types represented in the sample. The first column shows their type frequencies in the sample, the second column their token frequencies (i.e., type frequencies weighted by FE frequencies). As in the case of word frequencies, weighted proportions can serve to correct an impression given by the raw sample. They can help to discover in which aspects a purely linguistic analysis of the sample does not give a realistic impression of the actual use of a structure. For example, the predominant structure in the raw sample is the verb phrase (VP). Examples are *in gang zetten* 'get going' and *de bloemetjes buiten zetten* 'put the flowers outside' (≈ paint the town red). But as the word class frequencies already suggested, the actually realized occurrences of VPs are much less frequent than their type frequency suggests. This also holds, though to a lesser degree, for noun phrases (NPs). In contrast, the weighted percentages of phrase type show that prepositional phrases (PPs) are the dominant structure in the FEs examined.

Except for the categories S (Sentence) and AP (adverbial or adjectival phrase), the various phrase types embody a few common syntactic patterns. Within the group of verb phrases, the predominant phrase types are [VP [PP V]] like, e.g., *aan de gang gaan* 'get going' or *in herhaling vervallen* 'to repeat oneself', and [VP [NP V]] like, e.g., *rijkdom vergaren* 'gather a fortune' or *tijd winnen* 'gain time'. In the latter category, the NP typically functions as direct object. Only in very few cases does the NP function as indirect object. When prepositional phrases are part of a verb phrase (and thus in the

overall counts appear as VPs) they often function as locatives and appear together with support verbs that add little or no content to the phrase (e.g., *aan de dijk zetten* 'put someone on the dike', i.e., 'to fire someone' , *op de proppen komen* 'to come forward with something').

Within the group of noun phrases, the majority of phrases is rather short and preferably occurs in the form [NP [NP PP]] (e.g., *het rijk van de schimmen* 'realm of the spirits', *behoefte van het ogenblik* 'necessity of the moment') or in the form [NP [A N]] (e.g., *optisch bedrog* 'optic illusion', *dikke voldoende* 'good grade'). The prepositional phrases mostly take the form [PP [P NP]], e.g., *in de aanbieding* 'on sale' or *buiten kijf* 'beyond debate'. Adjectival or adverbial phrases (APs, e.g., *dik bevriend* 'be very good friends', *volslagen toktok* 'completely *toktok*, completely crazy') form only a small part of the sample with rather variable structures. The same holds for the category sentence (S). These are often proverbs and sayings, but as can be seen in the weighted proportions in Table 2.9, they hardly ever occur in the corpus.

An extensive analysis of the syntactic characteristics of FEs in English is provided by Moon (1998). An equally detailed analysis was beyond the scope of the present study, but a superficial inspection of the sample indicates that a more detailed analysis of the INL sample will probably not be at variance with what Moon reports. She categorized 40% of all FEs as predicates and 28% as adjuncts. These categories are roughly comparable with the VP and PP categories defined for the INL sample. As shown in Table 2.9, the relative proportion of these types differ from the weighted proportions. However, taken together they clearly are the dominant structures: 54% for the raw proportions and 70% for the weighted proportions, as compared to 68% in Moon's (unweighted) data).

Discussion

Frequency data were presented for 1102 Dutch FEs, with the aim of answering the question of the relevance of FEs in everyday language. By counting FEs in the Van Dale NN dictionary (1996), a first estimate could be made. If all the FEs that have been included in this dictionary form an actual part of living Dutch, then about one fifth of the Dutch

Table 2.9: Distribution of FEs (ordered by overall phrase type) in terms of proportions. NP = noun phrase, VP = verb phrase, PP = prepositional phrase, AP = adjectival or adverbial phrase, S = sentence. The first column shows the type frequency in the sample (in percent), the second column shows the token frequency. The third column shows the mean length as number of words.

phrase type	*type frequency*	*token frequency*	*mean length*
NP	27%	22%	2.8
VP	41%	31%	3.6
PP	10%	38%	3.2
AP	5%	7%	3.1
S	15%	2%	5.4
others	1%	-	-

lexicon must be considered as consisting of FEs. However, as with words, there seems to be a large gap between what we can find in the dictionary and what we actually use. The frequency counts for the FEs indicate that as much as 35% of these FEs did not occur a single time in a corpus of 52.6 million words. Even if one takes into account the fact that a written corpus does not necessarily mirror spoken language, this must be considered a large proportion. On the other hand, the number of zero frequency FEs should not be overestimated. A failure to appear in a corpus can be dependent on the corpus' style and genre, or might just be a random event. Nevertheless, there seems to be a great proportion of FEs that are not likely to be shared linguistic knowledge of the average speaker of Dutch. Therefore, if one takes this result seriously, the number of FEs in Dutch should be corrected by at least 35%. That is, the estimate of 17,500 FEs in Dutch has to be reduced to a mere 11,375 FEs that are really in use. This still is an optimistic estimate, because the concern of randomness not only holds for zero frequencies. For example, Moon (1998) considers any event with a frequency lower than four per 18 million words a random event. However, for the present purpose, 11,375 FEs seem a reasonable estimate. Together with the token frequencies of the FEs and their average length, it allows for a cautious estimate of what proportion of the INL corpus is made up of FEs:

$$\frac{number\ of\ FEs * average\ length * average\ frequency\ per\ mln}{1,000,000}$$

that is

$$\frac{11375 * 3.6 * 1.8}{1,000,000} = 0.07$$

or 7% of the words in the corpus. Of course, this must be considered a rather rough "estimate of estimates", the order of magnitude being more important than the actual figure. However, examination of a small text sample (randomly chosen) of some 4000 words of the NRC Handelsblad newspaper yields a very similar result. I classified 7.8% of these words as belonging to FEs, according to the criteria that were discussed in the introduction. Moon (1998) did not calculate the proportion of FE words in OHPC[18], but she expects it to be between 4% and 5%. Again, possible differences in genre, corpus size and language do not allow for a direct comparison of Moon's and my data. However, the general tendency is similar. It seems reasonable to conclude that at least about 7% of the words that are used in everyday (written) language are actually used as parts of a FE.

How does the estimate of some 12,000 FEs in Dutch relate to the earlier mentioned estimate of 40,000 FEs by Jackendoff (1995)? It seems to me that the latter figure is too high an estimate, because Jackendoff's concept of FEs includes a diversity of units, such as song titles and famous fragments of poems, that have not been considered in the present study. Such units are highly personal in nature and though one might assume that every person knows a certain number of song titles, it seems doubtful whether "Knocking on heaven's door"[19] should be considered shared linguistic knowledge. In other words, an estimate of the number of FEs in a language is always dependent on the underlying definition of FEs. For the present analyses, I used (a slightly adapted version of) the FE categories used by Moon (1998), which are much stricter than those applied by Jackendoff. The motivation for this choice was only partially a methodological one. It also results from the fact that, as yet, there is no theory that can help us decide whether or not well-known phrases (e.g., song titles) should be considered part of the mental lexicon. It seems tempting to include short phrases like "New York, New York". But what if the speaker in question actually knows the complete song by heart?

In general, it is striking that the estimates of the number of FEs that result from Moon's

[18] The Oxford Hector Pilot Corpus.
[19] The title of a popular rock song written by Bob Dylan.

and my analyses are so much lower than those of other authors such as Pawley and Syder (1983) or Mel'čuk (1995), who estimate the number of FEs to be at least as large as the number of words, but probably higher. Again, a large-scale analysis of spoken corpora may be the best way to find an empirical solution to this difference. However, the differences in views on *what* exactly should be counted in such a survey will probably remain. Future psycholinguistic research might help to further shape a common definition of FEs, since FE status is expected to be mirrored in language processing.

In addition to performing a pure frequency analysis, I also tried to shed light on the characteristics of Dutch FEs. The analysis of FE length shows that FEs most often are quite short building blocks. Taking FE frequency into account, the majority of actually used FEs consists of no more than two or three words. A closer look at these words revealed that they tend to be rather frequent. In general, FEs are short phrases that make use of very "normal" words of the language. They seem to be built around nouns, as is reflected in the relative dominance of nouns as opposed to verbs, and in the fact that those verbs that do appear in FEs tend to be support verbs of little semantic content.

The characterization of the FEs in the sample in terms of their syntactic structure had to remain rather shallow and by no means claims to be complete. As one could expect from their length, FEs mainly appear to be simply structured phrases that can easily be inserted into ongoing speech or text. This is further reflected in the observation that high frequency FEs are most likely short collocations. This is interesting in itself, because it seems to be a counter-intuitive finding if one looks at the (psycho)linguistic literature on FEs. The majority of papers focuses on idioms, that have peculiar semantic (and often syntactic) characteristics. One might hypothesize that the salience of the figurative character of idioms compensates for their relatively low frequencies. In contrast, the more frequent class of collocations often remains unnoticed, since they do not have the extra feature of ambiguity and figurativeness attached to them. This makes them rather neutral elements with regard to genre and style. They might therefore best be characterized as the "functions words" in the world of FEs. Of course, also in this domain a more detailed analysis of the frequencies of different kinds of FEs can shed further light on the relationship between figurativeness and frequency of usage. The results of Moon

(1998) identify metaphors as the second most frequent type of FEs[20], and *formulae* (i.e., formulae, sayings, proverbs and similes) as the lowest frequency class.

In general, the method of frequency analysis has proven to be a useful tool to explore the usage of FEs. This holds especially for the cases where token frequencies could be used to correct type frequencies that are very likely to be subject to sampling errors. Given a more powerful search tool than the one applied in this study, one might also want to explore variations and transformations of Dutch FEs. This could give an indication for the tightness with which the words of a FE are bound together, as well as the syntactic flexibility exhibited by FEs. For a detailed analyis of these questions in English, see Moon (1998).

The contrast of salience versus frequency further indicates that frequency values alone do not tell us the whole story about the probability for a FE to have been stored in the mental lexicon. The great majority of FEs in the sample has a frequency of less than one per one million words. Still, the fact that they *are* being used indicates that they are still part of the active lexicon, and thus part of the mental lexicon of average native speakers of Dutch. A main reason for the low frequencies of many FEs is their extremely specific conceptual content, and the specific genre they are applied in. Also, one might expect that a recognition test will reveal that even extremely low frequency FEs are still *passively* known by native speakers of a language.

A final question concerns the generalizability of the present results to the field of spoken interaction. As mentioned in the introduction, a corpus of spoken Dutch (Corpus Gesproken Nederlands) is currently being assembled. One will undoubtedly find different frequencies than those reported here, due to the general difference between spoken and written language, and due to the differences in style and genre. For example, formulae like "you know" in spoken English or the unavoidable "volgens mij" 'according to me' in Dutch are expected to be highly frequent elements in a spoken corpus. In contrast, Moon (1998) reports relatively lower frequencies for idioms in a spoken subcorpus of the Bank of England (BofE) corpus. In addition to varying frequencies for particular (classes of) FEs, one might also want to know whether the estimate of 7% of FEs in

[20]The most frequent class is "anomalous collocation".

the total corpus holds for spoken language as well. This is an empirical question that certainly deserves further exploration.

Conclusion

Fixed expressions are an intriguing phenomenon for such diverse disciplines as linguistics, lexicography, and psychology. In the present chapter, FEs were explored with linguistic methods, but the underlying aim was to gain insight into the phenomenon from a psychological perspective. How often do we have to deal with FEs in a language and what is the nature of these constructions? As I mentioned in the introduction, a theory of the mental lexicon needs to be able to explain the phenomena of normal, natural language use. The fact that FEs at first sight often seem to be exceptional constructions, containing odd words and structures, does not make them ideal candidates for inclusion in such a theory. However, the impression of FEs as being an odd part of language is misleading and the results presented in this chapter indicate that FEs are far from special. Instead, they are an integral part of the mental lexicon that definitely deserves attention in the form of a theory of the processing of FEs.

Appendix 2.A:
Examples of FEs from different parts of the frequency spectrum.

FEs with a frequency of 0 per million words[21]:

vuur en vlam spugen *spit fire and flame*, react in an aggressive way
werken als een galeislaaf *work like a galley slave*, work like a galley slave
gans en gaaf *completely and whole*, unharmed, intact
men kan van een kikker geen veren plukken *you can of a frog no feathers pluck*, some things are impossible
omarmend rijm *embracing rhyme*, abba rhyme scheme
bedrust voorschrijven *prescribe bed rest*, advise to stay in bed
de hond in de pot vinden *the dog in the pot find*, be too late for dinner
declaratoir vonnis *declarative verdict*, declarative verdict
een goed eind weg *a good end away*, far away

FEs with a frequency of 0-1 per million words:

overdaad schaadt *profusion harms*, profusion is harmful
wollig taalgebruik *wooly language use*, use many words to say little
dat komt wel goed *that comes [probably] good*, that will be alright
stom toeval *stupid coincidence*, pure coincidence
waar gehakt wordt vallen spaanders *where chopping is, fall chips*, some bad consequences of a (good) action cannot be avoided
onder tijdsdruk werken *under time pressure work*, work under time pressure
honger maakt rauwe bonen zoet *hunger makes raw beans sweet*, hunger makes one eat things one would not normally eat

FEs with a frequency of 1-2 per million words:

de koppen bij elkaar steken *the heads together put* , put one's heads together, confer
met het blote oog *with the naked eye*, by just looking at something

[21] **Dutch FEs, *Transliteration*, Translation**

in de minderheid *in the minority*, in the minority
bij uitzondering *with exception*, with exception
zwevende kiezers *floating voters*, indecisive voters

FEs with a frequency of 2-5 per million words:

militaire dienst *military duty*, draft
binnen afzienbare tijd *within foreseeable time*, within the near future
op de proppen komen *to come on the pellets*, initiate, suggest
nationaal inkomen *national income*, national income
vrije school *free school*, anthroposofic or R. Steiner school
te zijner tijd *at its time*, when the right time has come

FEs with a frequency of 5-10 per million words:

op gang brengen *on go bring*, to get going
een beeld schetsen *a picture sketch*, to sketch a picture, to give a rough description
van tijd tot tijd *from time to time*, from time to time
over en weer *over and back*, back and forth
met medewerking van *with assistance from*, with assistance from
in de rij staan *in the line stand*, to queue

FEs with a frequency of 10-50 per million words:

een beeld geven van *a picture give of*, to describe
akkoord gaan met *agreement go with*, agree with
openbaar vervoer *public transport*, public transport
min of meer *less or more*, more or less
op tijd *in time*, in time
bij elkaar *with each other*, together

Appendix 2.B:
Content words with a predictive value of one or higher

The overview below lists all content words with a predictive value of one or higher. The number after the Dutch FEs reflects the score of a paper and pencil test of the words' predictability for the FEs in question. See text for further details.

Content Word, Dutch FEs, Predictability measured in offline task
Transliteration, Translation

Nouns:
record, een record verbeteren, 0+
a record beat, beat a record
record, een record breken, 0+
a record break, break a record
kwast, verwaande kwast, 0
conceited brush, conceited guy
vervoering, in vervoering raken, 2+
in poetic ecstasy get, be carried away
toeten, van toeten noch blazen weten, 5
of toot nor blow know, not know the first thing about sth.
name, met name, 7
with name, in particular
akkoord, akkoord gaan met, 6
agreement go with, agree with
fabelen, naar het rijk der fabelen verwijzen, 2+
to the realm of fiction relegate, relegate (sth.) to the realm of fiction
ultimatum, een ultimatum stellen, 6
an ultimatum put, deliver an ultimatum
spaan, (er blijft) geen spaan van heel, 4
(there stays) no chip of intact, (sth.) is completey torn into pieces
justitie, officier van justitie, 1

officer of justice, public prosecutor

voetsporen, in NPs voetsporen treden, 5+

in NPs footprint step, follow in s.o.'s footsteps

toezeggingen, toezeggingen doen, 7

promises make, make promises

kijf, buiten kijf, 6

beyond dispute, beyond dispute

penningmeester, de penningmeester dechargeren, 0

the treasurer discharge, discharge the treasurer

mispel, zo rot als een mispel, 1

as rotten as a medlar, rotten through and through

leugens, pertinente leugens, 0

absolute lies, absolute lies

wils, voor elk wat wils, 4++

voor everybody what wanted, something for everybody

pluimage, van diverse pluimage, 1++

of diverse plumage, of different kinds

vervoer, openbaar vervoer, 4

public transport, public transport

proppen, op de proppen komen, 6

on the balls come, put forward, come out

Verbs:

dechargeren, de penningmeester dechargeren,

the treasurer discharge, discharge the treasurer

beraden, zich beraden op, 3

oneself consider on, consider, think over

debuteren, debuteren met, 4

make one's debut with, make one's debut with

memento, memento mori, 4

memento mori, memento mori

Adjectives and adverbs:

pertinente, pertinente leugens, 0

absolute lies, absolute lies, utter nonsense

verwaande, verwaande kwast, 4

conceited brush, conceited guy

preferente, preferente aandelen, 2

preference shares, preference shares

ondergeschoven, ondergeschoven kind, 7

supposititious child, supposititious child, changeling

overstag, overstag gaan, 5

tack, change one's mind

afzienbare, binnen afzienbare tijd, 6

within surveyable time, in the near future

schoolgaande, schoolgaande kinderen, 6

schoolgoing children, choolgoing children

achterheen, er achterheen gaan, 4

thereafter go, follow sth. up

vette, vette koppen, 0

bold headlines, bold headlines

overblijvende, overblijvende planten, 0

staying-plants, perennials

gemiste, een gemiste kans, 7

a missed opportunity, a missed opportunity

openbaar, openbaar vervoer, 0

public transport, public transport

Lexical access during the production of idiomatic phrases

Chapter 3

Introduction

Listening carefully to everyday conversations reveals that speakers rely heavily on pre-formatted utterances. They talk about the skeletons in their neighbour's closet, about the new position they are looking forward to, and they bet their shirt that their colleague's new car cost an arm and a leg. Such utterances are not new creations of the speakers themselves. Instead, they belong to the conventional repertoire of the native speaker of a language. Both their meaning and their form are standardized, often allowing for only minimal variation. Phrasal units as those cited above are often denoted as *Fixed Expressions* (hereafter referred to as FEs). The term FE covers a broad variety of multiword lexical units, ranging from phrasal verbs via restricted collocations[1] and idiomatic expressions (e.g., *to hit the road*) to sayings and proverbs (e.g., *a bird in the hand is worth two in the bush*).

Idiomatic expressions or *idioms* occupy a special position in this list because, unlike compositional phrases and collocations, their meaning is partly or completely non-compositional. The relationship between the meanings of the words that make up the utterance and the utterance as a whole is at least indirect and often absent. Typically, this goes unnoticed

[1] i.e., fixed, identifiable, non-idiomatic phrases and constructions, for example *to look forward to* or *to commit murder* (Benson, Benson, & Ilson, 1997)

by both speakers and hearers. For example, *to paint the town red* does not refer to the action of painting. However, the figurative meaning "going out, having a good time" might even be so strong that the sentence *They painted the town red, the animals green, and the flowers in shiny orange* evokes a garden-path effect.

Despite the rather loose relationship between the meaning of a FE and the meanings of its individual words, a FE's elements cannot generally be replaced or modified. For example, replacing *road* by *path* in *hit the road* yields a phrase that only has a literal interpretation and, at best, can be understood as a creative modification of the original idiom. The same holds for the insertion of a modifier as in *they hit the* icy *road* and for manipulations of the syntactic structure (*the road was hit by them*).

As a result, idioms are the prototypical examples of FEs. Their component words form a fixed set, with the consequence that exchanging or excluding one of them generally precludes the figurative interpretation of the phrase. The figurative interpretation is something that speakers have learned to attach to this phrase. This is most obvious in idioms that are *opaque*, like for example *kick the bucket*. Nothing about the literal meaning of this phrase suggests any relationship with dying. Still speakers *know* that *last night Jim kicked the bucket* means that Jim is dead.[2]

As to an idiom's syntactic behavior, it is as yet unclear how the syntactic constraints that apply to an idiom are learned and to what extent they are related to an idiom's syntactic or semantic features.[3] Flavell and Flavell (1992) assume that "there is no idiom that does not have a syntactic defect, that fails to undergo some grammatical operation that its syntactic structure would suggest is appropriate" (p. 6-7).

Both the non-literalness and the syntactic constraints that apply to idioms suggest that we are dealing with special units of linguistic processing. However, it is not only the different *kinds* of constraints and exceptions that apply to different idioms, but the mere fact that native speakers know these constraints so very well, which makes idioms an interesting case for further examination.

[2]Of course, a literal reading is never excluded. In a context where there has been a discussion about people kicking buckets, the literal reading will be preferred.

[3]See Nunberg (1978) and Gibbs and Nayak (1989) for a discussion of the relationship between an idiom's semantic decompositionality and its syntactic flexibility.

Still, idioms and FEs have not been addressed in standard accounts of language production, despite the fact that from an empirical point of view, FEs are anything but exceptions: a recently published dictionary of Dutch FEs and proverbs lists more than 22,000 entries (Meulendijks & Schuil, 1998), the Van Dale idiom dictionary (1999) about 10,000 entries. Jackendoff (1995) suggests that the number of FEs that speakers know (including names, titles, poetry and the like) and the number of single words in their vocabulary are at least of the same order of magnitude. He also argues that given their linguistic properties, the natural place to store FEs is the mental lexicon. This implies that estimates of the size of the (passive) mental lexicon (about 60,000 words; Miller, 1991) may have to be doubled. Even if only a portion of the FEs is actually part of the average speaker's *active* lexicon, clearly they are far from special: speakers use them quite frequently, which makes them an inherent feature of "native-like" language use (Pawley & Syder, 1983).

Incorporating FEs into the mental lexicon requires a theory of how they are stored, accessed and processed. Much work has been done in the field of language comprehension of fixed expressions, but only few studies have been devoted to the *production* of FEs. After a brief discussion of the literature we will present the findings from three experiments that explore the production of Dutch idiomatic expressions. We focus on the mental representation of idioms in the speaker's lexicon and the relationship between the idiom as a whole and the words it contains. We will argue that despite their special linguistic features, idioms are not special from the speaker's point of view and that they can be incorporated into standard models of language production.

Psycholinguistic studies of idiom comprehension have addressed the questions of how listeners derive the meaning of an idiomatic expression, what role literal word meanings play in that process, and how an idiomatic expression is identified as such. Though the results of these studies cannot tell us much about the *processes* that come into play when idioms are produced, they can nevertheless help us to clarify the mystery of how idioms are stored and represented in the mental lexicon, given the assumption that the same network of abstract concepts and linguistic representations is used for both language comprehension and production.

Within the literature on idiom comprehension, the prevailing view of idiom representation has for some time been that of a "unitary representation" (e.g., Bobrow & Bell, 1973; Swinney & Cutler, 1979). This view focuses on the non-literalness aspect of idioms, suggesting that idiomatic phrases are treated as long words that have their own entries in the mental lexicon and that lack the sort of internal structure that non-idiomatic phrases have. As Cutting and Bock (1997) point out, a strong interpretation of Swinney and Cutler's Lexical Representation Hypothesis takes the notion of an "idiom-word" literally. In this view, the single words that make up the phrase and the semantic and syntactic information they entail do not play a role for the idiom as a unit. The idiom-word supposedly is internally unstructured. However, several observations argue against such an unstructured representation. There is correct stress assignment in idioms and many of them show (restricted) syntactic flexibility (Katz, 1973). In an on-line syntactic priming procedure, Peterson, Burgess, Dell, and Eberhard (2001) demonstrate a syntactic priming effect for idiomatic phrases, independent of the degree of the structural flexibility of a given idiom. Furthermore, the idiom-word account precludes the possibility of parts of an idiom carrying part of the idiomatic meaning. However, idioms can have components that refer separately to the components of their figurative referents. Such idioms are defined as semantically decomposable. For example, in *break the ice*, *ice* refers to a "cold" social atmosphere and *break* to the process of changing it. Thus, semantically decomposable idioms allow us to match certain roles and relationships between the entities addressed in the idiom with their figurative counterparts. *Breaking the ice* is like *changing the social atmosphere in a positive fashion*. Based on Nunberg, Sag, and Wasow's (1994) observation that idioms vary in semantic decompositionality, Gibbs and Nayak (1989) point out that internal modifications of idioms only change part of their meaning and assume that in such cases each component makes its own contribution to the figurative interpretation of the idiom as a whole.

The concept of semantic decomposition of idioms is comparable to Zwitserlood's (1994) theory of the mental representation of compounds. For fully and partially transparent compounds (but not for opaque ones) she found that the semantics of the compounds' constituents are accessed during processing. She suggests that these compounds have their own semantic representation that is linked to the semantic representations of their

constituents. Zwitserlood argues that such an architecture can explain the semantic transparency of these compounds, while still allowing for the fact that their meaning is more than the meaning of their component parts.

For the field of idiom processing, a closely related question concerns the role of the literal meanings of the words that constitute an idiomatic expression. Outside the field of idiomaticity, language processing has been shown to be non-optional, i.e., we cannot decide *not* to process linguistic information (e.g., Miller & Johnson-Laird, 1976) . It seems therefore quite improbable that the words that make up an idiomatic utterance are not processed along the established lines of word recognition. However, merely activating lexical representations does not tell us the whole story about idiom comprehension. Clearly, some additional processes must be involved that are capable of discovering the non-literal nature of the utterance and that preclude noticeable disturbance by the utterance's literal meaning.

Cacciari and colleagues have focused on the role of literal word meanings in idiom comprehension. For example, Cacciari and Tabossi (1988) showed that, in the absence of contextual cues to the idiomatic meaning of a phrase, the activation of the literal meaning of its last word (that had been ambiguous between a literal and an idiomatic interpretation up to this position) precedes the activation of the idiomatic word meaning by about 300 ms. In contrast, given an *idiomatic* context, both the literal and the idiomatic word meanings are available immediately upon presentation. Cacciari and Glucksberg (1991) acknowledge that active literal meanings do not have to play a *functional* role in idiom understanding. Nevertheless, their activity can be measured, that is, the comprehension system does not seem to switch to a completely different manner of processing when running into idioms.

With their *Configuration Hypothesis*, Cacciari and Tabossi (1988) propose a theoretical framework accounting for their findings. In the first place, an idiomatic phrase is assumed to activate the same lexical items that would otherwise be involved in the comprehension of literal discourse. This process immediately yields the literal interpretation of the words involved. Access to the idiomatic meaning of a phrase requires recognizing the phrase as a special configuration. This configuration emerges after some informa-

tion that uniquely identifies the idiom as such (the idiom's *key*) has been processed. The interpretation of an idiomatic phrase is therefore literal until the configuration has been recognized. This theory clearly differs from the idiom-word approach referred to earlier, because Cacciari and Tabossi claim that "... each word is represented in the lexicon only in one form and need not be marked as literal or idiomatic."(p.679). Second, the theory accounts for the syntactic parsing of idioms. However, the authors do not specify how the syntactic constraints that are typical of idiomatic expressions are represented within the framework. Moreover, the definition of idiom key is unsatisfactory in that it does not enable its unambiguous identification in arbitrary idioms (but see also Tabossi & Zardon, 1993).

The Configuration Hypothesis clearly marks a shift of focus within the idiom comprehension literature towards the compositional aspect of idioms: idioms are made up of words that in most cases play their normal role in non-idiomatic language. In sum, idiom comprehension suggests that a theory of idiom representation has to solve a paradox: how to account for the unitary nature of idioms, given the literal interpretation of the single words involved.

However, one must be cautious when generalizing from idiom comprehension theories to a theory of idiom *production.* One should keep in mind that the speaker's situation is quite different from that of the listener. The process of speaking starts with the conceptual message and ends with an utterance that can be taken either literally or not. While the listener makes a decision about one or the other interpretation, there is no doubt on the part of the speaker about the message to be conveyed. Still, in the case of idioms, the compositional meaning of the words produced does not match that message.[4] The message that underlies an idiom often cannot even be paraphrased satisfactorily, its meaning is unique. Idioms have their own characteristic conceptual conditions and it seems therefore perfectly straightforward to assume, with Levelt (1989), that idioms have their own entry on the level of lexical concepts (see also Flavell & Flavell, 1992).

Accordingly, the first question that arises when considering idiom production is how the speaker handles this apparent contradiction. On the one hand we must investigate what

[4]See Nooteboom, 1999, for a discussion of speech errors and monitoring in idioms

role the individual words of an idiom play in production and how they are activated. On the other hand we must assume some unitary conceptual representation of idioms. The idea that idiom production also somehow involves the representations of single words that are entered in the lexicon in their own right is conducive to a maximally parsimonious conception of the mental lexicon.

To our knowledge, Cutting and Bock (1997) conducted the first experimental study answering some of the questions about the storage of idiomatic expressions in the mental lexicon and their retrieval during production. They studied semantic and syntactic influences on experimentally elicited idiom blends. Participants read two simultaneously presented (idiomatic) phrases (e.g., *meet your maker* and *kick the bucket*) and then, after a delay of two seconds, produced one of them in response to a cue. This procedure was expected to give rise to competition between the phrases, thereby setting the stage for the production of spontaneous phrase blends.

In their first experiment, Cutting and Bock investigated the sensitivity of idiom blends to both the internal structure and the figurative meaning of the idioms involved. They found that identical figurative meanings of two competing idioms resulted in significantly longer production latencies. Moreover, idioms with the same syntactic structure were more likely to blend than idioms with different structures. When examining intra-idiom errors in more detail, they found that these errors follow a grammatical class constraint (see also Stemberger, 1982). The authors conclude that idioms are not produced as "frozen phrases", but instead are syntactically analyzed.

In their second experiment, Cutting and Bock showed that phrase pairs with the same meaning produced more blends than phrase pairs with different meanings, irrespective of whether they were idiomatic or not. Moreover, the grammatical class constraint holds for both conditions, i.e., it is blind to the (non-)idiomaticity of the blending phrases. The results are interpreted as evidence for the activity of literal word meanings during the production of idiomatic phrases.

In a third experiment, Cutting and Bock investigated the hypothesis proposed by Gibbs and Nayak (1989) that the lexical representation of semantically decomposable idioms is less rigidly specified and more susceptible to change than that of non-decomposable

idioms. All idiom pairs presented shared both their syntactic structure and their figurative meaning, but differed in decompositionality (e.g., *shoot the breeze* and *chew the fat* as non-decomposable pair and *hold your tongue* and *button your lip* as decomposable pair). The error rates were the same for both kinds of pairs, that is, the (non-)decompositionality of an idiom is not mirrored in the production process. The authors conclude that the lexical representations of decomposable and non-decomposable idioms are the same when they enter into the production process.

Based on these findings, Cutting and Bock suggest a way of integrating idiom production into current models of language production (Dell, 1986; Levelt, 1989). They assume that each idiom has its own *lexical concept node*. Thus, idioms are represented as *unitary entities* on at least one processing level.

The authors assume furthermore that one concept can activate multiple lexical concept nodes (including other idioms) as is the case in non-idiomatic phrase production. For example, the concept that activated the lexical conceptual representation of *kick the bucket* is assumed to activate *meet your maker* as well. This may lead to competition and to semantic blends, as in *meet the bucket maker*.

In contrast, semantic decomposition is modeled by multiple concepts activating *one* lexical concept node. Thus, for example the concept *pop the question* (to propose marriage) is linked to both the concepts for *suddenly* and for *to propose*. However, in contradiction to Gibbs and Nayak's (1989) hypothesis, this representational difference has no effect on the syntactic flexibility of compositional and non-compositional idioms. Once the level of (lexical) concepts has been passed, processing no longer differs for decompositional and non-decompositional idioms anymore, making decomposition an issue of concepts, not syntax (see Figure 3.1).

When an idiomatic lexical concept node has been activated, activation spreads in *two* directions: First, the lemmas that together constitute the idiom get activated. In addition, activation spreads to *syntactic* information in the form of prefabricated phrasal frames. Accordingly, the model explains blending errors in syntactically similar idioms by means of shared phrasal frames. Cutting and Bock conclude that

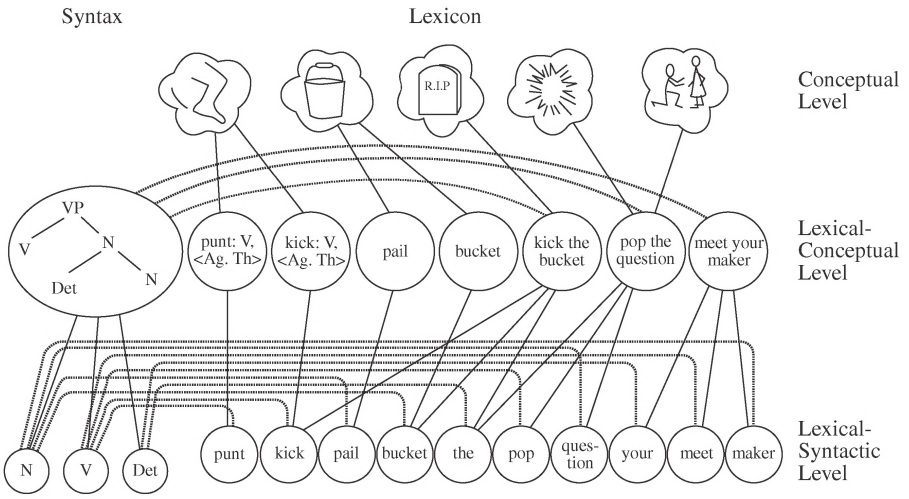

Figure 3.1: Model of the lexicon according to Cutting and Bock (1997).

> "Idioms may be special in their relationships to nonlinguistic concepts, but they are not special in the way they are produced in normal language use."(p. 69)

In sum, Cutting and Bock (1997) subscribe to the view that, although idioms are stored as a whole on some level of processing, they cannot be word-like entries without internal structure. Thus, Cacciari and Tabossi's (1988) view on idiom comprehension is mirrored in speech production.

The common factor of these theories is their solution of the earlier mentioned paradox. Idioms are unitary and compositional at the same time. Idioms can be both unitary in that they require their own lexical entry, and compositional, in that they make use of simple lemmas in the mental lexicon. These simple lemmas *can* be used within an idiomatic context, but they are not restricted to it. For example, if a speaker says "I was going to hit the road", he or she will be using the same lexical entry for "road" that is involved

in saying "I was going to clean the road". However, in the first example the lemma "road" will be activated via an entry that represents the idiom "hit the road" as a whole, while in the second example the lemma "road" will be activated by its own conceptual representation.

The present evidence for a "hybrid" model of idiom production is largely based on speech error data (Cutting & Bock, 1997). Though speech errors are a valuable source of data for theories of language production, they cannot show that error-free production takes place along the same pathways. Speech errors signal that some step(s) during lexical access went wrong. A theory of idiom representation therefore needs to be complemented with data that show the pathway of activation during normal speech production. We will present three experiments which test the predictions of the hybrid model for error-free speech production with a reaction time paradigm.

The predictions that we deduce from a hybrid model of idiom representation concern the possibility of *priming* the simple lemmas that belong to a phrase. If it is the case that the simple lemmas involved in idiom production are the same as those involved in compositional phrase production, it must be possible to activate these lemmas by means of priming. We know that the activation of a lemma by means of an identity prime speeds up production (e.g., Glaser & Düngelhoff,1984). Thus, priming *road* in *clean the road* by means of the word *road* itself is expected to result in shorter production latencies, compared to a condition where the prime is unrelated to the target words. If our assumption that simple lemmas are involved in idiom production is right, a similar effect of identity priming should be found for the production of *hit the road* as well. Therefore, we expect a significant main effect of prime type. In particular, we expect facilitating priming from identity primes (i.e., prime words that are identical to one of the words in the phrase), but not from control-primes that are phonologically and semantically unrelated to the to-be-produced utterance.

However, we do not expect the priming effect to be of the same magnitude for the two types of phrases. Instead, we predict a stronger facilitation from the identity prime in the case of idioms. Consider the case of *hit the road* again. Hearing the word *road* should activate the lemma *road* and, if it is indeed connected with a common idiom represen-

tation, the lexical entry *hit the road* should be activated as well. Upon selection of this entry, further activation spreading will result in higher activation levels of all simple lemmas attached to the idiom, thus speeding up their selection. In our example, *hit* can be selected more easily, thereby affecting the production latencies for *hit the road*. A literal phrase like *clean the road* on the other hand cannot profit to the same amount from *road* being primed. Though the priming of *road* should speed up production of the phrase involving that word to some extent, no benefit for the other lemmas belonging to the phrase is expected. The priming effect of *road* for *clean the road* should be smaller than that for *hit the road*, because no common lexical entry gets selected that binds the word *clean* to *road*. Their combination is transient and a consequence of conceptual decisions. In other words, we expect an interaction between the factors *prime type* (either related to one of the words of the phrase or unrelated) and *idiomaticity* (literal versus idiomatic phrases). If this interaction obtains, it would argue for a connection in the mental lexicon between simple lemmas via a common idiom representation.

We have tested these predictions in a series of three cued-recall experiments. Participants produced idiomatic and literal phrases in response to a visually presented prompt word. Primes were presented auditorily and simultaneously with the prompt word presentation. Response time analyses were carried out in order to determine the effects of priming and idiomaticity on response latencies.

Experiment 1

In Experiment 1, idiomatic and literal phrases were produced in the form [prep] [det] [noun] [verb(inf.)], with the primed target word being the second of two content words in the phrase. The prime was either identical with the target or semantically and phonologically unrelated.

Method

Participants

Nineteen participants were tested, who were all undergraduate students of the University of Nijmegen and native speakers of Dutch. They were paid for their participation.

Materials

We constructed sixteen item pairs on the basis of sixteen idiomatic expressions, all of the same syntactic structure: [VP [PP Prep [NP art N]] V]. They were all judged by six native speakers to be well-known Dutch idiomatic phrases. All phrases were infinitival Dutch phrases, as for example

> *door de mand vallen* (word-by-word translation: 'through the basket fall', i.e., to fall through the basket, figurative 'to have to own up, confess').

That is, their word order was [preposition] [determiner] [noun] [verb, inf.] in all cases.

Each idiomatic item was paired with a literal phrase that had the same syntactic form and the same noun as its idiomatic counterpart. A combination of an idiomatic and a literal phrase together yielded one item pair. Thus, for example *door de mand vallen* and *in de mand leggen* ('in the basket put', i.e., to put into the basket) form two members (idiomatic and literal) of the same item pair.

Every item required a prompt word that could trigger the production of the phrase. For example, the prompt word for *door de mand vallen* was *bekennen* 'to admit', the prompt word for *in de mand leggen* was *opbergen* 'to store'. The prompt words were chosen in such a way that they either paraphrased the meaning of the phrase in one word, or that they referred to an entity closely related to the meaning of the phrase. In both cases the prompt words formed strong semantic cues for the to-be-produced phrases. For the idiomatic phrases we ascertained that none of the prompt words referred to the literal meanings of their components. For both the idiomatic and the literal items, the prompts

were not allowed to be phonologically similar to the components of the phrases. The complete list of all items and the respective prompt words is given in Appendix 3.A.

The identity prime for each item was its noun, which was therefore the same for the idiomatic and literal item of a pair. In addition, 16 unrelated prime words were retrieved from the CELEX database (Baayen et al., 1993). They were frequency matched nouns that were semantically and phonologically unrelated to the phrases and their component words. A complete list of all primes is given in Appendix 3.C.

All primes were spoken by the same female native speaker of Dutch and were recorded on DAT-tape in one session.

Procedure

Participants were tested individually, and each session was recorded on DAT tape. The visual stimuli were presented on a computer screen, the acoustic stimuli via headphones. Responses were spoken into a microphone that was attached to a voice key, which in turn signaled the computer that a response had been initiated. The experiment was controlled by NESU[5], a program for controlling experiments that has been developed at the Max Planck Institute for Psycholinguistics.

An experimental session included a preparatory learning phase and two experimental cued-recall blocks with a pause in between.

Learning

After reading the instruction, participants were presented with a list of eight (prompt) words and associated phrases (half of them idiomatic and half of them literal). They were asked to memorize the phrases in such a way that they could produce the phrase fluently whenever they were presented with the prompt word. When the participants indicated that they knew all phrases by heart, they were presented a list of the prompt words alone (in random order) and had to produce the appropriate phrases as quickly and fluently

[5] Nijmegen Experiment Set-Up

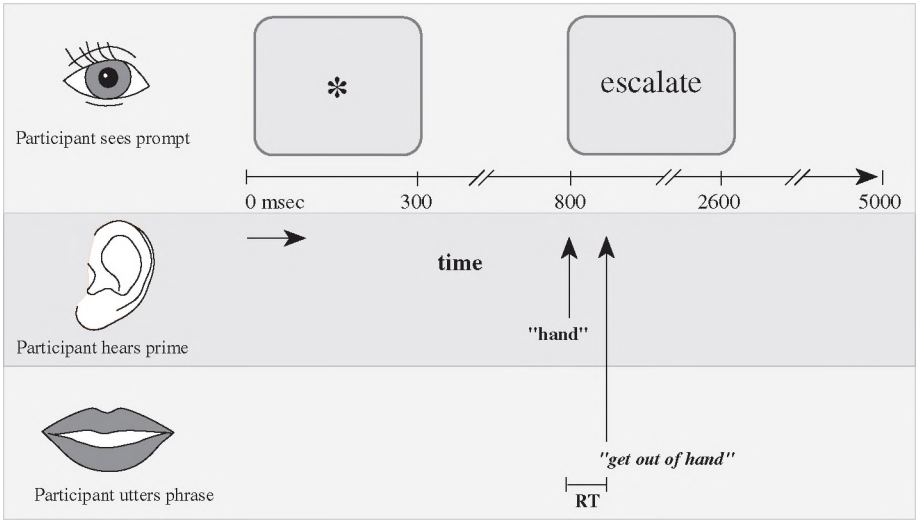

Figure 3.2: The timecourse of an experimental trial.

as possible. The production was judged by the experimenter. Any disfluencies or pauses led to a repetition of the learning phase and the rehearsal. Only when the participants succeeded in fluently producing all phrases, was the first experimental block started.

Cued recall

An experimental block consisted of the repeated presentation of eight previously learned prompt words and the production of their associated phrases by the speakers. Figure 3.2 depicts the time course of a typical trial. After a fixation cross had appeared in the center of the screen, participants saw one of the prompt words that they had learned in association with a phrase. Simultaneously with the presentation of the prompt word on the screen, a prime word was presented via the headphones. This prime was either identical to the noun of the to-be-produced phrase or unrelated. The participants' task was to react to the visually presented prompt word by producing the appropriate phrase as quickly as possible.

The responses triggered a voice key, whereafter the computer recorded the production onset latency of the response. If the speaker failed to respond within 4200 milliseconds, the computer automatically registered a missing response and a new trial was presented.

An experimental block consisted of 128 trials that were presented in pseudo-random order: there were at most two trials in the same condition[6], and the minimum distance between two appearances of an item was three trials. Every first presentation of an item counted as a practice trial, thus serving to refresh the participant's memory of the items within the context of the experimental situation. The participants were instructed to react as quickly as possible, but in a fluent fashion and without making mistakes. They were also asked to reduce coughing, etc., as far as possible and to avoid unnecessary noises that would set off the voice key. They were also told that they would be recorded on audio tape.

Participants could pause between experimental blocks. A second learning set was presented after participants indicated that they were ready to continue. The procedure was identical to the first part of the experiment, except that new words and phrases had to be learned and produced.

Design

The design included two within-subject factors (idiomaticity and prime, with two levels each), yielding four experimental conditions. Every speaker received one item out of each of the 16 item pairs, one half being idiomatic items, the other half literal. Both idiomatic and literal items were equally distributed over two experimental blocks. Every item was presented equally often with an identity prime as with an unrelated prime. The combination of an item with one of its primes was repeated eight times within a block, yielding 128 trials per block and 256 trials per subject. Since each subject only saw either the literal or the idiomatic item of an item pair, two different item lists were created. In addition, the order of block presentation was counterbalanced, yielding 4 different experimental lists. Every list was tested on four participants, each receiving a

[6] With condition defined as one of the four possible combinations of the variables *priming* (two levels) and *idiomaticity* (two levels).

different randomized version.

Analyses

The data of three participants were excluded from analyses due to measurement problems during the experiment, yielding sixteen sets of valid data. In addition, for every participant every first measurement of an item was excluded from the set of valid data.

The DAT-tape recordings of the sixteen remaining participants were checked for erroneous or missing responses and disfluencies. A response was scored as erroneous if either the word order had been changed or if one or more words had been replaced. However, this rule did not hold for preposition or verb exchanges in idiomatic phrases if they reflected variants of the same idiom. For example, *op de hoogte brengen* (to inform) was considered equivalent with *op de hoogte houden* (to keep informed), if used consistently over the trials.

The erroneous responses ($< 1\%$ of the valid data) were excluded from further analyses.[7] The remaining data points were entered into analyses of variance with idiomaticity and prime as within subject factors. Separate analyses were carried out with either subjects or items as random factors, yielding F1 and F2 statistics, respectively.

Results

The mean response latencies are shown in Table 3.1 and Figure 3.3, panel A. The main effect of priming was significant both in the subject and item analyses ($F_1(1, 15) = 64.23, MS_e = 2070, p < .001$; $F_2(1, 15) = 76.74, MS_e = 1834, p < .001$). As expected, phrases that were primed with an identity prime were produced faster than phrases produced with an unrelated prime (767 msec vs. 859 msec). The interaction of idiomaticity and prime was significant as well ($F_1(1, 15) = 15.60, MS_e = 853, p = .001$; $F_2(1, 15) = 14.59, MS_e = 865, p = .002$), and in the predicted direction. The

[7] An analysis of the error percentages yielded no significant difference between the idiomatic and the literal phrases (0.6% vs. 1%)

Table 3.1: Mean Production Latencies and Standard Deviations in Experiment 1.

	Priming	
Idiomaticity	Unrelated	Identity
literal	826 (101)	763 (86)
idiomatic	891 (109)	771 (94)

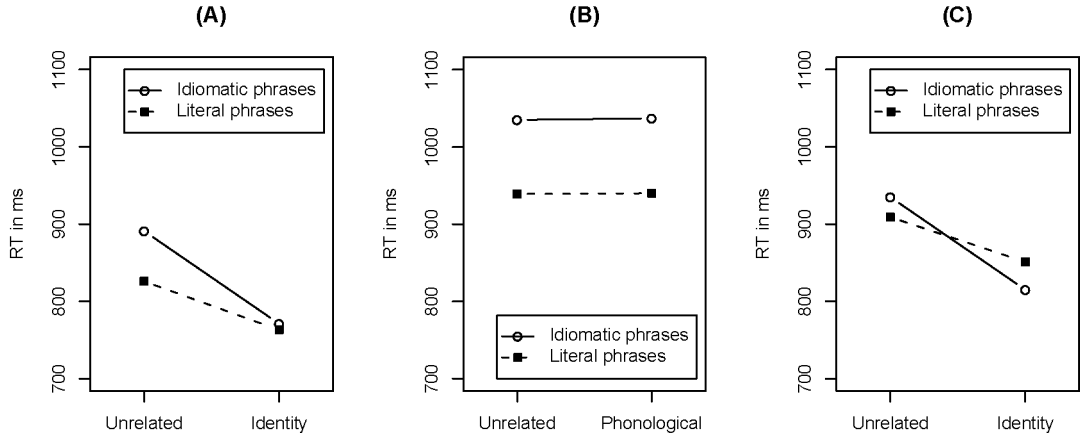

Figure 3.3: Mean Production Latencies for idiomatic and literal phrases primed with unrelated and identity or phonological primes. See text for description of the three experiments.

reduction in response latencies that idiomatic phrases gained from an identity prime compared to an unrelated prime was twice as large as the latency reduction for literal phrases (120 msec vs. 63 msec). A mean difference of 37 msec between idiomatic and literal phrases (with speech onset latencies for the idioms being longer than those for the literal phrases) also turned out to be significant in the subject analysis ($F_1(1, 15) = 11.22, MS_e = 1928, p = .004$) and marginally so in the item analysis ($F_2(1, 15) = 3.77, MS_e = 5591, p = .071$).

An additional analysis was conducted to examine a possible floor effect in the data. Because the average speech onset latencies in the related condition are very similar for the idiomatic and the literal phrases, it might be the case that participants cannot produce the phrases any faster than that. This would constrain the possible size of the effect of priming. As a consequence, the obtained interaction between idiomaticity and priming could be a pure side effect of such a floor effect. To examine this possibility, we split the

Table 3.2: Mean Production Latencies for fast and slow subjects in Experiment 1.

	Priming			
Speed	Fast		Slow	
Idiomaticity	*Unrelated*	*Identity*	*Unrelated*	*Identity*
literal	746	696	905	831
idiomatic	810	700	973	842

data into a group of slow and a group of fast subjects (between-subjects factor *speed*). If the obtained interaction of the factors priming and idiomaticity is due to a floor effect, an interaction between priming and speed is expected. However, we did not find such an effect ($F1(1, 14) < 1$). The mean response latencies are shown in Table 3.2

Discussion

The results support the hypothesis that during the planning of an idiomatic phrase the single words that make up the utterance are accessed separately. The increased availability of these words speeded up phrase production. The significant interaction between idiomaticity and prime type, priming being more effective for idioms than for literal phrases, argues for a special relation between the words that make up an idiomatic phrase.

However, there are two possible fallacies in our argumentation. One involves the claim that what we measured in Experiment 1 are actually effects of *lemma* priming, and the other involves the unexpected significant effect of idiomaticity (with idioms taking more time to produce than literal phrases). We will first discuss the question of where the priming effect is actually located. For expository purposes, the discussion of the effect of idiomaticity will be postponed to the discussion of Experiment 2.

One might argue that the reduction in response latencies that we found in the related priming condition might partly be due to phonological facilitation, since an identity prime obviously activates both meaning and form of the target word. Such a form priming effect would not allow us to draw conclusions about idiom representations on the

lemma level. Of course, phonological facilitation alone could not account for the interaction between priming and idiomaticity that we found, but nevertheless it could considerably weaken our conclusion. In contrast, demonstrating the absence of phonological priming effects in our Experiment would be additional evidence for the claim that the effects found in Experiment 1 mirror the facilitation of simple lemma access.

Experiment 2

We replicated Experiment 1 with a different set of prime words. In contrast to being identical with the noun of the to-be-produced phrase, these prime words were only phonologically similar to these nouns. Thus, for example, participants were presented the acoustic primeword *hoop* 'hope' whenever they had to produce the phrase *op de hoogte houden* (to keep [sb.] informed, literally "to keep on the height"). We predicted that there would be no effects of priming. Though phonological similarity is known to speed up word production (e.g., Schriefers, Meyer & Levelt,1990), we predicted that the relatively late position of the noun within the utterance (it is the third element) would preclude an effect of phonological priming on speech onset latencies (Kempen & Huijbers, 1983; Schriefers & Teruel, 1999; Levelt, 2002; Jescheniak, Schriefers, & Hantsch, In press).

Method

Participants

Twenty-two participants were tested, who were all undergraduate students of the University of Nijmegen and native speakers of Dutch. They were paid for their participation.

Materials

Materials, procedure and design were identical to those applied in Experiment 1, except for the prime words. The prime words were phonologically similar to the target word

Table 3.3: Mean Production Latencies and Standard Deviations in Experiment 2.

	Priming	
Idiomaticity	Unrelated	Phonological
literal	939 (179)	940 (176)
idiomatic	1035 (205)	1037 (219)

onset in the related prime condition, and semantically and phonologically unrelated to the target word in the unrelated prime condition. A complete list of all materials used can be found in Appendices 3.A and 3.C.

Analyses

The data of six participants were excluded from the analyses due to measurement errors and major attentional problems, yielding sixteen sets of valid data. These data were analyzed according to the same principles as described in Experiment 1. An analysis of the error percentages yielded no significant difference between the idiomatic and the literal phrases (1.7% on average, in both conditions).

Results

The mean response latencies are shown in Table 3.3 and Figure 3.3, panel B. The main effect of idiomaticity was significant in the subject analysis ($F_1(1, 15) = 35.26, MS_e = 4235, p < .001$) and marginally so in the item analysis ($F_2(1, 15) = 3.70, MS_e = 38062, p = .074$). The mean latencies were longer for idiomatic phrases than for literal phrases (1036 msec vs. 940 msec). The main effect of priming was - corresponding to our expectations - not significant (987 msec vs. 989 msec, F_1 and $F_2 < 1$), and neither was the interaction between idiomaticity and priming (F_1 and $F_2 < 1$).

Discussion

The results of Experiment 2 confirm our interpretation of the findings of Experiment 1. There being no facilitation from phonological primes supports our view that the effects found in Experiment 1 must have been due to lemma priming, not form priming.

Again, the data show a clear effect of idiomaticity. Although the material was chosen in such a way that idiomatic and literal phrases were very similar as regards their form and their component words, we find that it takes participants much longer to produce the idiomatic phrases. The source of this difference is unclear. Given the high similarity of the phrases, it suggests that the two types of sentences (idiomatic and literal) were not processed along the same pathways. However, an alternative explanation is based on the fact that idioms and literal phrases were combined each with their own set of prompt words. The idiomatic phrases might have taken more time to produce not because of a structural difference in the representation of the phrases, but because of a qualitative difference between the association strengths of prompt words and phrases in the different conditions. In other words, the idioms might simply have been more difficult to retrieve.

A control experiment was set up that systematically monitored the number of necessary learning trials participants needed to learn the phrases by heart. The results confirm the concern that the prompt-phrase combinations for the idiomatic phrases were more difficult than those for the literal phrases. In addition, for the idiomatic phrases, we found a high positive correlation ($r = .78, p < .01$) between the number of necessary learning trials and the mean speech latencies when no prime word was given. We therefore concluded that the main effect of idiomaticity found in Experiments 1 and 2 must be assigned to the different strength of association between the prompt word and the to-be-produced phrase for the idioms compared to the literal phrases.

Of course, such a finding undermines the strength of the interaction between priming and idiomaticity that we found in Experiment 1. One might argue that this interaction is not due to the existence of a special idiom representation, but because retrieval-by-association was harder for the idioms than for the literal phrases. If associations happened to be weaker in the idiomatic case, then the observed interaction should result

(cueing a difficult item allows for more facilitation than cueing an easy one that is at ceiling). Therefore we designed an additional experiment that circumvented the problem of qualitative differences in the association between prompts and targets.

Experiment 3

Experiment 3 made use of the same experimental technique as Experiments 1 and 2. Participants had to learn either the combination *Laura... viel buiten de boot* (literally "Laura... fell out of the boat", figurative "Laura... was excluded from the group") or *Laura... ging met de boot* 'Laura... went by boat'. By choosing names as cues for the production of a particular phrase we made sure that the prompts were neutral as to the semantic content of the to-be-produced phrases. Moreover, the prompt words were either identical or highly similar for the idiomatic and the literal variant of an item pair.[8] Differences in production latencies and/or priming effects between the two kinds of phrases (idiomatic and literal) in response to their prompt words must then be due to the properties of the phrases themselves and can no longer be ascribed to the semantic association between the phrases and their prompt words. We predicted a replication of the main effect of priming and the interaction between priming and idiomaticity that we had found in Experiment 1. Moreover, the effects were expected to be independent of the change of word order that resulted from using finite Dutch phrases (the primed target now being the last content word of the phrase), because the word order variation had earlier been applied successfully in an additional experiment. This experiment was a variant of Experiment 1 that combined semantic prompt words with finite past tense clauses (*viel door de mand*, 'fell through the basket'). The results confirmed the findings of Experiment 1. This effect is conform the prediction that part whole priming affects the availability of *all* elements of an idiom, not only the primed one.

[8]The introduction of an extra noun in the prompt of three item pairs was necessary because a person's name could not be the subject of the phrase; e.g., *John... got terribly out of hand

Method

Participants

Sixteen participants were tested, who were all undergraduate students of the Nijmegen University and native speakers of Dutch. They were paid for their participation.

Materials

While procedure and design were identical to the one used in Experiments 1 and 2, the materials were adapted such that the prompt word formed the beginning of a finite clause. For thirteen item pairs, the prompt word was a common Dutch name (e.g., *Jan*). The same name was chosen for both variants of an item pair (idiomatic and literal). For the remaining three item pairs the prompts consisted of a short phrase (name [possessive s] [noun]), like e.g., *Jan's feestje...* 'John's party...' vs. *Jan's dochter...* 'John's daughter...', which was different for the two versions of an item pair, but yet neutral with respect to the phrases' contents . This procedure allowed us to use the finite versions of the same items that had been used in Experiments 1 and 2.

Some of the phrases required the introduction of a direct object (e.g., *Karin... hield* ***hem*** *op de hoogte*, 'Karin... kept **him** informed'). In these cases the other item of an item pair was made longer, too, whether or not it was necessary from a syntactic point of view. This was accomplished by means of the insertion of modifiers (*Karin... schrok* ***erg*** *van de hoogte*, 'Karin... was freightened by the height **a lot**') Two items were slightly changed, because participants of Experiments 1 and 2 had indicated that the chosen items had a more common variant. In item 1 *uit de boot vallen* 'to fall out of the boat, to be excluded from the group') the preposition "uit" was replaced by "buiten" (both words can both be translated with "out of"). In item 16 *door de grond zinken* 'to sink trough the ground, to be so embarassed that you would like to disappear' we replaced the verb "zinken" by the verb "zakken" (both can be translated with "to sink"). In addition, three literal phrases were replaced by ones that fitted better with the finite idioms (items 18, 22 and 29). One idiom (item 13) was replaced for syntactic reasons (in the finite version

Table 3.4: Mean Production Latencies and Standard Deviations in Experiment 3.

	Priming	
Idiomaticity	Unrelated	Identity
literal	909 (164)	851 (163)
idiomatic	935 (160)	815 (157)

of *voor de wind gaan*, the persons's name would be the indirect object rather than the subject of the phrase). All replacements were taken in such a way that the target noun stayed the same, holding the same position in the phrase.

Using the finite form of the Dutch phrases resulted in a changed word order for all items, such that the primed noun (*mand* 'basket' in *Kees... viel vreselijk door de mand*) now became the *last* content word of the phrase. The complete materials are listed in Appendix 3.B.

Analyses

Except for error trials (3% of the data), no data were excluded from the analyses. The data were analyzed according to the same principles as described in Experiment 1.

Results

The mean response latencies are shown in Table 3.4 and Figure 3.3, panel C. An analysis of error percentages revealed a significant difference between the idiomatic and the literal phrases (on average 3.6% errors ($sd = 2.2$) for the idiomatic phrases vs. 2.3% errors ($sd = 1.6$) for the literal phrases; $t = -1.823, p = .044$ (one-tailed test). This effect was caused by two idiomatic items (1 and 14) whose error percentages were (more than) twice the average idiomatic error rate (7.1% and 7.8%, respectively). Since the aim of the experiment was to create a set of items that were equally difficult in all conditions, we excluded these items (and their literal counterparts) from further analyses.

The results confirm our hypotheses. There is no main effect of idiomaticity (F_1 and

$F_2 < 0$). The main effect of priming (on average 922 msec in the unrelated condition vs. 833 msec in the related condition) is significant ($F_1(1, 15) = 40.72, MS_e = 3136, p < .001, F_2(1, 13) = 40.47, MS_e = 2673, p < .001$), and so is the interaction (58 msec facilitation for the literal phrases vs. 120 msec facilitation for the idiomatic phrases, $F_1(1, 15) = 5.11, MS_e = 2930, p = .039; F_2(1, 13) = 4.78, MS_e = 2395, p = .048$).

Though the main effect of idiomaticity has proven to be non-significant, there is still a 26 msec difference in mean speech onset latencies in the unrelated condition. However, paired comparisons show that this difference is not significant ($t = -.813, p = .429$, two-tailed test). Instead, we find a significant difference between the mean speech onset latencies in the related condition ($t = 2.292, p = .037$), with idiomatic phrases being significantly faster than literal phrases.

Discussion

The results of Experiment 3 confirm the relevant findings of Experiment 1. Both idiomatic and literal phrases can by primed successfully by means of priming one of their content words. This effect supports the compositional nature of idiomatic expressions, suggesting that they make use of the very same lexical entries as the literal phrases do. Moreover, the effect of priming is stronger in the case of idioms. This squares well with another feature of idiomatic expressions, i.e., the fact that their different components are bound together by one common entry in the mental lexicon. Priming *one* of an idiom's elements results in spreading activation from the element to all the remaining elements via a common idiom representation, resulting in faster availability of these elements. For literal items, no such common representation exists. Priming speeds up the availability of the primed element, but cannot help preparing the remaining elements of the phrase. Therefore reaction times are relatively slower for the literal phrases. Taken together, the results of Experiment 3 confirm the idea of a hybrid model of idiom representation.

General Discussion

Three experiments were conducted to test a hybrid model of idiom representation. Such a model assumes that idioms are both unitary and compositional, be it at different levels of processing. They have a unitary idiomatic concept that points to individual lemmas. These lemmas together constitute the idiom, but they are not bound exclusively to an idiomatic meaning. For example, the idiom *he gave me a hand* 'he helped me' will involve the same lemma "hand" that is active during the production of "he gave me his hand" (i.e., a literal phrase). It is the *source* of activation for "hand" that differs in the two cases.

In Experiment 1 we observed a significant main effect of priming during phrase production. Hearing a word identical to the noun of the phrase that is being planned, significantly reduces production latencies for that phrase. This holds for both idiomatic and literal phrases, suggesting that the underlying representation of idioms is a word-based representation. This idea is further supported by a significant interaction between priming and idiomaticity. The relative reduction in planning time accomplished by identity priming is larger in the case of idioms than in the case of literal phrases.

In Experiment 2 we could show that the effects observed in Experiment 1 had not been caused by simple phonological priming. However, in both Experiments we found a large difference in reaction times between idiomatic phrases and literal phrases. A control experiment revealed that this difference was caused by the the prompt words being more effective cues for the idiomatic than for the literal phrases. Experiment 3 was designed to circumvent this problem. By using neutral prompt words in combination with finite phrases, we could replicate the main effect of priming and the interaction between priming and phrase type that we found in Experiment 1.

Thus, part-whole priming of idioms is not only possible, it is even more effective than part-whole priming of literal phrases. This is exactly what a hybrid model of idiom representation predicts, assuming that the individual words that constitute an idiom are separately addressable processing units, linked together in a common representation. Boosting the activation of one element of the idiom that is being planned has influence

on all the remaining elements. The observed latency reduction by an identity prime must be ascribed to the enhanced availability of *all* the words that make up the idiom. In contrast, the reduction in literal phrase planning time represents the maximum gain that phrase planning can get from the enhanced availability of only *one* of its elements.

In the introduction we discussed the basic architecture of such a hybrid model, as it has been formulated by Cutting and Bock (1997). In their view, idioms have their own lexical entry, which is directly linked to the simple lemmas that constitute the idiom. The data that we presented support this view of idiom representation. Together with Cutting and Bock's (1997) own speech error data the available evidence constitutes a firm empirical basis for the assumption of idioms as being compositional and non-compositional at the same time, be it with respect to different aspects of its cognitive representation.

However, we feel that Cutting and Bock's (1997) model is underspecified with respect to syntactic processing assumptions. Since syntactic peculiarities are one of the defining features of idioms, this aspect deserves more attention. We therefore have designed an alternative model of idiom production that specifies the way the syntactic information that belongs to an idiom gets activated and combined with the information that belongs to the single words. While sharing some basic characteristics with the Cutting and Bock (1997) model, our model offers a more precise description of idiom representation, therefore allowing for more detailed predictions about idiom processing.

We agree with Cutting and Bock's assumption that idioms are not "special". It seems unlikely that they require processing mechanisms other than those involved in literal language production. They are just far too frequent for such a special treatment. On the other hand, idioms come along with numerous idiosyncrasies. Though not all constituents are equally important for the identification of an idiomatic configuration (Cacciari & Tabossi, 1988), they are all vulnerable in that a change to any of them may cause the interpretation of the idiom to switch from figurative to literal (e.g., *kick the buckets*). Such linguistic constraints are clearly not conceptually motivated. Conceptually, the link between *dying* and *bucket* is arbitrary, and so are the diacritical features of "bucket" (e.g., "singular"). In the WEAVER model (Roelofs, 1992; Levelt et al., 1999), this kind of information is specified at the lemma level. Accordingly, we assume idiomatic ex-

pressions to be represented in the lexicon by a lemma of their own, called a *superlemma*. These superlemmas represent the syntactic properties of idiomatic expressions and involve multiple lemmas.

As described in Roelofs (1992) and Levelt et al. (1999), the production of a phrase starts with a message that has to be mapped onto the appropriate lexical concepts. For example, the phrase *he holds a pen in his hand* involves the activation of separate concepts for *hold*, *pen*, *his*, and *hand*. However, in the case of idioms (e.g., *to give someone a hand*) the meaning of the phrase is no longer a function of the meanings of its parts. This is mirrored in our assumption that an idiomatic phrase is represented by only *one* lexical concept. Activating this concept will result in activation of its lexical entry: the superlemma *to give someone a hand*. The production of the sentence *can you give me a hand?* requires the selection of this superlemma. Lexical selection involves competition among co-activated lemmas and we assume that this holds for superlemmas as well. Thus, the superlemma *to give someone a hand* competes for example with *to help somebody* and will only be selected if it is the most highly activated node in the system. The probability of selecting the target superlemma from the mental lexicon is the ratio of the superlemma's degree of activation and the total activation of all lemmas (superlemmas and simple lemmas) in the lexicon ("Luce's ratio"). Upon selection of the superlemma, the syntactic constraints that come along with the idiom become available to the production system. They delimit or modify the syntactic properties of the simple lemmas involved. Moreover, the selection of the target superlemma fixates the set of simple lemmas that are to be selected in subsequent processing steps. We assume that superlemma selection is a *condition* on activation spreading towards the "dependent" simple lemmas. The process of simple lemma selection is, again, based on Luce's ratio. The target lemma is always in competition with all other active superlemmas and simple lemmas. See Figure 3.4 for an example of a superlemma representation in the mental lexicon.

Superlemmas differ from the notion of phrasal frames (Cutting & Bock, 1997), in that they specify the grammatical relations between the the actual lemmas involved in the idiom. They are best characterized as a (phrasal) function over some set of simple lemmas. The superlemma specifies the syntactic relationships between the individual lemmas and modifies the pre-existing syntactic options of the simple lemmas it dominates.

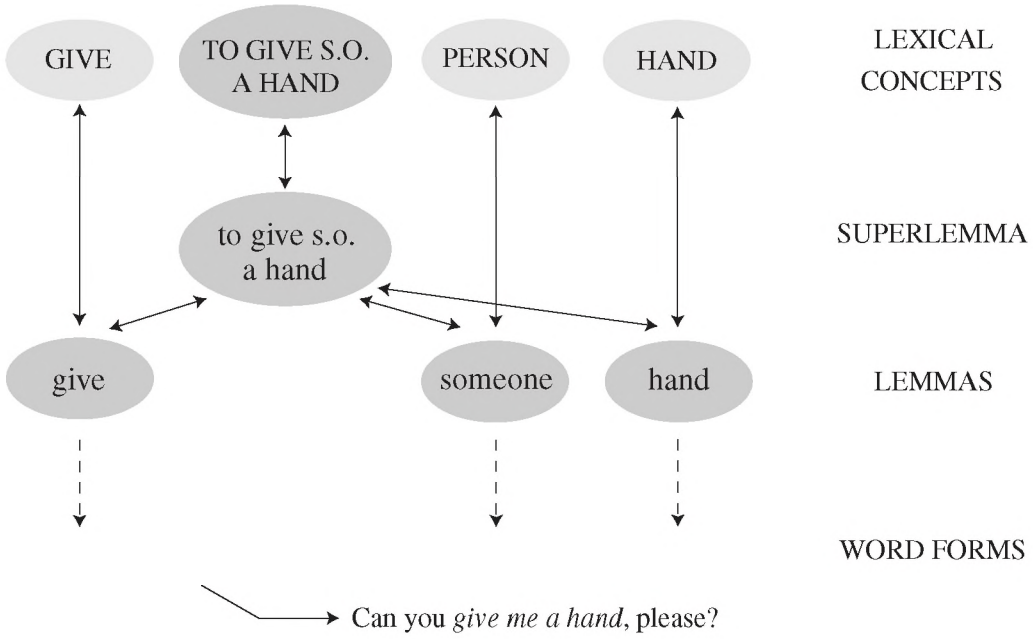

Figure 3.4: A small part of the mental lexicon, representing the phrase *to give someone a hand*.

For instance, the passive option of the simple lemma "kick" is disabled by the idiom's superlemma ("kick the bucket"). In rare cases, the superlemma seems to *extend* the syntactic options of a constituent lemma (for example, in *to sweat blood* or *to breathe one's last breath* the verbs *sweat* and *breathe* are used transitively, although they are basically intransitive). This keeps the network of lemmas minimally redundant. In terms of the Performance Grammar formalism (Kempen & Harbusch, 2002) one might say that the superlemma's task is the finetuning of the "lexical frames" that are associated with individual lemmas. In the case of *Can you give me a hand, please?* several restrictions apply to the idiom's phrase structure. First of all, native speakers of English *know* that they have to use the indefinite determiner *a* in order to communicate the idiomatic meaning *Can you help me, please.* Using the definite determiner *the* or a pronoun like *your* in this position would force the listener to interpret the phrase in a literal fashion. In other words, the idiomatic meaning is bound to the singular and indefinite realization of the noun *hand.* Thus, *Can you give me two hands?* will not be interpreted as idiomatic. A similar constraint holds for *Can you give me a strong hand?.* The superlemma prohibits

the insertion of a modifier in the lexical frame of the NP *hand*.

In the superlemma theory, the syntactic features of the superlemma's elements form the building blocks of its structure. This structure is reduced in its syntactic potential, making the idiom syntactically inflexible. For example, the syntactic information for *to give someone a hand* might be represented as shown in Figure 3.5.

The superlemma model differs markedly from the Cutting and Bock model. The latter authors assume that idiomatic concepts activate phrasal frames that are independent of any lemma representation. These frames provide a phrase structure with open slots that can be filled with the simple lemmas that are activated by the idiom's lexical concept in *parallel*. For example, the sentence *John kicked the bucket* is assumed to have activated a phrasal VP frame with open slots for a verb and a direct object. Filling in *kicked* and *the bucket* in these slots seems rather straightforward. But let us consider a VP with an additional NP: *be a wolf in sheep's clothing*. The phrasal VP frame provides us with two slots for two nouns that are possible fillers. It is unclear how the system knows where the nouns *sheep* and *wolf* should be inserted. The nouns' lemmas themselves are not assigned to specific grammatical roles, and the phrasal frame is an abstract syntactic structure that is blind to the relationship between the concepts and the active lemmas. Therefore, there is no possibility for the system to find out whether it is *a wolf in sheep's clothing* or rather *a sheep in wolf's clothing* that the speaker intended. However, this order is not arbitrary, and changing it means loosing the idiomatic meaning of the phrase. Additional syntactic constraints must be assumed to solve the problem within the phrasal frame approach. Within the superlemma approach, no such problem arises. The syntactic relationships and constraints that come with the idiom are directly applied to the set of simple lemmas involved in the idiom. No additional operation is required that merges syntax and lemmas. When the simple lemmas get activated, they will already be provided with their exact position in the idiom's syntactic structure. This can only be accomplished by a stored syntactic representation where the simple lemmas are strongly linked to a syntactic structure. Idiomatic blends like those observed by Cutting and Bock (1997; Exp.1) result from the simultaneous activation of two superlemmas with similar meanings and/or syntactic structures.

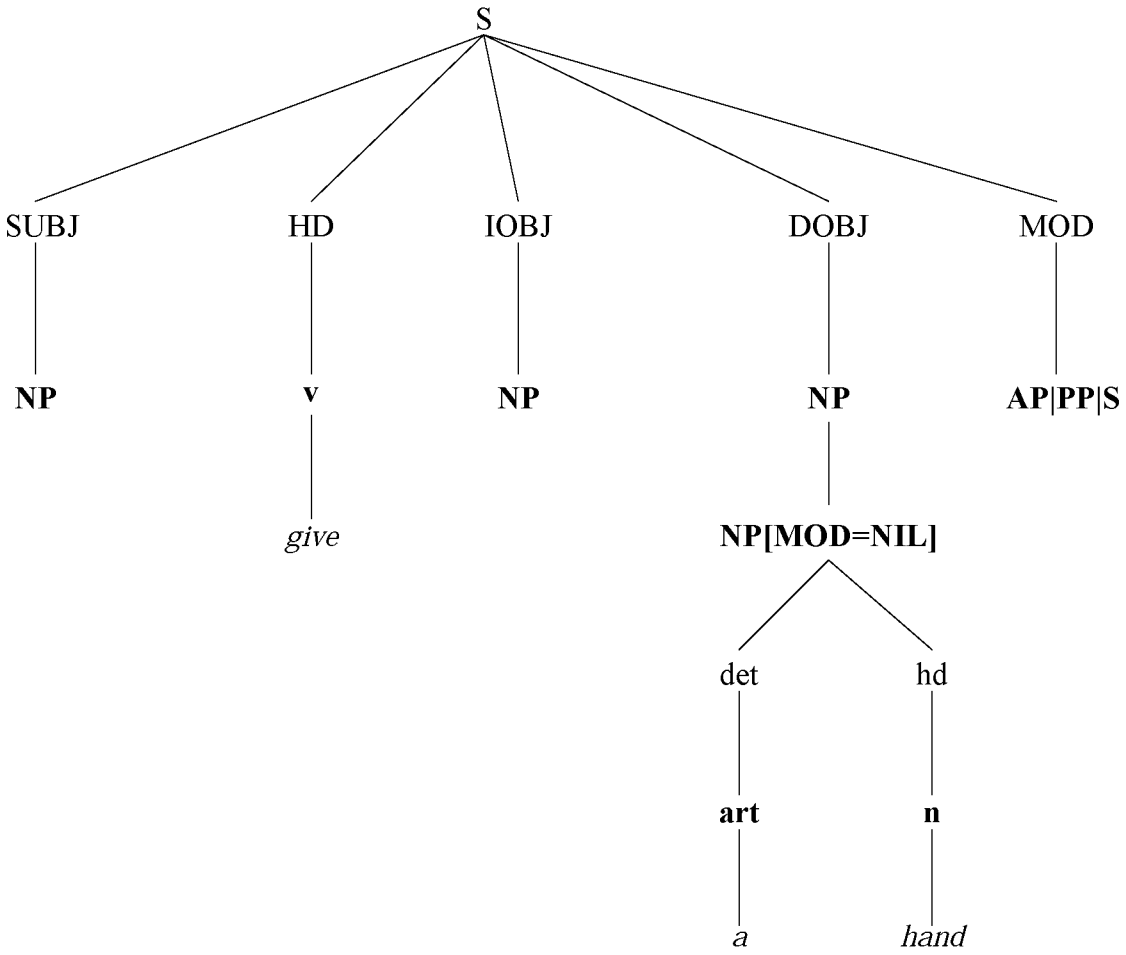

Figure 3.5: Information represented in the superlemma for *to give someone a hand*. The lemmas *give*, *a*, and *hand* are obligatory components. Modification of *hand* (e.g., **give a strong hand*) is not allowed. Legends: 1. Syntactic functions. S = sentence, SUBJ = subject, HD/hd = head, IOBJ = indirect object, DOBJ = direct object, MOD = modifier, det = determiner. 2. Syntactic categories. NP = noun phrase, AP = adverbial or adjectival phrase, PP = prepositional phrase. 3. Parts of speech. art = article, n = noun, v = verb. Syntactic notation according to Performance Grammar developed by Kempen and associates (Kempen, 1996; Vosse & Kempen, 2000; Kempen & Harbusch, 2002).

In sum, the superlemma model offers a theoretical alternative for the model of Cutting and Bock (1997). In addition to explaining the available empirical data on idiom production, it spells out the syntactic nature of idiom representations in more detail and makes clear-cut assumptions about how the syntactic constraints that come along with an idiom are realized during idiom production. Also, the superlemma is equally capable of solving the paradox that idioms seem to entail: the holistic nature of idiomatic expressions is not at variance with their generation out of single words in grammatical encoding. Most important, the theory is fully compatible with our knowledge about *non*-idiomatic phrase production. As we mentioned in the introduction, the production of fixed expressions (and of idioms as prototypical FEs) is the rule rather than the exception. Therefore both idiomatic and literal production should be captured by the same production theory.

Appendix 3.A:
Materials Experiments 1 and 2.

Word order is always [preposition] [determiner] [noun] [verb]

Pair	Item	Prompt word(s)	Idiomatic phrase
01	01	*afhaken*	uit de boot vallen
		to drop out	*to fall out of the boat*, to be excluded from the group
	17	*varen*	met de boot gaan
		to sail	*to go by boat*, to go by boat
02	02	*bijstaan*	uit de brand helpen
		to aid, to help	*to help out of the fire*, to help out of problems
	18	*ontkomen*	voor de brand vluchten
		to escape	*to flee from the fire*, to flee from the fire
03	03	*herrijzen*	uit het dal kruipen
		to rise	*to crawl out of the valley*, to get oneself together
	19	*Tirol*	in het dal wonen
		Tirol	*to live in the valley*, to live in the valley
04	04	*escaleren*	uit de hand lopen
		to escalate	*to go out of the hand*, to get out of hand
	20	*wuiven*	met de hand zwaaien
		to wave	*to wave with the hand*, to wave one's hand
05	05	*informeren*	op de hoogte houden
		to inform	*to hold on the height*, to keep informed
	21	*terugdeinzen*	van de hoogte schrikken
		to shrink, to recoil	*to get freightened from the height*, to get freightened

			from the height
06	06	*blijken*	aan het licht komen
		to appear	*to come into the light*, to be discovered
	22	*verblinden*	in het licht kijken
		to blind	*to look into the light*, to look into the light
07	07	*verkopen*	aan de man brengen
		to sell	*to bring to the man*, to sell, to convince
	23	*overleggen*	met de man spreken
		to consult	*to talk to the man*, to talk to the man
08	08	*bekennen*	door de mand vallen
		to confess, admit	*to fall through the basket*, to have to own up, confess
	24	*opbergen*	in de mand leggen
		to stow away	*to put in the basket*, to put in the basket
09	09	*mislopen*	achter het net vissen
		to miss out on	*to fish behind the net*, to miss out, miss the boat
	25	*vlinder*	met het net vangen
		butterfly	*to catch with the net*, to catch with the net
10	10	*opvallen*	in het oog springen
		to strike	*to jump into the eye*, to catch the eye
	26	*vechten*	op het oog slaan
		to fight	*to hit on the eye*, to hit on the eye
11	11	*riskeren*	op het spel zetten
		to risk	*to put on the game*, to risk
	27	*knoeien*	bij het spel sjoemelen
		to swindle	*to cheat with the game*, to cheat with the game

12	12	*bedriegen*	om de tuin leiden
		to deceive	*to lead around the garden*, to lead up the garden path
	28	*ontspannen*	in de tuin zitten
		to relax	*to sit in the garden*, to sit in the garden
13	13	*voorspoed*	voor de wind gaan
		prosperity	*to go before the wind*, to do well
	29	*vlag*	in de wind wapperen
		flag	*to blow in the wind*, to blow in the wind
14	14	*oprichten*	in het leven roepen
		to set up	*to call into life*, to found
	30	*mediteren*	over het leven peinzen
		to meditate	*to ponder over the life*, to ponder over life
15	15	*waarschuwen*	aan de bel trekken
		to warn	*to pull at the bell*, to warn
	31	*opspringen*	van de bel schrikken
		to jump up	*to get startled by the bell*, to get startled by the bell
16	16	*schamen*	in de grond zinken
		to be ashamed	*to sink in the ground*,not to know where to put onself, cringe with embarassment
	32	*wroeten*	in de grond graven
		to root	*to dig in the ground*, to dig in the ground

Appendix 3.B:
Materials Experiment 3

Word order is [noun (name)][verb][preposition][noun]

Pair	Item	Prompt word(s)	Idiomatic phrase
01	01	Laura...	viel buiten de boot
			fell out of the boat, was excluded from the group
	17	Laura...	ging met de boot
			went with the boat, took the boat
02	02	Mark...	hielp hem uit de brand
			helped him out of the fire, helped him out of problems
	18	Mark...	waarschuwde hem voor de brand
			warned him of the fire, warned him of the fire
03	03	Paulien...	kroop uit het dal
			crawled out of the valley, got herself together
	19	Paulien...	woonde in het dal
			lived in the valley, lived in the valley
04	04	Jan's feestje...	liep uit de hand
		Jan's party...	*went out of the hand*, got out of hand
	20	Jan's dochter...	zwaaide met de hand
		Jan's daughter...	*waved with the hand*, waved her hand
05	05	Karin...	hield hem op de hoogte
			held him on the height, kept him informed
	21	Karin...	schrok erg van de hoogte
			was startled a lot by the height, was startled by the height

06	06	Anna's vervalsing. . .	kwam aan het licht
		Anna's forgery	*came into the light*, was discovered
	22	Anna's ketting. . .	vonkelde in het licht
		Anna's necklace. . .	*was glittering in the light*, was glittering in the light
07	07	Petra. . .	bracht alles aan de man
			brought everything to the man, could sell everything,
	23	Petra. . .	sprak vaak met de man
			often talked to the man, often talked to the man
08	08	Kees. . .	viel vreselijk door de mand
			fell terribly through the basket, really had to own up
	24	Kees. . .	legde het hondje in de mand
			put the puppy in the basket, put the puppy in the basket
09	09	Corien. . .	viste altijd achter het net
			fished always behind the net, always came too late
	25	Corien. . .	ving de vlinder met het net
			caught the butterfly with the net, caught the butterfly with the net
10	10	Erik's schoenen. . .	sprongen in het oog
		Erik's shoes. . .	*jumped into the eye*, were very eye-catching
	26	Erik's vader. . .	sloeg hem op het oog
		Erik's father. . .	*hit him on the eye*, hit him on the eye
11	11	Suzan. . .	zette alles op het spel
			put everything on the game, put everything on one card
	27	Suzan. . .	sjoemelde lelijk bij het spel
			was faking awfully during the game, was faking terribly

			during the game
12	12	John...	leidde haar om de tuin
			led her around the garden, led her up the garden path
	28	John...	zat graag in de tuin
			sat with pleasure in the garden, enjoyed sitting in the garden
13	13	Ton...	sloeg de waarschuwing in de wind
			hit the warning into the wind, ignored the warning
	29	Ton...	waarschuwde iedereen voor de wind
			warned everybody about the wind, warned everybody about the wind
14	14	Marieke...	riep de stichting in het leven
			called the foundation into life, founded the foundation
	30	Marieke...	peinsde eindeloos over het leven
			thought endlessly about life, endlessly pondered on life
15	15	Henk...	trok vergeefs aan de bel
			pulled in vain at the bell, warned without success
	31	Henk...	wachtte vergeefs op de bel
			waited in vain for the bell, waited in vain for the bell (to ring)
16	16	Sara...	zakte door de grond
			sank through the ground, cringed with embarassment
	32	Sara...	groef in de grond
			dug in the ground, dug in the ground

Appendix 3.C:
Acoustic Prime Words

List of acoustic prime words used in Experiments 1 and 3:

	Prime			Prime	
Pair	**Identity**	**Unrelated**	**Pair**	**Identity**	**Unrelated**
1	boot	kat	9	net	breuk
	boat	*cat*		*net*	*break*
2	brand	lijst	10	oog	taak
	fire	*list*		*eye*	*task*
3	dal	jurk	11	spel	fax
	valley	*dress*		*game*	*fax*
4	hand	tijd	12	tuin	heer
	hand	*time*		*garden*	*lord*
5	hoogte	muziek	13	wind	spons
	height	*music*		*wind*	*sponge*
6	licht	schroef	14	leven	feit
	light	*screw*		*life*	*fact*
7	man	huis	15	bel	koek
	man	*house*		*bell*	*cake*
8	mand	riem	16	grond	pen
	basket	*belt*		*ground*	*pen*

List of acoustic prime words used in Experiment 2:

	Prime			Prime	
Items	**Phonological**	**Unrelated**	**Items**	**Phonological**	**Unrelated**
1	boog	zak	9	nek	baan
	bow	*bag*		*neck*	*job*
2	Bram	merk	10	oom	buurt
	(*name*)	*brand*		*uncle*	*neighbourhood*
3	dak	kist	11	spek	vocht
	roof	*chest*		*bacon*	*moisture*
4	hang	kurk	12	tuig	lijm
	bent	*cork*		*riffraff*	*glue*
5	hoop	raad	13	wip	naad
	hope	*advice*		*seesaw*	*seam*
6	lip	bijl	14	leem	kier
	lip	*hatchet*		*clay*	*crack*
7	mat	wond	15	bek	kooi
	mat	*wound*		*beak*	*cage*
8	map	vet	16	gros	rijm
	map	*fat*		*gross*	*rime*

The activation of literal word meanings during idiom production

Chapter 4

Introduction

In Chapter 3 of this thesis I introduced the Superlemma theory of idiom production. The model aims at an architecture of the mental lexicon that can explain the production of idiomatic and other fixed expressions, and that is in agreement with what we know about comprehension processes for these structures. Like Cutting and Bock's (1997) theory of idiom production, the Superlemma theory is based on the assumption that during the production of an idiomatic expression the same word representations are involved that otherwise are used in normal (i.e., literal) language production. Thus, for example, the production of the idiom *She was skating on thin ice* will involve the same representations of *skate*, *on*, *thin* and *ice* that are involved in literal utterances like for example *She often goes skating on the lake* or *When they woke up, their tent was covered with a thin layer of ice.*

The idea that word representations come into play that are not unique to the idiom is based on the assumption of maximum parsimony of the mental lexicon. It is supported by the available evidence for the activation of literal word meanings during idiom comprehension and production. The literature on idiom processing in language understanding includes many articles that explore the relationship of an idiom's parts to its interpretation as a whole. Establishing the activation of literal word meanings during idiom

comprehension has been regarded as a first step towards decompositional models of idiom interpretation and representation (e.g., models in which the listener maps a fragment like *thin ice* onto the concept *dangerous situation* when interpreting the idiom). Various taxonomies of idiomatic expressions have been developed (e.g., Nunberg et al., 1994; Gibbs, Nayak, Bolton, & Keppel, 1988; Cacciari & Glucksberg, 1991; Glucksberg & Keysar, 1993) that assume a contribution of literal word meanings to the idiomatic interpretation, be it to different degrees. Experimental evidence for the activity of literal word meanings during idiom comprehension comes from, for example, Cacciari and Tabossi (1988) and Titone and Connine (1999).

Both idiom production and idiom comprehension theories have to solve the paradox that is inherent to idiomatic language use: we say things that – in a strict sense – we do not mean, but this does not necessarily confuse our listeners. However, the problems that the various theories have to solve are opposite. While the listener has to deal with two competing interpretations (a literal and an idiomatic one) of an unequivocal signal (e.g., the word *ice* in *skate on thin ice*), the speaker has no doubts about what he or she wants to say. The message is unambiguous and unitary, and so is the concept underlying the FE.[1]

Theoretical problems arise at the point where this concept has to be translated into spoken words. How is a message like *She deliberately puts herself into a dangerous situation* translated into words that refer to sports and winter? Are the words really chosen because of the concepts that they refer to? Both Cutting and Bock (1997) and the Superlemma theory answer with a clear *no*. Both theories argue that regular lexical entries are involved in idiom production, but that the source of activation for these words is different from literal language production. Cutting and Bock (1997) propose a direct link between the idiom's lexical concept and its individual lemmas. In the Superlemma theory, the superlemma is proposed as an additional linking element between the concept on the one hand, and the individual words on the other. In both theories activation flows directly from the concept to the lemma level. No conceptual translation process like *a*

[1] For example, Cutting and Bock (1997, Experiment 3) showed that differences in idiom decomposability (i.e., the degree in which parts of the idiomatic meaning are distributed over components of the idiom; Gibbs et al., 1988; Gibbs & Nayak, 1989) are not mirrored in idiom production.

dangerous situation is like thin ice is involved. The transition from the concept of *deliberately putting oneseself into a dangerous situation* and the metaphor *skate on thin ice* is considered as following a conventional link, not as a matter of online processing.

The assumption that idiom concepts activate regular lexical entries is by no means trivial. The numerous syntactic constraints that come along with idioms might lead one to the assumption that there are multiple lexical entries for a word, one for literal usage and one for its usage in an idiom. Or, alternatively, one might want to merge all elements of an idiom into one long word (Swinney & Cutler, 1979). However, the former assumption can be solved by an independent representation that entails the idiom's syntactic features (Cutting & Bock, 1997; and Superlemma theory). The problem with Swinney and Cutler's approach is that it cannot be reconciled with the fact that idioms show syntactic and lexical flexibility.

In addition, the involvement of simple lemmas in the production of an idiomatic expression can explain why literal word meanings become active during idiom production, without assuming that this activation originates from the speaker's conceptual message. Activity of literal word meanings during idiom production has been proposed by Cacciari and Glucksberg (1991), who argue that literal word meanings contribute to an idiom's productive use in discourse.[2] Cutting and Bock (1997, Experiment 2) show that literal meaning similarity between an idiom and a phrase enhances the probability of blending errors between the two. How can this finding be reconciled with the idea that idioms are represented by their own lexical concept node?

Figure 4.1 illustrates how the superlemma theory represents idiomatic expressions within the network of lexical entries.[3] Simple lemmas can be activated either via their own lexical concept or via the idiom representation. In addition, the reciprocal connections between concepts and lemmas imply that activation of a lemma from a source other than its own lexical concept will nevertheless lead to activation of this concept node. Thus, when a simple lemma gets activated by an idiom representation, activation will

[2] Compare, e.g., *He had already been skating on thin ice, but after the stock market crashed it started to melt from under his feet.*

[3] Since Cutting & Bock's (1997) theory of idiom representation does not differ from the Superlemma theory with respect to the aspects discussed, I will confine myself to the Superlemma theory in the following. A detailed comparison of the models can be found in Chapter 3.

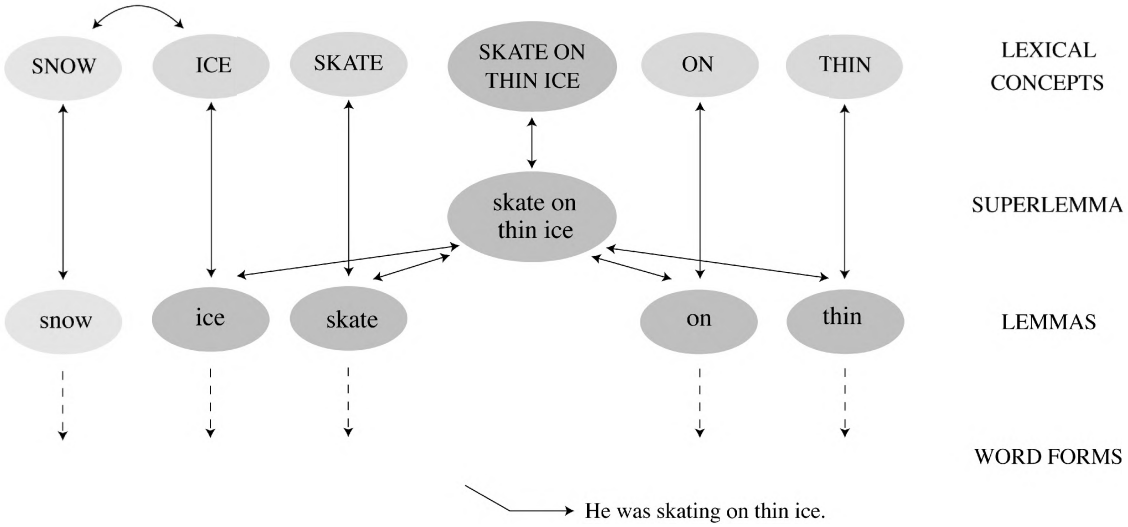

Figure 4.1: The network of representations for *snow* and *skate on thin ice* according to the Superlemma theory of idiom production. Reciprocal connections between superlemma, lemmas, and lexical concepts allow for spreading activation in the system, and thus for the activity of literal word meanings during idiom production.

spread to the conceptual level, leading to indirect activation of the word's literal meaning. Thus, although the concept of *ice* is not part of the speaker's message, its literal meaning becomes active as soon as the lemma *ice* has been selected as part of the idiom *skate on thin ice*.

Two experiments were designed to test this model of idiom representation. Experiment 1 addresses the question whether the production of idioms involves the same lemmas that are otherwise part of normal language production and have their own meaning and lexical concept. Experiment 2 tests if these literal word meanings become active during idiom production.

Experiment 1

According to the Superlemma model as illustrated in Figure 4.1, the building blocks of an idiom are simple lemmas that are not unique to the idiom. Dependent on the sentence

context, they can either be activated by the Superlemma (and thus function as parts of an idiom), or by their own lexical concept as parts of a literal utterance. In both cases the production of a simple lemma should be sensitive to the presentation of a semantically related prime word (compared to an unrelated condition). Such a sensitivity has been shown outside the domain of idiom production (e.g., Levelt et al., 1991; Peterson & Savoy, 1998).

If however idioms make use of word representations that are unique to the idiom, idiom production should not be affected by the presentation of a prime word that is semantically related to one of its words.

This prediction was tested in an idiom completion task that required the production of the last word of an idiom in response to a visually presented idiom fragment. Prime words were presented at different SOAs (Stimulus Onset Asynchronies), relative to the presentation of the visual stimulus. These prime words were either semantically related, phonologically related, or unrelated to the to-be-produced target word. Phonological priming manipulates the preparation of a word's phonological form and is therefore expected to be independent from meaning related factors like idiomaticity. Given the possibility of a null effect for the semantic condition, the phonological effect can function as a general indicator of the paradigm's sensitivity for priming.

Method

Participants

Seventy-one participants were tested, all being undergraduate students of the University of Nijmegen and native speakers of Dutch. They were paid for their participation.

Materials

Sixteen Dutch idiomatic expressions were chosen as experimental items. They all were presented as finite phrases in past tense form, and they all shared the same syntactic

structure: Jan [VP [V [PP Prep [NP art/pro N]]]]. For example:

Jan viel door de mand.
Jan fell through the basket.
Jan had to own up.

That is, their word order was 'Jan [verb, past tense sgl.] [preposition] [determiner] [noun]' in all cases.

The first part of the sentence (up to the determiner) functioned as stimulus for producing the last word of the idiom. Thus, the presentation of *Jan viel door de . . .* was the stimulus for producing *mand*. In addition to the written stimulus, participants were presented with acoustic primes. These primes were either unrelated, phonologically related, or semantically related to the last word of the idiom. All prime words were short Dutch nouns, and they were all spoken by the same female native speaker of Dutch. All acoustic primes were recorded in one session. The semantic primes were chosen such that they belonged to the same semantic field as the noun of a particular item. The phonological primes were chosen such that they shared the noun's onset. For example, the prime words for the word *mand* 'basket' that belongs to *Jan viel door de. . .* were

map ('file'; phonological prime) and *korf* ('hive'; semantic prime).

Primes that are related to one item functioned as unrelated primes for the other items. The complete materials are listed in Appendix 4.A.

Procedure

Participants were tested individually, and each session was recorded on DAT tape. The visual stimuli were presented on a computer screen, the acoustic stimuli via headphones. Responses were spoken into a microphone that was attached to a voice key, which in turn signaled the computer that a response had been initiated. The experiment was controlled by NESU[4], a program for controlling experiments that has been developed at the Max

[4]Nijmegen Experiment Set-Up

Planck Institute for Psycholinguistics.

The production of the correct nouns required the participants to be familiar with the idiomatic expressions. This was tested in a paper-and-pencil cloze task at the beginning of each experiment. Participants were presented a list of the sixteen items without their respective nouns. They were asked to fill in the missing nouns, and to indicate on a scale from one to five how difficult it was for them to fill in each individual noun. The list was then checked by the experimenter and difficult items were clarified. Participants were instructed to produce the missing nouns, just as they had done in the cloze task, in response to the sentence fragments on the computer screen. They were instructed to react as quickly as possible, but in a fluent fashion and without making mistakes. They were asked to reduce coughing, etc., as far as possible and to avoid unnecessary noises that would trigger the voice key. Participants were told, that in addition to the visual stimuli they were going to be presented acoustic stimuli (that had to be ignored) via the headphones, and that their responses would be recorded on audio tape. The experiment started with a short practice session of fifteen trials, in which participants could get acquainted with the different tasks and the experimental setting. They were then presented 512 experimental trials in four blocks. The blocks were separated by a short pause.

After a fixation cross had appeared in the center of the screen, participants saw one of the sentence fragments that they had seen earlier in the cloze task. Dependent on the experimental condition, an acoustic prime word or distractor was presented via the headphones. Prime onset was varied in relation to sentence presentation (Stimulus Onset Asynchrony, SOA, between subjects). The participants' task was to react to the visually presented sentence fragment by producing the appropriate noun as quickly as possible. Four different SOAs were tested (-150, 0, 100, and 200 msec, between subjects). Response times were measured from visual stimulus presentation on. When the voice key was triggered, the visual stimulus got removed from screen and a new trial was iniated. If however participants failed to respond within 2000 msecs, the trial was stopped automatically and was counted as timeout error.

Design

Within each of the four SOAs, each of the sixteen items was presented in 32 trials. Each item appeared in the following conditions: 1. with a semantic prime, 2. with a phonological prime, 3. with an unrelated prime, 4. without prime.

Each item was presented eight times under each of the four conditions. In the unrelated condition, semantic and phonological primes were rotated over items such that they functioned as unrelated primes. Four unrelated primes/distractors stemmed from the group of phonological primes, and the four remaining ones stemmed from the group of semantic primes (yielding the two subconditions Phon-unrel and Sem-unrel). Together, this design resulted in 512 trials per experimental session.

Analyses

DAT-tape recordings of seventy-three participants were checked for erroneous or missing responses and dysfluencies. Data from seven participants were removed from the data set, because of more than ten percent errors. Item sixteen was removed from the data set, because of more than 22% errors (compared to 6% errors on average). For the remaining data, an analysis of errors was conducted.

Error percentages per subject per condition were analyzed in a series of planned comparisons between different levels of the factor Priming, which has four levels: Phon-rel (phonologically related), Sem-rel (semantically related), No prime or distractor, and Unrel (unrelated). The factor level Unrel can further be divided into Phon-unrel (unrelated primes from the set of phonologically related primes) and Sem-unrel (unrelated primes from the set of semantically related primes).

Reaction times exceeding twice the standard deviation from the subject means (per priming condition) counted as outliers and were excluded from the set of valid responses (2.7% of the valid responses). The reaction time data of the remaining set of correct responses were analyzed in a series of planned comparisons.

Results and Discussion

Five percent of all responses were errors. Table 4.1 shows the mean error percentages per SOA per condition. In general, participants made fewer errors when a related distractor word was presented than when an unrelated distractor word was presented. Planned comparisons show a significant difference between Phon-rel and Phon-unrel and between Sem-rel and Sem-unrel for SOAs 0, 100, and 200. For SOA -150, the direction of the difference follows that of the other SOAs. When no prime word was presented, participants made fewer errors than when an unrelated prime was presented, and more errors than when a related prime was presented. t-statistics for the planned comparisons between the related and the unrelated conditions are provided in Table 4.2.

Table 4.1: Mean error percentages per level of priming per SOA in Experiment 1.

SOA	Phon-rel	Phon-unrel	Sem-rel	Sem-unrel	Unrel	No prime
-150	4.9	5.5	4.6	5.9	5.7	5.3
0	4.0	8.4	4.7	8.3	8.4	5.4
100	3.3	7.6	4.1	7.1	7.4	4.4
200	3.1	5.8	3.6	5.8	5.8	5.4

Table 4.2: t-statistics for planned comparisons of the error percentages in the related and unrelated conditions in Experiment 1. p-values are given for the two-tailed test. Values for t_1 refer to the analysis with subjects as random factor ($df = 15$), values for t_2 refer to the analysis with items as random factor ($df = 14$).

SOA	comparison	t_1	SD	p	t_2	SD	p
-150							
	Phon-rel - Phon-unrel	-.592	0.04	$= .563$	-.669	0.04	$= .514$
	Sem-rel - Sem-unrel	-1.141	0.04	$= .178$	-1.270	0.04	$= .225$
0							
	Phon-rel - Phon-unrel	-3.345	0.05	$= .004$	-3.424	0.05	$= .004$
	Sem-rel - Sem-unrel	-2.709	0.05	$= .016$	-3.909	0.04	$= .002$
100							
	Phon-rel - Phon-unrel	-5.409	0.03	$= .000$	-4.273	0.04	$= .001$
	Sem-rel - Sem-unrel	-3.719	0.03	$= .002$	-2.240	0.05	$= .042$
200							
	Phon-rel - Phon-unrel	-2.230	0.05	$= .041$	-2.290	0.05	$= .038$
	Sem-rel - Sem-unrel	-2.956	0.03	$= .010$	-2.281	0.04	$= .039$

The mean reaction times per level of priming per SOA are shown in Table 4.3. The relative effects of the related primes per SOA are illustrated in Figure 4.2.

Table 4.3: Mean reaction times (in msec) per level of priming per SOA in Experiment 1.

SOA	Phon-rel	Phon-unrel	Sem-rel	Sem-unrel	Unrel	No prime	Overall
-150	840	905	819	895	900	826	864
0	816	925	843	897	911	827	896
100	791	891	847	879	885	806	849
200	753	823	792	814	818	758	793

Planned comparisons of the related and unrelated conditions reveal significant facilitatory effects (two-tailed test) for both phonologically related and semantically related primes, for SOAs -150, 0, and 100. t-statistics are provided in Table 4.4. For SOA 200, the phonological effect is significant, but in the subject analysis the semantic effect is only marginally significant. However, it should be kept in mind that when comparing the related conditions (Phon-rel and Sem-rel) to the unrelated conditions (Phon-unrel and Sem-unrel), the number of observations in the unrelated conditions is only half the number of observations in the related conditions. Thus, in terms of sample size one might rather want to compare the related conditions to the overall unrelated condition (unrel), which summarizes the RTs of trials with unrelated distractors from both the set of phonologically related and the set of semantically related distractors. In that case, the effect of the semantically related condition for SOA 200 is significant as well ($t_1(1, 15) = -2.891, SD = 36.1, p = .011$; $t_2(1, 14) = -3.468, SD = 28.4, p = .004$).

The results show that the production of nouns as parts of idiomatic expressions can be speeded up by both phonologically related and semantically related acoustic distractors. The facilitatory effect of phonologically related primes confirms the sensitivity of the paradigm for the effects of acoustic priming. The effects of phonological and semantic priming have been found to be significant across all four SOAs tested. The graph in Figure 4.2 shows that the effect of phonological priming is strongest when the prime is presented in parallel with or shortly after the idiom fragment. In contrast, the effect of semantic priming is strongest if the prime is presented 150 msecs before the sentence fragment. Thus, we find a general pattern of early semantic and later phonological

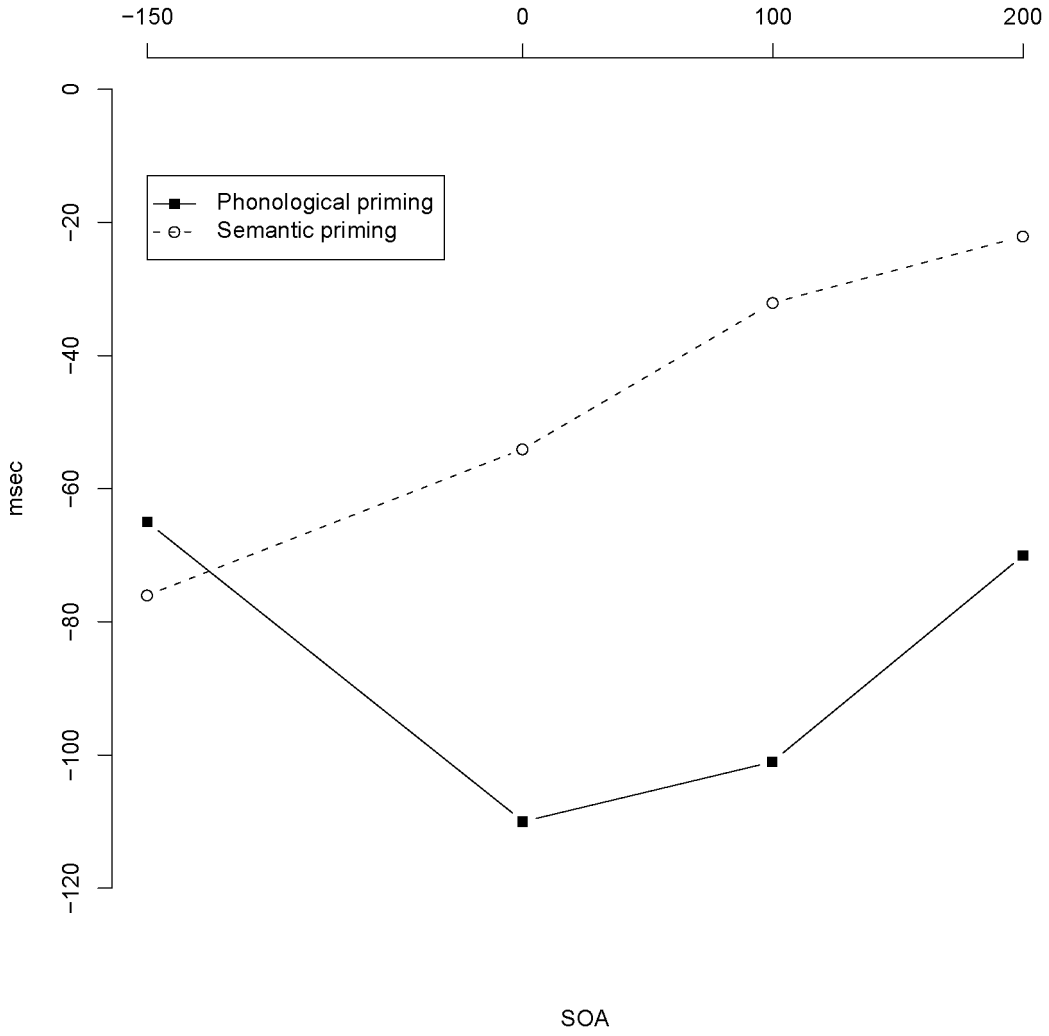

Figure 4.2: Facilitatory effects of phonologically related and semantically related primes in Experiment 1. Values on the vertical axis refer to mean differences between Phon-unrel and Phon-rel, and between Sem-unrel and Sem-rel, respectively.

Table 4.4: t-statistics for planned comparisons of the mean reaction times in the related and unrelated conditions in Experiment 1. p-values are given for the two-tailed test. Values for t_1 refer to the analysis with subjects as random factor ($df = 15$), values for t_2 refer to the analysis with items as random factor ($df = 14$).

SOA	comparison	t_1	SD	p	t_2	SD	p
-150							
	Phon-rel - Phon-unrel	-7.616	33.9	= .000	-5.657	44.1	= .000
	Sem-rel - Sem-unrel	-7.449	40.7	= .000	-6.972	43.1	= .000
0							
	Phon-rel - Phon-unrel	-7.047	62.2	= .000	-6.626	63.9	= .000
	Sem-rel - Sem-unrel	-4.538	47.9	= .000	-4.563	46.2	= .000
100							
	Phon-rel - Phon-unrel	-9.137	44.0	= .000	-8.061	48.8	= .000
	Sem-rel - Sem-unrel	-2.961	63.6	= .010	-2.866	44.7	= .012
200							
	Phon-rel - Phon-unrel	-5.621	49.7	= .000	-5.608	47.8	= .000
	Sem-rel - Sem-unrel	-1.876	46.2	= .080	-2.159	37.1	= .049

effects.

The fact that speech onset latencies for the production of an idiom noun can successfully be influenced with a semantically related distractor confirms the prediction made by the superlemma model. Specifically, the results indicate that the very same lexical entry can be activated via fundamentally different ways. It can either be selected because of its semantics (as in normal language production), or because it has a fixed link to the representation of an idiomatic expression. It is important to note, that in both cases we are dealing with the same lexical entry. If the representation of *ice* as part of *skate on thin ice* were different from *ice* as frozen water, then no effect of the semantically related distractor should have been established at all. Thus, the effects found support the assumption that the representation of an idiom activates simple lemmas that are lexical entries on their own. These simple lemmas are not special to the idiom, but are natural elements of the speaker's lexicon.

Experiment 2

Experiment 1 showed that the production of idiomatic expressions can be primed by means of phonologically and semantically related primes. The effects were interpreted in favor of the Superlemma model, which assumes that during idiom production simple lemmas are activated via a common superlemma. The simple lemmas are assumed not to be unique to the idiom, and thus can be primed with a word that is related to the literal meaning of the word. Experiment 2 goes one step further in exploring the involvement of literal word meanings in idiom production. The results found by Cutting & Bock (1997) suggest that literal word meanings become active during idiom production. In terms of the superlemma model, this implies that activation spreads from the superlemma to its simple lemmas, and then back to the conceptual level. Thus, the activity of literal word meanings is assumed to be an indirect effect that results from the architecture of the mental lexicon. The presumed effect is illustrated in Figure 4.1. Experiment 2 was designed to exploit a preparation effect that should arise when speakers who are planning to complete an idiomatic expression have to switch task and read out loud a visually presented word that is *semantically related* to the literal meaning of the target word.

The preparation of the idiom's target lemma should co-activate words that are semantically related. For example, the preparation of *ice* as part of *skate on thin ice* should result in the co-activation of *freeze*. This co-activation is expected to affect the speech onset latencies in a reading task. Specifically, the semantically related target *freeze* is expected to be available faster than a semantically unrelated target like, e.g., *tree*. The preparation effect thus should be mirrored in shorter speech onset latencies for *freeze* than for *tree*.

Method

A variant of a task used by Peterson and Savoy (1998) was used to explore the activation of literal word meanings during idiom production. In this task, the preparation of the last word of an idiomatic expression (completion task) was used to prime the production of visually presented target words (reading task). Again, target words could be

either phonologically related, semantically related, or unrelated. The phonologically related condition was included in order to measure the sensitivity of the paradigm for the influence of idiom word preparation on word reading.

Participants

Seventy-two participants were tested, all being undergraduate students of the University of Nijmegen and native speakers of Dutch. They were paid for their participation.

Materials

The materials were identical to those used in Experiment 1, with two exceptions. Item sixteen *Jan viel in de smaak* ('Jan fell into the taste', meaning 'Jan was very popular') was replaced by *Jan viste achter het net* ('Jan fished behind the net', meaning 'Jan did not get what he wanted'), due to the large number of errors for this item in Experiment 1. The words that had been presented as auditory primes in Experiment 1 now functioned as visual targets in the naming task.

Procedure

The experimental set-up was identical to the one described for Experiment 1. Again, participants were presented a paper-and-pencil cloze task that tested their familiarity with the items. Participants were told that their main task was the fast completion of visually presented idiom fragments in response to a question mark that would appear below the idiom fragment. They were also told that instead of a question mark, in some cases a word could be presented. In this case participants would have to switch task and read out loud the word stimulus. Although in the instruction the latter task was presented as a secondary task, the actual ratio of completion trials and reading trials was 50:50. Both kinds of trials started with the presentation of a fixation cross, followed by the presentation of the idiom fragment. In the completion trials, a red question mark appeared after 100, 200, 300 or 400 msecs (condition SOA), in a center position right

under the idiom fragment. Response latencies were measured from the presentation of the question mark onward. The screen was cleared as soon as the voice key was triggered. If no response was given within 1200 msecs, the screen was cleared automatically and the response was coded as timeout error. In the reading trials, a word appeared in red letters in the same position as the question mark would have appeared in the completion trials. The interval between the presentation of the idiom fragment and the word was determined by the SOA. The word could be either phonologically related, semantically related, or unrelated to the target word. Participants were instructed to read the word out loud instead of completing the idiom. Response latencies were measured from the presentation of the target word onward. As in the procedure used by Peterson and Savoy (1998), trial length was kept short in order to avoid strategic behavior and to encourage the preparation of idiom completion immediately after the beginning of idiom fragment presentation.

Design

Within each of the four SOAs, each of the sixteen items was presented in 32 trials. Half of the trials were completion trials, the other half were reading trials. In the reading trials, each item appeared in three different conditions: 1. with a phonologically related target (Phon-rel), 2. with a semantically related target (Sem-rel), 3. with an unrelated target (Unrel).

Each item was presented four times in condition one, four times in condition two, and eight times in condition three. In the unrelated condition, semantically and phonologically related targets were rotated over items such that they functioned as unrelated targets. Four unrelated targets stemmed from the group of phonologically related targets, and the four remaining ones stemmed from the group of semantically related targets (yielding the two subconditions Phon-unrel and Sem-unrel). With sixteen different items, the design resulted in a total of 512 trials per experiment.

Analyses

DAT-tape recordings of seventy-two participants were checked for erroneous or missing responses and disfluencies. Data from eight participants were removed from the data set, because of more than twenty percent errors in the idiom completion trials. For the remaining data, an analysis of errors was conducted.

Error percentages per subject per condition were analyzed in a series of planned comparisons between different levels of the factor Relatedness, which has three levels: Phon-rel (phonologically related), Sem-rel (semantically related), and Unrel (unrelated). The factor level Unrel can further be divided into Phon-unrel (unrelated primes from the set of phonologically related primes) and Sem-unrel (unrelated primes from the set of semantically related primes).

For the reading trials, reaction times that exceeded twice the standard deviation from the subject means (per relatedness condition) counted as outliers and were excluded from the set of valid responses (2.7% of the responses). The reaction time data of the remaining set of correct responses were analyzed in a series of planned comparisons. Separate error and reaction time analyses were conducted for the four different SOAs.

Results and Discussion

Six percent of all responses were errors. As expected, most errors were made in the completion trials (8.3%). In the reading trials, error percentages are relatively low (3.6%).

Table 4.5 shows the mean error percentages per SOA per condition. Planned comparisons show no significant difference between Phon-rel and Phon-unrel and between Sem-rel and Sem-unrel for any of the SOAs. The only significant difference is the one between tasks. Participants make more errors in the idiom completion task than in the word reading task. t-statistics for the planned comparisons between the related and the unrelated conditions are provided in Table 4.6.

The mean reaction times per level of priming per SOA are shown in Table 4.7. The rela-

Table 4.5: Mean error percentages per level of priming per SOA in Experiment 2.

SOA	Phon-rel	Phon-unrel	Sem-rel	Sem-unrel	Unrel	No prime
100	4.7	3.2	3.4	3.3	10.3	4.9
200	3.3	3.3	2.6	2.5	9.7	4.3
300	4.1	2.8	2.3	3.1	5.9	3.7
400	4.1	3.1	3.5	2.9	6.9	4.1

Table 4.6: t-statistics for planned comparisons of the mean error percentages in Experiment 2. p-values are given for the two-tailed test. Values for t_1 refer to the analysis with subjects as random factor ($df = 15$), values for t_2 refer to the analysis with items as random factor ($df = 15$).

SOA	comparison	t_1	SD	p	t_2	SD	p
100							
	Phon-rel - Phon-unrel	-1.99	0.03	$= .064$	-1.29	0.05	$= .213$
	Sem-rel - Sem-unrel	-0.15	0.03	$= .884$	-0.14	0.03	$= .894$
	Priming - no Priming	-7.45	0.04	$< .001$	-5.45	0.05	$< .001$
200							
	Phon-rel - Phon-unrel	0	0.03	1	0	0.03	1
	Sem-rel - Sem-unrel	-0.16	0.02	$= .876$	-0.12	0.03	$= .906$
	Priming - no Priming	-5.06	0.05	$< .001$	-4.62	0.06	$< .001$
300							
	Phon-rel - Phon-unrel	-1.48	0.03	$= .160$	-1.23	0.04	$= .237$
	Sem-rel - Sem-unrel	1.41	0.02	$= .178$	1.05	0.03	$= .309$
	Priming - no Priming	-2.10	0.05	$= .053$	-2.83	0.04	$= .013$
400							
	Phon-rel - Phon-unrel	-0.99	0.04	$= .338$	-1.37	0.03	$= .190$
	Sem-rel - Sem-unrel	-0.70	0.03	$= .497$	-0.89	0.03	$= .383$
	Priming - no Priming	-4.07	0.03	$= .001$	-3.53	0.04	$= .003$

tive effects of the related primes per SOA are illustrated in Figure 4.3. The last column in Table 4.7 shows the reaction times for the completion task. With longer SOAs, reaction times decrease in this task. This can be seen as evidence for the preparation of the utterance in response to the idiom fragment when subjects do not know yet what kind of task they have to perform. If subjects applied a strategy (e.g., wait until either the question mark or a word appear before preparing the response) no such decrease would have been observed.

Table 4.7: Mean reaction times (in msec) for the different conditions and SOAs in Experiment 2.

	Word reading				
SOA	*Phon-unrel*	*Phon-rel*	*Sem-unrel*	*Sem-rel*	*Completion*
100	576	566	574	563	668
200	600	594	596	585	644
300	570	558	568	569	532
400	558	551	560	559	516

Planned comparisons of the related and unrelated conditions reveal significant facilitatory effects for phonologically related and semantically related targets at different SOAs. At a SOA of 100 msec, both effects become significant in the subject analysis (one-tailed test), but not in the item analysis. At SOA 200, the semantic effect is established in both subject and item analysis. The opposite holds for SOA 300. Here, only the phonological effect is established. SOA 400 shows a significant effect of phonology, but again only in the subject analysis. t-statistics are provided in Table 4.8. A more detailed item analysis was conducted in order to identify possible subgroups of items. An interaction of item group and condition might have explained the rather weak effects in the item analyses. However, no such subgroups were found. Figure 4.3 illustrates the time course of the phonological and the semantic effect across the different SOAs. Although only the strongest effects reach significance in both item and subject analyses, the Figure shows clear trends in the predicted direction. Like in Experiment 1, a pattern of early semantic effects and later phonological effects is established.

The results indicate that the preparation of a word as part of an idiom can affect the production latencies of words that are phonologically or semantically related to this word.

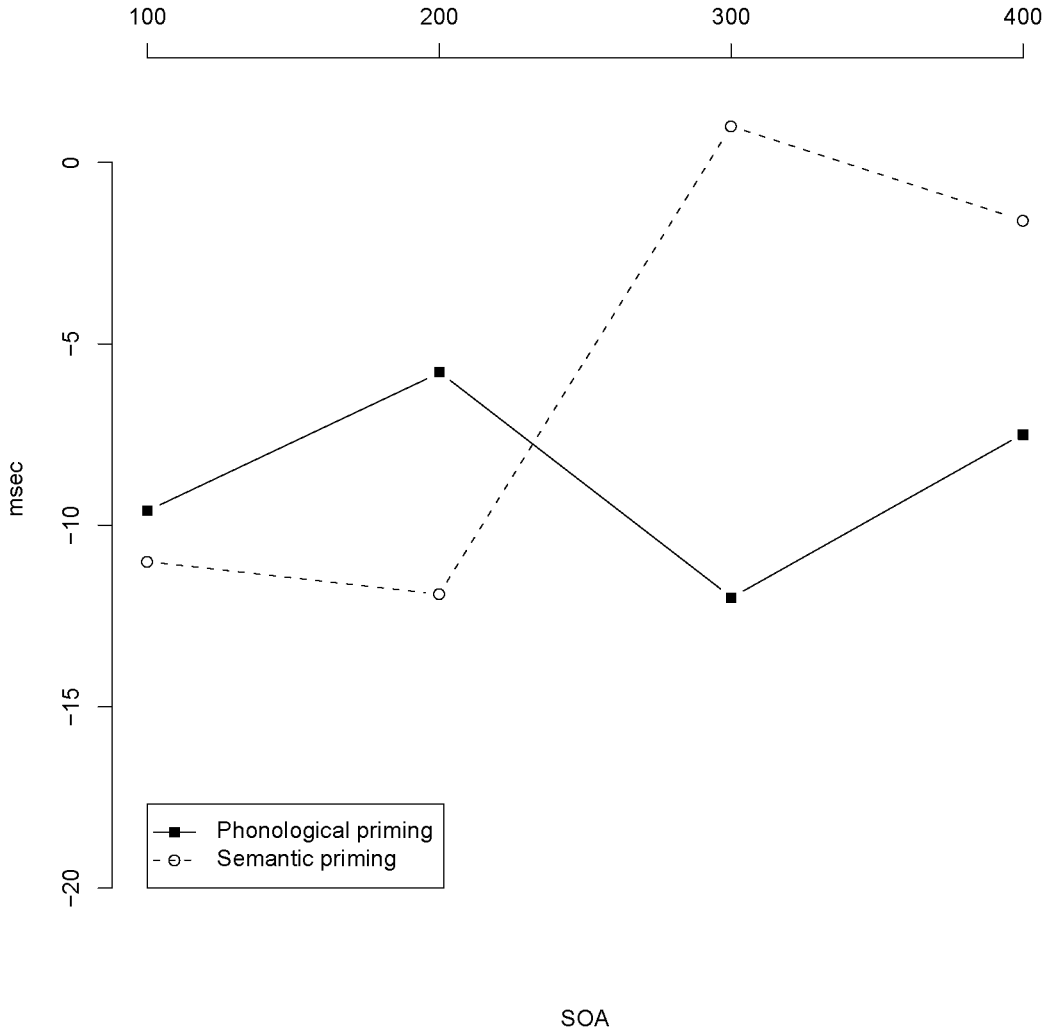

Figure 4.3: Facilitatory effects of phonologically related and semantically related targets in Experiment 2. Values refer to mean differences between Phon-unrel and Phon-rel, and between Sem-unrel and Sem-rel, respectively.

Table 4.8: t-statistics for planned comparisons of the mean reaction times in the related and unrelated conditions in Experiment 2. p-values are given for the two-tailed test. Values for t_1 refer to the analysis with subjects as random factor, values for t_2 refer to the analysis with items as random factor ($df = 15$ in both cases).

SOA	comparison	t_1	SD	p	t_2	SD	p
100							
	Phon-unrel - Phon-rel	2.801	13.8	$= .013$	1.487	25.1	$= .158$
	Sem-unrel - Sem-rel	2.103	21.0	$= .053$	1.681	24.1	$= .113$
200							
	Phon-unrel - Phon-rel	.819	28.5	$= .426$	.832	31.4	$= .419$
	Sem-unrel - Sem-rel	1.824	23.8	$= .088$	2.626	16.6	$= .019$
300							
	Phon-unrel - Phon-rel	1.987	24.3	$= .066$	2.716	18.7	$= .016$
	Sem-unrel - Sem-rel	-.291	13.7	$= .775$	-.022	28.6	$= .983$
400							
	Phon-unrel - Phon-rel	2.780	10.7	$= .014$	1.217	25.1	$= .242$
	Sem-unrel - Sem-rel	.377	16.5	$= .711$	.317	25.8	$= .756$

Again, the presence of a phonological effect confirms the sensitivity of the paradigm to measure these effects. The presence of a semantic effect can be seen as evidence for the activation of literal word meanings during the production of idioms. The effect has been predicted by the superlemma theory, because it assumes the activation of the lexical concept nodes of the lemmas that have been selected as parts of the idiom representation.

General Discussion

Two experiments were conducted in order to explore the activation of simple lemmas and their literal meanings during idiom production. The results have been interpreted in favor of the Superlemma theory. According to this theory, simple lemmas become active during idiom production because they are directly connected to the idiom's own lexical entry (its superlemma). Literal word meanings are predicted to become active, because activation spreads from the simple lemmas to their lexical concept nodes. This direction of activation flow is opposite to the situation where a simple lemma is part of a literal utterance. In that case, words are directly selected because of their meaning, not because

they belong to a fixed expression. If a simple lemma can indeed play a role in both kinds of utterances (idiomatic and literal), it should be possible to trace the flow of activation in its semantic network. Accordingly, Experiment 1 shows that the production latencies for such a simple lemma (as part of an idiomatic phrase) are considerably shorter when primed with a semantically related word than when primed with an unrelated one. Spreading activation within the semantic network enhances the availability of the target lemma. In contrast, Experiment 2 shows that the same effect arises when the preparation of an idiom's simple lemma functions as prime for the production of a semantically related word. Again, spreading activation within the semantic network is assumed to be responsible for the effect. These findings imply that the literal word meanings become active during the production of idiomatic expressions. They are in line with results found by Cutting and Bock (1997), who found an increase in blending errors when there was literal meaning overlap between an idiom and a phrase. They also fit well with the idea that literal word meanings play a role in the productive use of idioms in discourse, as proposed by Cacciari and Glucksberg (1991).

The Superlemma theory offers an explanation for the activity of literal word meanings without having to assume that these meanings are actually part of the speaker's message. This idea is also attractive if one assumes that the production system and the comprehension system both have access to the lemma level and the level of lexical concepts (e.g., Kempen & Harbusch, 2002). Current theories like that of Cacciari and Tabossi (1988) and Titone and Connine (1999) suggest that literal meanings are accessed during idiom comprehension, and that a separate idiom representation is being accessed as soon as there is sufficient evidence (e.g. the "idiom key", see Chapter 3). The easiest implementation of this idea would assume direct connections from the various simple lemmas to the idiom representation. Again, there is no need to assume simple lemmas unique to the idiom. Their activation can spread both to their literal meanings and to the lexical entry of the idiom(s) they belong to.

Appendix 4.A:
Materials Experiments 1 and 2.

Item	Stimulus	Idiom noun	Phon-rel	Sem-rel
1	Jan beet in het	stof	stok	vuil
	Jan bite into the	*dust*	*stick*	*dirt*
	Jan bite into the dust			
2	Jan liep op zijn	tenen	thee	vingers
	Jan walked on his	*toes*	*tea*	*fingers*
	Jan pushed himself to the limit			
3	Jan stond aan het	roer	roem	mast
	Jan stood at the	*helm*	*glory*	*mast*
	Jan was in control			
4	Jan zakte door de	grond	grot	aarde
	Jan sank through the	*ground*	*cave*	*ground*
	Jan cringed with embarassment			
5	Jan schoot in de	roos	roof	tulp
	Jan shot into the	*rose*	*rubbery*	*tulip*
	Jan hit the nail on the head			
6	Jan leefde bij de	dag	dam	week
	Jan lived by the	*day*	*dam*	*week*
	Jan lived from day to day			
7	Jan liep tegen de	lamp	land	kaars
	Jan walked into the	*lamp*	*land*	*candle*
	Jan got caught			
8	Jan viel buiten de	boot	boon	auto
	Jan fell out of the	*boat*	*bean*	*car*
	Jan was excluded from the group			
9	Jan bleef op de	been	beer	arm
	Jan stayed on the	*leg*	*bear*	*arm*
	Jan remained on his feet			

10	Jan ging voor de	bijl	beits	hamer
	Jan went in front of the	*axe*	*stain*	*hammer*
	Jan gave in			
11	Jan zat in de	put	punt	emmer
	Jan sat in the	*well*	*dot*	*bucket*
	Jan was depressed			
12	Jan viel door de	mand	map	korf
	Jan fell through the	*basket*	*file*	*basket*(syn.)
	Jan had to own up			
13	Jan trok aan de	bel	bed	gong
	Jan pulled at the	*bell*	*bed*	*gong*
	Jan raised the alarm			
14	Jan ging uit zijn	dak	das	vloer
	Jan went out of his	*roof*	*tie*	*ground*
	Jan went crazy			
15	Jan stond in zijn	hemd	held	broek
	Jan stood in his	*shirt*	*hero*	*pants*
	Jan was made ridiculous			
16 (Exp. 1)	Jan viel in de	smaak	smaad	geur
	Jan fell into the	*taste*	*dafamation*	*smell*
	Jan appealed (to . . .)			
16 (Exp. 2)	Jan viste achter het	net	nek	hengel
	Jan fished behind the	*net*	*neck*	*fishing* rod
	Jan missed the boat			

General Discussion and Conclusions

Chapter 5

Fixed Expressions (FEs) are fixed combinations of words that function as units of language processing. The goal of this thesis was to explore the role that these units play in language processing and to integrate FEs into theories of language production. The starting point was a survey of the frequencies of FEs in Dutch, the underlying idea being that frequency can be used as a measure of the "relevance" of FEs as a unit of language processing. So, how "relevant" are FEs? A conservative estimate that can be derived from the research reported in this thesis is that about 7% of the words in written text belong to FEs. However, there are several aspects that make it difficult to interpret this figure as either relevant or non-relevant. The frequency counts are based on a corpus that, to a large extent, consists of newspaper articles. It is difficult to determine if this domain of language use is representative for language in general. Still, although one might expect more and different FEs to appear in spoken language, it seems reasonable to expect some considerable overlap between the different domains of language use. Therefore, the estimate of 7% can serve the role of a lower boundary for the percentage of text that is related to the use of FEs. I have interpreted this number as evidence for the hypothesis that FEs are indeed *relevant* units of language processing that are worth integrating into a theory of language production.

However, as has been discussed in Chapter 2, frequency might not be the only criterion appropriate to determine the relevance of a linguistic unit. For example, idioms and proverbs have been found to be much less frequent than the large group of so-called restriced collocations, both in the data discussed herein and in the data of Moon (1998). Yet, idioms and proverbs are generally thought of as the typical examples of FEs.

The relative dominance of restricted collocations over other types of FEs is an interesting finding by itself. Not only does it falsify the intuition that idioms and proverbs are prototypical FEs. It also implies that the presence of a peculiar semantic relationship between the phrase and its elements is not crucial for the processing as a phrasal unit.

In the discussion of Chapter 2, I mentioned the large differences between the estimates of the number of FEs that can be found in the literature. These differences are not so much based on actually different *empirical counts* of FEs, but rather on the differences in the definition of FEs. For example, Pawley and Syder (1983) include "memorized phrases" (e.g., *Where are my keys?* or *I'm surprised to hear that.*) in their definition of FEs, yielding an estimate of "hundreds of thousands" FEs (p.192). Likewise, Jackendoff (1995) suggests including names, song titles and virtually any other well known phrases as entries in the mental lexicon. These different definitions of FEs show that the boundaries of the mental lexicon still need to be explored by identifying objective criteria for categorizing phrases as lexical entries.

Idiomatic expressions allow us to communicate complex concepts that otherwise would require many more words. They allow the speaker to reduce the required number of lexical items that is needed to express the various aspects of a state of affairs. Take for example *He broke the ice with a compliment on her cooking.* The idiom tells us that *he changed the social awkwardness and formality in a positive fashion by complimenting her on her cooking.* According to the Superlemma theory, introduced in Chapter 3, the former utterance requires only a single retrieval act for "break the ice" compared to a multitude of retrievals for the phrase that explicitly spells out the same message. Thus, idioms can function as a shortcut that makes language use easier, because they reduce the cognitive load that is associated with assembling the elements of the target utterance. This position is advocated by Kuiper (1996), who has shown that the predominance of formulaic speech in sport commentaries is closely linked to the speed of the sport in question (e.g., horse races versus cricket). The faster the course of events and the less time a commentator has to describe what is seen, the more often preformatted utterances will be used. In addition, idioms create the opportunity for the speaker to benefit from the concreteness, salience, and imagability that is typical of idiomatic language.

Although it was concluded in Chapter 2 that restricted collocations are the dominant FE subtype, psycholinguistic research on FEs has been focused on idiom processing. One of the reasons for this bias is the intriguing nature of idioms, caused by the multiple layers of meaning that are attached to them. The natural appeal of idioms and other forms of figurative language is mirrored in the large number of dicitionaries that are devoted to idioms, proverbs and sayings (e.g.; Meulendijks & Schuil, 1998, De Groot, 1999, De Coster, 1998, Schuurmans, 1998, and Laan, 1988 for Dutch). Moreover, idioms are especially interesting, because producing idioms involves producing words that have meanings which are not part of the speaker's message. Also, syntactic inflexibility in idioms is more than a simple word order restriction. Often the syntactic constraints that come along with idioms seem arbitrary, or appear to be based on complex interactions between the literal and the figurative meaning of the phrase. Thus, compared to restricted collocations, idioms have a set of additional features, suggesting that once we know how the production of idioms is accomplished, the production of restricted collocations will be explained as well.

So far, the production of idioms has been studied less extensively than their comprehension. In my discussion of the literature on idiom comprehension in Chapter 2, I have stressed the importance of Cacciari and Tabossi's (1988) work. Their "configuration hypothesis" explains the process of idiom comprehension without assuming the existence of a separate idiom lexicon or idiom processing mode (as it had been advocated by Bobrow and Bell (1973)). Instead, this approach to the representation of FEs in the mental lexicon is compatible with a theory of idiom production that represents idioms (and FEs) as ordinary entries in the mental lexicon. However, it is also compatible with the idea that idioms can be subdivided and analyzed into their component words. Cutting and Bock's (1997) research on idiom production points to a similar direction. In their study on experimentally elicited speech errors ("idiom blends"), Cutting and Bock provide evidence for the syntactic processing of idioms and for the activity of literal word meanings during production.

Chapter 3 presents the first experiments that explore idiom production using a reaction time paradigm. The results of these experiments show that the production of an idiomatic phrase can be primed by one of its elements (part-whole priming). For example, present-

ing the word *hand* can speed up the production of the idiom *get out of hand*. When the priming effect for idioms is compared to that for literal phrases, an interaction becomes apparent: The priming effect is larger for idioms than for literal phrases. The presence of such an interaction confirms the hypothesis that idioms have their own entries in the mental lexicon. Moreover, it supports the assumption of an idiom node that binds together the representations of the individual words of the idiom, as formulated by Cutting and Bock (1997). In their view, idioms have their own, unitary representations on the level of lexical concepts. These concepts are connected to the lemmas of the individual words that belong to the idiom. However, the results of the priming experiments are also compatible with a different theoretical position on idiom production. The *Superlemma theory of idiom production* presented in this thesis is based on the theory of language production as proposed by Levelt et al. (1999) and on the Performance Grammar by Kempen and Harbusch (2002). The major difference between the superlemma model and Cutting and Bock's (1997) model is the introduction of a lemma (the Superlemma) for FEs. This Superlemma links the idiom's concept with the simple lemmas that are needed to produce it.

Such an abstract syntactic representation of idioms makes sense, because syntactic constraints are an important aspect of idiom processing. In the language production theory proposed by Kempen and Huijbers (1983) and Levelt et al. (1999), syntactic information is represented on the lemma level. Thus, assuming a superlemma for idioms is a straightforward extension of this model. By linking the superlemma directly to the idiom's lexical elements (simple lemmas), the syntactic constraints can directly be imposed on the elements of an idiom.

In contrast, Cutting and Bock (1997) introduce the so called "phrasal frames" in order to explain the syntactic processing of idioms. These are also abstract, syntactic representations, but they are not unique to the idiom. Unlike superlemmas, phrasal frames require an additional operation that merges the lexical and syntactic information when producing an idiom. However, it remains unclear how this merging operation actually works, in particular when the idiom includes several words of the same syntactic category (as in *be a wolf in sheep's clothes*). With respect to the syntactic encoding of FEs, the Superlemma theory is both more simple and more encompassing than the model proposed by

Cutting and Bock (1997).

In addition, a major drawback of Cutting and Bock's idiom production model is an inconsistency in the connections between lemmas and lexical concepts. *If* one assumes that those connections are reciprocal *and* that this network forms the basis for both idiom production and comprehension, then a qualitative difference emerges between the different kinds of connections in the network which has not been made explicit. Consider for example the connections between the lexical concepts for "bucket" and "kick the bucket" to the lemma "bucket" in Figure 1 of Chapter 3. The pathway for production is straightforward as the connections from a lexical concept to a lemma can be labeled "is (partly) expressed by this word". Thus, the concept "bucket" is expressed by the lemma *bucket* and the concept "kick the bucket" is expressed by the lemmas *kick*, *the* and *bucket*.

However, this approach cannot easily explain the opposite pathway (from lemmas to concepts). For "ordinary" lexical entries, the connection between a lemma and a lexical concept can be labeled "has the meaning of". Thus, the lemma *bucket* has the meaning of the concept "bucket". When the lemma *bucket* is presented in the context of the idiom "kick the bucket", a different connection has to become active, too. This connection has to express "is an element of", as the lemma *bucket* does not "have the meaning of" the idiom but is simply one of its elements. Consequently, one can either assume that there are qualitatively distinct kinds of connections from lemmas to concepts ("is an element of" in addition to "has the meaning of") or one can introduce an idiom representation at the lemma level itself. The latter solution has been chosen in the Superlemma theory of idiom production. According to this approach, the simple lemmas activate the Superlemma. As simple lemmas "have the meaning of" directly linked concepts, the Superlemma *kick the bucket* can have the meaning of the concept "kick the bucket". That way, all links connecting the lemma level with the lexical concept level have the same quality.

It is important to note that such differences in the labeling of connections and the earlier mentioned differences in the application of syntactic constraints are difficult to test empirically. The experiments presented in this thesis cannot rule out the Cutting and

Bock model in favor of the Superlemma model. Future research is necessary and computational modeling might be one of the approaches worth pursuing. However, a general conclusion to be drawn from both theories is that idiom production can successfully be implemented in existing models of language production, without making major changes to the way we think about language production in general.

The results of the experiments presented in Chapter 4 are in line with this conclusion. They were designed to explore further the relationship between the representations of words and idioms in the mental lexicon. Cutting and Bock (1997) report that an overlap between the literal meanings of idioms results in more idiom blends, suggesting that literal word meanings become active during idiom production. Both their model and the Superlemma theory predict such activation, but it has not yet been shown in an online idiom processing task. The first experiment presented in Chapter 4 shows that idioms can be accessed faster when primed with a word that is semantically related to one of the idiom's constituents (e.g., the prime *foot* decreases the speech onset latencies for the idiom *get out of hand*). This supports the assumption that idiom production uses the same simple lemmas that are involved in literal language production. The results support the idea of a flow of activation from the prime word to the target lemma via their conceptual representations. The second experiment reported in Chapter 4 shows that this pathway can also be activated the other way around: the preparation of a word that is part of an idiom can prime the production of a word that is semantically related. Thus, preparing *hand* as part of *get out of hand* can prime the production of *foot*. This result is the first online reaction time evidence for the activity of literal word meanings during idiom production.

The production of FEs is as much a normal part of language production as can possibly be. It is accomplished with the same ease that is characteristic of our ability to speak in general. This is due to the fact that FE production and the production of compositional phrases share the cognitive representations and operations that form the basis of speaking and that arise out of the architecture of the mental lexicon. The work that has been provided in this thesis may contribute to the understanding of this architecture.

Summary

Chapter 6

Listening carefully to everyday conversations reveals that speakers rely heavily on pre-formatted utterances. They talk about the skeletons in their neighbour's closet, about the new position they are looking forward to, and they bet their shirt that their colleague's new car cost an arm and a leg.

Phrasal units as those cited above are often denoted as *Fixed Expressions* (hereafter referred to as FEs). The term FE covers a broad variety of multiword lexical units, ranging from phrasal verbs via restricted collocations[1] and idiomatic expressions (e.g., *to hit the road*) to sayings and proverbs (e.g., *a bird in the hand is worth two in the bush*). For learners of a second language these idioms, proverbs and restricted collocations pose a difficult problem. For example, there is no obvious relationship between secrets and beans, making *he spilled the beans* an uninterpretable utterance for someone who does not know the idiom. In contrast, native speakers easily understand the meaning of the phrase, suggesting that FEs are well integrated units of language processing.

The research that is being described in this thesis was designed to test the general hypothesis that speakers have a good knowledge of FEs and use them frequently. The questions that have been in the focus of interest concern the question *if* we use FEs at all and how FE usage can be explained within a theory of language production.

Examining the occurence of FEs in spoken language is a difficult task, because it requires a large collection of spoken language that has been transcribed and annotated in order to

[1] i.e., fixed, identifiable, non-idiomatic phrases and constructions, for example *to look forward to* or *to commit murder* (Benson et al., 1997)

make it accessible for automatic searches. For the Dutch language, such a collection is at present being assembled (Corpus Gesproken Nederlands, 2003). However, at the time this research was conducted, this corpus was not yet available. Therefore a written corpus of the Dutch Institute for Lexicology (INL) was used instead. This corpus comprises a collection of texts that add up to more than 52 million words. In chapter 2 the results of a count of 1102 FEs in this corpus are described. Since it is a written corpus that contains mainly newspaper articles, the results of this study cannot easily be transferred to the domain of spoken language. For example, it is very likely that the FE "public transport" appears much more often in the media than in spoken interaction. Speakers probably say *I go by bus* instead of *I make use of public transport*. Therefore, the counts that are presented in Chapter 2 of this thesis should be considered a best possible guess. However, it is being assumed throughout the thesis that the usage of FEs in written and spoken language correlates.

The results of the FE corpus research confirm most speakers' intuition that FEs are a frequent phenomenon. FEs are a substantial part of our language use: at least 7% of all words in the corpus belong to an FE. Therefore, FEs can be considered "relevant" building blocks of our language processing system. A theory of language processing (and a theory of language production in particular) need to account for FEs. However, the frequency count also shows that the intuition of the speaker is wrong with regard to the most frequent type of FE. The most common class of FE is not *idiom* or *proverb*, but the so-called "restricted collocations". These are FEs like for example "black coffee", which can be taken literally. However, a closer look reveals that the words that constitute the FE are used and learned as a group (for example, one cannot replace "black" with "dark brown", although this would be a correct description). In written language idioms and proverbs are scarce. That does not necessarily imply that they are uncommon in spoken language, too. Idioms are often colloquial (e.g.;*hit the road*). The frequency analysis of FEs shows that FEs tend to be small building blocks (between two and three words long) that are composed of relatively frequent words. Only few words are bound so strongly to an FE that they are hardly ever (or never) used in a context outside the idiom (compare for example *be withing earshot*). Thus, FEs are "normal", relatively frequent language processing units.

In general theories of language production (compare for example Levelt et al., 1999) FEs so far did not play a role. Cutting and Bock (1997) have done empirical research on the production of idioms. In their study on the characteristics of elicited speech errors they show that so called "idiom blends" are more likely to appear if the two idioms that are involved are similar with regard to their literal of figurative meaning. This result illustrates the compositional character of idioms and contradicts the idea proposed by Swinney and Cutler (1979) that idioms are units that cannot be further analyzed. The speech error data suggest that idioms can be analyzed syntactically and that they are composed out of single words *online*. This result seems difficult to reconcile with the unitary character of idioms and the fact that they often show syntactic peculiarities. For example, it is often not possible to exchange a word in an idiom by another word, even if it has a similar meaning. For example, *spill the beans* makes sense, but *spill the peas* does not. Only small changes of the elements of an idiom may result in an utterance that can only be taken literally. The same holds for changes in the syntax. For example, *get out of hand* is idiomatic, but *get out of hands* (with the plural noun) is not. This vulnerability of idioms suggests that - despite their apparent compositionality - they have a unitary character. All elements of an idiom need to be saved together, and idiom usage is subject to more strict and specific syntactic rules than that of literal phrases and sentences. From this perspective idioms appear more as configuration than as truly compositional units.

Cacciari and Tabossi (1988, language comprehension) and Cutting and Bock (1997, language production) show that this is not necessarily a contradiction. Their models of idiom representation in the mental lexicon are based on the idea that simple word representations become active during idiom processing. However, these simple word representations are linked to an idiom representation. This approach is especially interesting for language production, because it is necessary to find a theoretical explanation for the fact that speakers are able to use an idiom even if its literal meaning is not related to its real, figurative meaning. The missing overlap between the literal and the figurative meaning of *hit the road* does not seem to be a problem for speakers. Cutting and Bock (1997) therefore assume that idioms have their own lexical entry on the level of lexical conceptual representations. This assumption seems to make sense if one assumes that idioms are more than just a random combination of words. Idioms have their own

specific meaning. As elements of figurative language use they allow the speaker to express complex affairs or emotions in few, but clear words. Their meaning is more than just their literal meaning. Even restricted collocations are obligatory elements for native speakers. A learner of English might talk about *brown coffee*. Although this would be a semantically and syntactically appropriate description of coffee without milk, it would immediately reveal the non-nativeness of the speaker (Pawley & Syder, 1983). Therefore idioms (and other FEs) should have their own representation in the mental lexicon. Moreover, such a representation should be connected to the representations of the simple words that are part of the idiom. Such a compositionality of idioms can indirectly be concluded from Cutting and Bock's (1997) speech error data. In their model of idiom representation acitivity flows from the level of lexical concepts to the abstract syntactic word representations on the lemma level. The compositionality of FEs results from the links from an idiom concept to its words. These words are not idiom-specific and are therefore related to their own concept as well. The model explains the production of idioms as a process that makes use of simple lexical entries, and it can explain both the holistic and the compositional character of idioms.

The experiments that are described in Chapter 3 and 4 of this thesis are the first that have tested this theory within a reaction time paradigm. In contrast to the method of speech error analysis the paradigms that have been used here allow to manipulate the processing of idioms during production. The experiments that are presented in Chapter 3 test the hypothesis that during production idioms are composed out of individual words that - unlike in "normal", compositional phrases - are linked via a common representation. In Experiment 1 participants produced Idioms and compositional phrases in response to a previously learned, visually presented stimulus.[2] English examples are *die - kick the bucket* compared to *spill - kick the pail*. At the same time the visual Stimulus (*die* or *kick*) was presented participants were presented an acoustic prime. This was either an identity prime (*bucket*) or a word that was unrelated to the noun of the phrase (*pen*). The reaction times show a main effect of priming: if the acoustic prime is identical to the noun of planned utterance (hearing *bucket* if *kick the bucket* is to be said) reaction times are significantly shorter than if it is unrelated (hearing *pen*). This effect has been found for

[2] All Experiments were in Dutch.

both types of phrases (idiomatic and compositional) and can be explained by the higher availability of the noun for the production system. Hearing the word *bucket* makes it easier to produce *bucket*. The fact that this effect is not restricted to the normal phrases, but has also been found for the idioms, is an argument in favor of the compositional nature of idioms.

A closer look at the data shows an interaction of priming and phrase type. The effect of priming is stronger for idioms than for the compositional phrases. This can be explained by the link that exists between the individual words of an idiom via a common idiom representation. If one element of the idiom gets activated, activation spreads within the network of representations and enhances the availability of all the idiom's elements. If however an element of a compositional phrase gets activated, only the availability of the word itself is enhanced. There is no representation in the mental lexicon for this combination of words. The results of Experiment 2 in Chapter 3 show in addition that the priming effects that were found in Experiment 1 are lemma based effects. The experiment is very similar to the first one, except for the usage of acoustic primes that were either phonologically related or unrelated to the noun of the phrase. The absence of a priming effect in this Experiment argues against the assumption that the effects that were found in Experiment 1 are mere phonological preparation effects. Since both Experiment 1 and Experiment 2 show a difference in reaction times between idiomatic and compositional phrases (idioms need more time to produce), Experiment 3 was designed to eliminate possible differences in the accessability of the different phrase types. The method applied in this experiment allows to clarify if the difference in reaction times is due to a general difference between the phrase types or if it merely results from the experimental method that was applied. The results of Experiment 3 argue in favor of the latter option. If both kinds of phrases are made equally difficult to access (for example, *John... had kicked the bucket* versus *John... had kicked the pail*, with *John* as prompt word in both cases) no reaction time differences are found. However, the interaction between priming and phrase type that was found in Experiment 1 still remains.

The results that are described in Chapter 3 are compatible with the earlier described model of idiom processing by Cutting and Bock (1997), in which individual word representations are connected via a common idiom representation. However, this model has

its drawbacks as it comes to syntactic processing. Cutting and Bock (1997) assume that the syntactic features of an idiom are stored by means of so called *phrasal frames*. According to this idea, an acitve idiom representation sends activation in two directions: to the individual word representations and to the corresponding phrasal frame. In a further processing step syntax and word information have to be combined. An alternative for this concept is the Superlemma theory of idiom processing that is introduced in the discussion of Chapter 3. This theory is based on theories of language production by Kempen and Huijbers (1983) and Levelt et al. (1999). Accordingly, syntactic information is assumed to be lemma information. The lemma of a word comprises its syntactic specifications that allow to integrate the word into larger syntactic units like phrases or sentences. Idioms also have specific syntactic features.Therefore it seems necessary to represent them with their own lexical entry on the lemma level of processing. Such a *superlemma* is directly linked to the lemmas of the individual words that belong to the idiom. Thus, the lemmas that belong to the idiom *kick the bucket* are not assumed to be activated by an idiom concept, but by a syntactic idiom representation that entails the positions and syntactic functions of the idiom's component words. An additional processing step that combines the single word representations and the idiom's syntax is therefore not necessary. Moreover, the principle of a direct link between a concept and lemma is kept intact. The data that are described in Chapter 3 and 4 are compatible with both Cutting and Bock's (1997) theory of idiom processing and the Superlemma theory. The difference between the theories concerns mainly the syntactic aspects of idiom representation. However, the experiments presented mainly focus on the role that individual word representations play during idiom production.

In Chapter 4 the activation of word meanings during idiom production is further explored. At the basis of this research was Cutting and Bock's (1997) observation that idiom blends occur more often if the idioms show overlap in their literal meanings. Both Cutting and Bock's model and the Superlemma theory predict such an effect, because they both assume that idioms activate normal word representations that each have their own entry on the conceptual level. Therefore idiom production should be sensitive to the presentation of prime words that are semantically related to the words that make up the idiom. If a speaker prepares *bucket* as part of *kick the bucket* a semantically related prime

like *pail* can facilitate the production of *bucket* and therefore the production of the idiom as a whole. This effect was found in Experiment 1 in Chapter 4. It shows that during the production of the idiom "normal" word representations become active. This result is only an indirect proof for the activation of literal word meanings during the production of idioms. However, it is supported by the results of Experiment 2. In this experiment it is shown that priming also works the other way round. Participants were instructed to complete visually presented idiom fragments. Sometimes another word was presented and participants were instructed to then switch task and read out loud the single word. This word was sometimes semantically related to the last word of the idiom (e.g., *pail* if *bucket* was being prepared). Again, semantic priming effects were observed. These results are additional evidence for the activation of literal word meanings (*bucket*) during the production of idioms, even if these meanings are not part of the message to be conveyed (*to die*). Thus, a word can be activated in the mental lexicon via two different pathways: via its conceptual representation or via an idiom representation. In both cases the same lexical entry becomes active.

The intuition that idioms are "special" units of processing can therefore partly be supported, but also partly misses the point. When speakers use idioms, they activate word meanings that are not part of the idea that they want to convey (if someone *kicks the bucket* the pain in his foot will be the least problem). The data in Chapter 4 show that still the literal word meanings become active when we produce the idiom. Together with the results of Chapter 3 (which support the general decomposability of idioms, but also stress the need for a unitary representation) this argues for a hybrid model of idiom representation in the mental lexicon. FEs are both compositional and holistic at the same time. The superlemma theory and the model of Cutting and Bock (1997) agree in this point. The data that have been collected so far do not allow to falsify one of the two models in favor of the other. This leaves opportunities for further research on idiom production. A closely related question concerns the precise implementation of the syntactic component of FEs. Other questions concern the representation and processing of different types of FEs (as for example restricted collocations). The relatively high frequency of non-idiomatic FEs, together with the discussion in Chapter 2 on the boundaries of the mental lexicon leads to numerous other questions of interest.

Samenvatting

Kapitel 7

Achter zogenaamde *Fixed Expressions* ("vaste uitdrukkingen", afgekort tot FE in het vervolg van dit hoofdstuk) gaat een fenomeen schuil waar de meeste sprekers goed bekend mee zijn. In het alledaagse taalgebruik komen spreekwoorden, idiomen en gezegdes veel voor. Wij hebben het over *de aap die uit de mouw komt*, we *halen oude koeien uit de sloot* en *schieten soms voor geen meter op* met wat we doen. Een ander voorbeeld van vaste uitdrukkingen zijn de zogenaamde *restricted collocations* (vaste samenstellingen): *openbaar vervoer* of *officier van justitie*. Voor iemand die een vreemde taal leert zijn zowel uitdrukkingen, gezegdes en vaste samenstellingen moeilijke gevallen, want bijvoorbeeld "waarheid" heeft weinig met een "aap" of een "mouw" gemeen. Als moedertaalsprekers hebben wij echter weinig moeite met dit soort rare taal gevallen. Dit is misschien een eerste indicatie dat FE bijzonder goed in ons taalverwerkingssysteem zijn geïntegreerd. In het onderzoek waarvan in dit proefschrift verslag wordt gedaan, is geprobeerd om met behulp van systematisch onderzoek naar het voorkomen en het gebruik van FE ondersteuning te vinden voor de claim dat sprekers in het algemeen goed bekend zijn met idiomen en FE en er veelvuldig gebruik van maken. Daarbij ging het niet om de vraag naar de *functie* van FE in taalgebruik, maar om de vraag *of* wij überhaupt FE gebruiken en om de vraag hoe het gebruik van FE verklaard kan worden in een theorie van taalproductie.

De vraag naar het voorkomen van FE in gesproken taal is moeilijk te onderzoeken. Noodzakelijk daarvoor is dat er een uitgebreide verzameling van gesproken taal beschikbaar is, die bovendien uitvoerig woord voor woord getranscribeerd (welk woord wordt uitgesproken) en geannoteerd (de klasse van dat woord, bv. werkwoord) is. Alleen als

een dergelijke verzameling voorhanden is, is het mogelijk de noodzakelijke gecomputeriseerde tellingen te doen. Momenteel wordt er aan een verzameling gewerkt (Corpus Gesproken Nederlands, 2003) die aan deze eisen voldoet, maar deze was op het tijdstip waarop dit onderzoek plaats vond nog niet beschikbaar. Als alternatief werd er daarom gebruik gemaakt van een corpus van geschreven teksten van het Nederlandse Instituut voor Lexicologie (INL) in Leiden. De teksten die voor dit corpus zijn gebruikt, hebben tezamen meer dan 52 millioen woorden. In Hoofdstuk 1 worden de resultaten gepresenteerd van een telling van 1102 willekeurig gekozen FE. Omdat het om een geschreven corpus gaat, met bovendien een relatief groot aandeel van krantenteksten, zijn de resultaten van deze telling niet zonder meer naar gesproken taal te generaliseren. Het is bijvoorbeeld waarschijnlijk dat FEs als *openbaar vervoer* of *officier van justitie* veel vaker in krantentekst verschijnen dan in een normaal gesprek. Men zal eerder zeggen *ik ga met de bus* dan *ik ga met het openbaar vervoer*. De hier gepresenteerde telling moet daarom als een schatting van het gebruik van FE worden gezien. (Een voorbeeld van hoe veel FEs wel niet kunnen voorkomen in krantenteksten wordt gegeven in de verzonnen krantentekst gepresenteerd in Tabel 4, Hoofdstuk 2.)

De resultaten van de telling bevestigen de intuitie van de meeste sprekers dat FE een relatief frequent voorkomend fenomeen zijn. Een conservatieve schatting is dat 7% van alle woorden van het doorzochte corpus onderdeel van een FE zijn. Deze telling ondersteunt het idee dat FE relevante bouwstenen van ons taalgebruik zijn, en dat een theorie van taalverwerking en taalproductie daarom een verklaring moet kunnen geven over hoe FE worden gebruikt. De telling laat echter ook zien dat de vaak voorkomende intuitie van moedertaalsprekers niet altijd juist is: de klasse van FE die het vaakst voorkomt zijn niet de spreekwoorden en gezegdes, maar de *restricted collocations*. Zoals de voorbeelden die eerder zijn aangehaald al aangeven zijn deze samenstellingen vaak beter letterlijk te interpreteren dan de uitdrukkingen en gezegdes. Echter, ondanks het feit dat *openbaar vervoer*, *officier van justitie* en *zwarte koffie* gemakkelijk letterlijk zijn te interpreteren zijn deze samenstellingen bijzonder omdat zij als woordgroep moeten worden geleerd en ook als zodanig worden gebruikt. Men zegt bijvoorbeeld niet *donkerbruine koffie*, terwijl dat wel een betere beschrijving zou zijn. In geschreven taal komen idiomen en spreekwoorden maar heel zelden voor. Maar omdat schrijftaal in het algemeen formeler is dan

gesproken taal hoeft dit niet perse te betekenen dat dit soort eenheden ook in gesproken taal zelden voorkomt. Idiomen zijn vaak onderdeel van algemeen, informeel taalgebruik. *De boel op stelten zetten* zal men bijvoorbeeld niet snel in een formeel krantenartikel tegenkomen en als het wel voorkomt, is het vaak om een bepaalde informele sfeer aan te geven.

Uit de analyses blijkt dat de gemiddelde lengte van een FE in de bestudeerde teksten twee tot drie woorden lang is. Als wordt gekeken naar de frequentie van de woorden waaruit de FE bestaan blijkt verder dat de meeste woorden in FE hele gewone woorden zijn. Er zijn slechts weinig FE die woorden bevatten die zo sterk aan een FE zijn gebonden dat zij nauwelijks of niet in andere contexten voorkomen (bijvoorbeeld *kijf* in *buiten kijf*).

In de algemene theorieën over taalproductie (zie bijvoorbeeld Levelt et al., 1999) speelden FE tot nu toe geen rol.Cutting en Bock (1997) hebben empirisch onderzoek naar de productie van idiomen gedaan. In hun onderzoek naar de karakteristieke kenmerken van uitgelokte spraakfouten laten zij zien dat zogenaamde "idiom blends" (het door elkaar halen van twee idiomen) vooral voorkomen als de idiomen gelijkenis vertonen in de syntactische structuur en/of in betekenis (bijvoorbeeld "onder het hoekje liggen" door vermenging van "onder de zoden liggen" en "het hoekje omgaan"). Dit resultaat laat zien dat idiomen, hoewel ze grotere eenheden zijn dan een woord, wel woord-voor-woord worden opgebouwd. Dit compositionele karakter is in strijd met het bestaande idee dat idioomverwerking in grotere, niet opbreekbare eenheden plaatsvindt (zie Swinney en Cutler, 1979). De spraakfoutdata wijzen er echter op dat idiomen syntactisch analyseerbare eenheden zijn en dat zij uit aparte woorden *online* in elkaar gezet worden.

Dit resultaat is in eerste instantie moeilijk in overeenstemming te brengen met de vaste structuur van idiomen die vaak ook gepaard gaat met syntactische afwijkingen van normaal taalgebruik. Wat betreft de vaste structuur: men kan in een FE niet zomaar een woord vervangen door een ander woord, zelfs niet als de woorden qua betekenis erg op elkaar lijken. Zo denkt men bij het horen van *door de mand vallen* aan "ontmaskeren" maar bij *door de korf vallen* aan iets dat door een korf valt. Met andere woorden, door het veranderen van slechts één woord is het mogelijk dat de uitdrukking alleen maar letterlijk geïnterpreteerd kan worden. Ook syntactische veranderingen kunnen dit tot ge-

volg hebben: bij *door de manden vallen* zal men eerder denken aan iets dat valt dan aan ontmaskeren. Deze relative kwetsbaarheid van FE duidt erop dat zij – ondanks de compositionaliteit – een vast karakter hebben. De elementen van FE zijn verbonden opgeslagen en dat het gebruik ervan is gebonden aan strengere en specifiekere syntactische regels dan het gebruik van woorden in niet-idiomatische frases en zinnen.

Vanuit dit perspectief lijken idiomen daarom beter als "configuraties" begrepen te kunnen worden dan als "compositionele" eenheden. Dat dit niet tegenstrijdig is, laat zowel de configuratie hypothese voor het begrijpen van idiomen Cacciari en Tabossi (1988) zien als de theorie van Cutting en Bock (1997) over de representatie van idiomen in het mentale lexicon van sprekers. Beide theorieën gaan ervan uit dat aparte representaties voor idiomen actief worden bij verwerking. Deze idioom-representaties zorgen vervolgens voor het activeren van de woorden die nodig zijn om het idioom uit te spreken. Dit idee is voor de taalproductie bijzonder interessant omdat hiermee een verklaring kan worden gegeven hoe het mogelijk is dat woorden worden uitgesproken waarvan de letterlijke betekenis op geen enkele manier lijkt op de geplande boodschap (bijvoorbeeld, *mand* uitspreken als de boodschap *ontmaskeren* is). Cutting en Bock (1997) gaan ervan uit dat FEs een *entry* op conceptueel niveau hebben in het mentale lexicon. Deze assumptie sluit aan bij het idee dat idiomen hun eigen, specifieke betekenis hebben die slecht uit te drukken is in andere woorden (bijvoorbeeld, het is moeilijk een precieze omschrijving van de betekenis van *voor spek en bonen* te geven). Als elementen van figuurlijk taalgebruik maken zij het de spreker mogelijk ingewikkelde situaties en emoties in weinig maar wel duidelijke woorden te vatten. Het betekenisgehalte van een FE steekt ver uit boven dat van de losse woorden zelf. Voor de restricted collocations geldt dat deze in het algemeen zeer bekend zijn en veelvuldig gebruikt worden; soms zelfs vrijwel onvermijdelijk zijn. Zo zou iemand die Nederlands leert van *bruine koffie* kunnen spreken als *zwarte koffie* bedoeld wordt. Ookal is dit een semantisch en syntactisch correkte beschrijving van *koffie zonder melk*, toch zal het direct duidelijk zijn dat de spreker geen moedertaal spreker is Pawley en Syder (1983).

Het bovenstaande maakt het zowel aannemelijk om te veronderstellen dat idiomen compositioneel zijn (op grond van de spraakfoutdata) en dus verbonden zijn met losse woorden, als te veronderstellen dat idiomen een aparte representatie hebben (op grond van

de eigen betekenis van een idioom en de onmogelijkheid woorden te vervangen danwel te veranderen zonder de idiomatische betekenis te verliezen). Cutting en Bock (1997) veronderstellen dat het concept van een idioom is verbonden met de losse woorden (de lemma's). In dit model gaat de activatie van het niveau van de concepten naar de (meer abstracte, syntactische) woordrepresentaties op lemma niveau en is de compositionaliteit van idiomen een direct resultaat van de verbindingen van een idioom-concept met de aparte woorden. Deze woorden hoeven daardoor niet specifiek voor het idioom te zijn, zij hebben ieder hun eigen betekenis. Een dergelijk model heeft het voordeel dat het de productie van idiomen met behulp van meerdere eenvoudige *entries* kan verklaren. Het gaat hier om een hybride model van idioomproductie, omdat er zowel een representatie van het idioom als geheel is, als een rol voor de losse woorden.

De in Hoofdstuk 3 en 4 van dit stuk besproken experimenten zijn de eerste die deze theorie in een reactietijd paradigma hebben getest. Proefpersonen kregen de opdracht om zo snel mogelijk een idioom danwel een deel van een idioom uit te spreken. (Omdat spreekwoorden en gezegdes beter geschikt zijn voor het soort onderzoek gepresenteerd in dit proefschrift, zijn er geen restricted collocations gebruikt in de experimenten.) Met behulp van metingen van de tijd die het kost om een bepaalde zin af te maken, kan worden onderzocht hoe idiomen gerepresenteerd zijn. Daarnaast is het mogelijk de verwerking van idiomen tijdens het productieproces te manipuleren door de context waarin een zin wordt aangeboden te veranderen. Dit is een voordeel boven spraakfout analyses die alleen indirecte conclusies over de verwerking van taal toelaten. De in Hoofdstuk 3 besproken experimenten testen de hypothese dat idiomen tijdens de productie uit aparte woorden in elkaar worden gezet, maar dat ze desondanks anders zijn dan 'gewone' frases, omdat de woorden door de gemeenschappelijke representatie met elkaar verbonden zijn. In Experiment 1 produceerden proefpersonen Nederlandse FE als reactie op een visueel gepresenteerd woord. Voor het experiment hadden de proefpersonen koppelingen van woorden en frases (zowel idiomatische als niet idiomatische frases) moeten leren, zoals *waarschuwen* met *aan de bel trekken* en *opspringen* met *van de bel schrikken.* In het experiment hoorden de proefpersonen een auditief gepresenteerd woord tegelijkertijd met het visueel gepresenteerde woord. Dit was een identity prime (een woord dat voorkomt in de frase, zoals *bel*) danwel een ongerelateerd prime (*koek*). De reactietijden

laten een effect van priming zien: als de auditieve prime identiek is, zijn de reactietijden significant korter dan als de prime ongerelateerd is.

Dit effect treedt op bij beide soorten frases en is te verklaren uit de snellere beschikbaarheid van het zelfstandig naamwoord als het eerder gehoord is. Het feit dat het effect zich niet beperkt tot de gewone frases is een argument voor het compositionele karakter van idiomen; als idiomen enkel als complete, kant-en-klare structuur beschikbaar zouden zijn, zou deze priming niet eenvoudig tot stand hebben kunnen komen. Verder laten de reactietijden een interactie tussen priming en het type frase zien. De priming is sterker voor de idiomen dan voor de niet-idiomatische frases. Dit kan worden verklaard uit de indirecte onderlinge verbondenheid van de losse woorden van het idioom. Aangezien alle woorden via de idioom-entry met elkaar verbonden zijn, zorgt de priming van een enkel woord door middel van activatie-spreiding voor indirecte priming van alle andere idioom-woorden. Daardoor zullen deze sneller kunnen worden uitgesproken. Als een woord van een niet-idiomatische frase wordt geprimed, wordt enkel de beschikbaarheid van dat woord groter. De toevallige combinatie van de woorden van de niet-idiomatische frase zal niet extra aktief worden, omdat er geeen representatie in het mentale lexicon is voor die combinatie.

Experiment 2 van Hoofdstuk 3 laat bovendien zien dat het bij de in Experiment 1 gevonden priming-effecten om effecten op het lemma-niveau (woordniveau) van het mentale lexicon gaat. Een mogelijke verklaring van het in Experiment 1 gevonden effect zou namelijk kunnen zijn dat het louter gaat om fonologische priming. Dit houdt in dat puur doordat de klanken van het woord zijn gehoord, het woord daarna sneller kan worden uitgesproken. Het experiment is een herhaling van het eerste experiment, maar dan met auditieve primes die fonologisch gerelateerd danwel ongerelateerd zijn aan het zelfstandig naamwoord. Dit experiment liet geen effect van priming zien. De afwezigheid van een fonologisch priming effect gaat tegen de alternatieve verklaring in dat het bij de resultaten van Experiment 1 volledig of gedeeltelijk om fonologische voorbereidingseffecten gaat.

Zowel Experiment 1 als Experiment 2 laat een verschil zien in de reactietijden voor idiomatische en niet-idiomatische frases. In beide experimenten zijn de idiomatische frases

trager dan de niet idiomatische frases. Omdat niet duidelijk was of dit een echt effect was, of veroorzaakt werd door de experimentele opzet, werd een experiment opgezet waarin ervoor gezorgd werd dat beide types frase even moeilijk danwel makkelijk op te roepen zijn. Hiertoe werden de frases gekoppeld aan eigennamen (bijvoorbeeld *Kees...viel vreselijk door de mand* versus *Kees...legde het hondje in de mand*). De resultaten van Experiment 3 duiden erop dat het reactietijdverschil gevonden in Experiment 1 en 2 veroorzaakt wordt door de experimentele opzet. Echter, de in Experiment 1 gevonden interactie tussen priming en frase type blijft behouden.

De in Hoofdstuk 3 beschreven resultaten zijn compatibel met de eerder beschreven idioomverwerkingstheorie van Cutting en Bock (1997), waarin aparte woordrepresentaties met een gemeenschappelijke idioomrepresentatie verbonden zijn. Deze theorie is echter vaag waar het om syntactische verwerking van idiomen gaat. Cutting en Bock (1997) gaan ervan uit dat de syntactische eigenschappen van een idioom (bijvoorbeeld "onderwerp staat in meervoud") met behulp van een "phrasal frame" opgeslagen worden. Volgens deze theorie stuurt een actief idioom activatie in twee richtingen: naar de aparte woordrepresentaties en naar de phrasal frame. In een extra verwerkingsstap moeten dan syntax en woordinformatie met elkaar gecombineerd worden.

De Superlemma theorie van idioomproductie, geïntroduceerd in de discussie van Hoofdstuk 3, is een alternatief voor deze theorie. Volgens de Superlemma theorie is de *entry* in het mental lexicon die het concept van een idioom weergeeft verbonden met een superlemma. Een dergelijk superlemma is direct met de aparte woord-lemmas van het idioom verbonden. Hierdoor worden de woorden die bij het idioom *door de mand vallen* horen niet direkt door het idioom-concept geäctiveerd, maar door het superlemma. Deze bevat een syntactische representatie, die de posities en syntactische functies van de bestanddelen definieert. Een extra verwerkingsstap die de opgehaalde woorden en de syntax van het idioom met elkaar combineert is hierdoor overbodig. Verder blijft het algemene principe van een direkte link tussen één concept naar één lemma behouden. Zie voor een grafische afbeelding van deze theorie Hoofdstuk 3, Figuur 2. De resultaten in dit proefschrift kunnen zowel worden beschreven met de theorie van Cutting en Bock (1997) als met de Superlemma-theorie. Het verschil tussen de twee theorieën ligt in eerste plaats op het gebied van de syntactische representaties van idiomen. De hier beschreven experimen-

ten richten zich echter voornamelijk op de bijdrage van de aparte woordrepresentaties tijdens de idioomproductie.

In Hoofdstuk 4 werd specifiek naar de activatie van woordbetekenissen tijdens idioomproductie gekeken. Uitgangspunt was de observatie van Cutting en Bock (1997) dat idiom blends vaker optreden als de betrokken idiomen in letterlijke betekenis overlappen. Een dergelijk effect wordt zowel door het model van Cutting en Bock (1997) als ook van het Superlemma model voorspeld, omdat beide theorieën ervan uitgaan dat idiomen normale woordrepresentaties activeren die ieder een eigen entry op conceptueel niveau hebben. De productie van idiomen zou daarom gevoelig moeten zijn voor de presentatie van prime woorden die semantisch met de woorden van het idioom verbonden zijn. Als een spreker *mand* als deel van het idioom *door de mand vallen* voorbereidt dan kan een semantisch gerelateerde prime (*korf*) de productie van het woord *mand* (en daardoor het idioom als geheel) makkelijker maken. In Experiment 1 van Hoofdstuk 4 werd dit effect inderdaad gevonden. Dit laat zien dat tijdens het produceren van idiomen de "normale" representaties van woorden actief worden. Dit effect is echter slechts een indirect bewijs voor de activatie van woordbetekenissen bij het produceren van idiomen. Experiment 2 versterkt dit bewijs door te laten zien dat ook via de tegenovergestelde weg priming meetbaar is. Proefpersonen werd geïnstrueerd om visueel gepresenteerde idiomen aan te vullen. Soms moesten zij echter van taak wisselen, en een visueel gepresenteerd woord voorlezen. Dit woord was soms gerelateerd aan het laatst aangevulde idioom (bijvoorbeeld, het idioom *door de mand vallen* gevolgd door het woord *korf*). Ook in dit experiment zijn semantische priming effecten te zien. De resulaten zijn wederom een indicatie dat bij het produceren van idiomen de betekenissen van de aparte woorden aktief worden (de betekenis "mand" voor *mand*), ook al vormen ze geen deel van de intentie van de spreker ("ontmaskeren"). Een woord in het mentale lexicon kan dus via beide wegen actief worden: via zijn conceptuele representatie (als zijn betekenis gevraagd is) of via een idioom-representatie. In beide gevallen wordt er van dezelfde representatie gebruik gemaakt.

De intuïtie dat het bij idiomen om 'bijzondere' eenheden gaat kan daarom gedeeltelijk worden bevestigd maar wordt ook gedeeltelijk ontkracht. Als mensen idiomen produceren dan activeren zij woordbetekenissen die geen deel uitmaken van het concept dat

onder woorden gebracht wordt. *Daar komt de aap uit de mouw* heeft noch betrekking op apen noch op mouwen, maar op het opeens duidelijk worden van iets. De resultaten van de experimenten in Hoofdstuk 4 laten zien dat desalniettemin de verschillende woordbetekenissen actief worden als wij het idioom produceren. Samen met de resultaten in Experiment 3, die de algehele compositionaliteit van idiomen bevestigen, maar ook de noodzakelijkheid aangeven van een aparte idioomrepresentatie, pleit dit voor een hybride model van idioomrepresentatie in het mentale lexicon. FE zijn tegelijkertijd compositioneel en holistisch. Het Superlemma-model en de idioomproductie theorie van Cutting en Bock (1997) stemmen hierin overeen. Zoals gezegd maken de ter beschikking staande data het niet mogelijk om één van de twee modellen te verwerpen. Hieruit ontstaan aanbevelingen voor verder onderzoek naar idioomproductie. Een belangrijk hieruit voortvloeiend aandachtspunt is hoe de syntactische component van FE geïmplementeerd is. Verdere open vragen betreffen de representatie en verwerking van verschillende types FE (zoals restricted collocations). De relatief hoge frequenties van niet-idiomatische FE, zowel als de in Hoofdstuk 2 gevoerde discussie over de grenzen van het mentale lexicon zorgen voor verdere vragen.

Zusammenfassung

Kapitel 8

Hinter sogenannten *Fixed Expressions* (feststehende Redewendungen, im Folgenden FE) verbirgt sich ein Phänomen, dass den meisten Sprechern gut bekannt ist: der Gebrauch von Idiomen, Sprichwörtern, Grussformeln oder anderweitigen Redewendungen, die wir in unseren Sprachgebrauch mit einfliessen lassen. Wir reden darüber, dass alles *Jacke wie Hose* ist, wir verkünden, dass wir *Bäume ausreissen könnten*, oder dass *der Hund in der Pfanne verrückt wird*. Aus der Perspektive eines Sprachlerners handelt es sich hierbei um schwierige Fälle, haben doch z.B. Kleidungsstücke nur wenig mit der Entscheidungsfindung zu tun (*Jacke wie Hose*). Als Muttersprachler gehen wir jedoch mit erstaunlicher Leichtigkeit über solche Widersprüchlichkeiten hinweg, was als erster Hinweis dafür gelten mag, dass FE ausgesprochen gut in unser Sprachverarbeitungssystem integriert sind. In der vorliegenden Arbeit wurde der Versuch unternommen, solcherlei anekdotische Evidenz ("Jeder kennt und benutzt Idiome/FE") für die Relevanz von FE mit einer systematischen Untersuchung zu Vorkommen und Gebrauch von FE zu unterstützen. Dabei ging es nicht um die Frage nach der Funktion von FE im Diskurs, sondern einzig um die Frage *ob* wir FE benutzen, und wenn ja, wie dies innerhalb eines Sprachproduktionsmodells erklärt werden kann.

Die Frage nach dem Vorkommen von FE in gesprochener Sprache ist äusserst schwierig zu untersuchen, da es dafür einer umfangreichen Sammlung gesprochener Texte bedarf, die ausführlich transkribiert und annotiert ist, und die einer automatisierten Such-Routine zugänglich ist. Eine solche Sammlung ist – für das Niederländische – zur Zeit in der Entstehung begriffen (Corpus Gesproken Nederlands, 2003) , befand sich aber zum Zeitpunkt der hier vorgestellten Untersuchungen noch in den Kinderschuhen. Es

wurde daher auf einen geschriebenen Corpus des Instituts für Niederländische Lexikologie (INL) zurückgegriffen. Dieser Corpus umfasst eine Sammlung von Texten, die sich zu mehr als 52 Millionen Wörtern addiert. In Kapitel 1 werden die Ergebnisse einer Zählung von 1102 FE in diesem Corpus dargestellt. Da es sich um einen geschriebenen Corpus handelt, der noch dazu überwiegend aus Zeitungsartikeln besteht, sind die Ergebnisse dieser Zählung nicht ohne weiteres auf gesprochene Sprache zu übertragen. Es ist beispielsweise wahrscheinlich, dass der feststehende Ausdruck *Öffentlicher Nahverker"* weit öfter in den Medien erscheint als in normaler Unterhaltung. So sagt man zum Beispiel eher *Ich nehme den Bus* anstatt *Ich nutze den Öffentlichen Nahverkehr*. Die hier vorliegende Zählung sollte deshalb als bestmögliche Schätzung des Gebrauchs von FE gesehen werden. In dieser Arbeit wurde im weiteren davon ausgegangen, dass der Gebrauch von FE in geschriebener und gesprochener Sprache miteinander korreliert.

Die Ergebnisse der Zählung bestätigen die Intuition der meisten Sprecher, dass FE ein relativ häufiges Phänomen sind. FE sind ein fester Bestandteil unseres Sprachgebrauchs: mindestens 7% aller Wörter des durchsuchten Corpus gehören zu einer FE. Diese können damit als "relevante" Bausteine unseres Sprachverarbeitungssystems gesehen werden, denen eine Theorie der Sprachverarbeitung (und hier insbesondere der Sprachproduktion) Rechnung tragen muss. Die Frequenzzählung zeigt jedoch auch, dass die Sprecher-Intuition in einem Punkt trügt: die am häufigsten vorkommende Klasse von FE sind nicht die Idiome und Sprichwörter, sondern die sogenannten "eingeschränkten Kollokationen". Darunter fallen Ausdrücke wie z.B. *schwarzer Kaffee*, die zwar ohne weiteres wörtlich zu nehmen sind, jedoch bei näherer Betrachtung als *Wortgruppe* benutzt und gelernt werden (man sagt zum Beispiel nicht *dunkelbrauner Kaffee*, obwohl dies die korrektere Beschreibung wäre). In geschriebener Sprache scheinen Idiome und Sprichwörter dagegen nur sehr selten vor zu kommen. Da sich Schriftsprache jedoch im Allgemeinen durch eine formalere Ausdrucksweise kennzeichnet, bedeutet dies jedoch nicht zwangsweise, dass diese Einheiten auch in gesprochener Sprache selten sind. Idiome gehören oft zur Umgangsprache (vgl. *da wird doch der Hund in der Pfanne verrückt!* oder *Was Hänschen nicht lernt, lernt Hans nimmermehr*). Desweiteren zeigt die Frequenzanalyse, dass frequente FE eher kleine Bausteine sind (zwischen zwei und drei Wörtern lang), die noch dazu aus relativ frequenten Wörtern aufgebaut sind. Nur wenige Wörter sind

so stark an eine FE gebunden, dass sie kaum oder gar nicht in anderen Kontexten benutzt werden (vgl. zum Beispiel *Schnippchen* in *jemandem ein Schnippchen schlagen*). Es handelt sich bei FE deshalb um "normale", relativ frequent vorkommende sprachliche Verarbeitungseinheiten.

In allgemeinen Theorien zur Sprachproduktion (vgl. etwa Levelt, Roelofs und Meyer, 1999) spielten FE jedoch bisher keine Rolle. Cutting und Bock (1997) liefern eine empirische Untersuchung zur Produktion von Idiomen. In ihrer Studie über die Charakteristika elizitierter Sprechfehler zeigen sie, dass sogenannte "idiom blends", also die Vermischung zweier Idiome, wahrscheinlicher sind, wenn sich die Idiome in ihrer syntaktischen Struktur oder in ihrer wörtlichen oder figürlichen Bedeutung ähneln. Dieser Befund illustriert den kompositionellen Charakter von Idiomen und widerspricht der in der Literatur zur Idiomverarbeitung vertretenen Auffassung, dass es sich bei Idiomen um nicht-analysierbare Strukturen handelt (Swinney und Cutler, 1979) . Die Sprechfehlerdaten weisen im Gegenteil darauf hin, dass Idiome syntaktisch analysierbare Einheiten darstellen und dass sie aus Einzelwörtern *online* zusammengesetzt werden. Dieser Befund scheint nur schwer mit der Tatsache zu vereinbaren, dass es sich bei Idiomen um ganzheitliche Strukturen handelt, die noch dazu oftmals syntaktische Besonderheiten aufweisen. So kann man beispielsweise nicht einfach ein Wort durch ein anderes ersetzen, auch wenn es dem Ursprungswort in seiner Bedeutung ähnelt. Zum Beispiel ist *Hals über Kopf* sinnvoll, *Schulter über Kopf* dagegen nicht. Gleiches gilt für *vom Regen in die Traufe* und *vom Nieselregen in die Traufe*. Schon eine kleine Veränderung der Elemente eines Idioms kann dazu führen, dass der Ausdruck nur noch wörtlich zu interpretieren ist. Auch auf syntaktischem Gebiet können kleine Änderungen zum einem Verlust des idiomatischen Charakters führen. *Sich in die Nesseln setzen* ist idiomatisch, doch *sich in die Nessel setzen* (mit dem Nomen im Singular) ist es nicht. Diese relative Verletzbarkeit von Idiomen deutet darauf hin, dass sie – trotz der augenscheinlichen Kompositionalität – einen ganzheitlichen Charakter haben. Alle Elemente eines Idioms müssen gemeinsam gespeichert sein, und ihre Nutzung unterliegt strengeren und spezifischeren syntaktischen Regeln als die nicht-idiomatischer Phrasen und Sätze. Von dieser Perspektive aus erscheinen Idiome dagegen eher als Konfiguration dann als kompositionelle Gebilde.

Dass diese Eigenschaften nicht notwendigerweise im Widerspruch zueinander stehen müssen, zeigen Cacciari und Tabossi (1988) mit ihrer Konfigurationshypothese zur Idiomverarbeitung beim Sprachverstehen und Cutting und Bock (1997) mit ihrem Modell zur Repräsentation von Idiomen im mentalen Lexikon des Sprechers. Beide Modelle gehen davon aus, dass Einzelwortrepräsentationen bei der Idiomverarbeitung aktiv werden. Diese sind jedoch mit einer eigenständigen Idiomrepräsentation verbunden. Für die Sprachproduktion ist dieser Ansatz besonders interessant, denn es gilt eine theoretische Erklärung dafür zu finden, dass Sprecher in der Lage sind, ein Idiom zu benutzen, auch wenn dessen wörtliche Bedeutung in keinerlei Zusammenhang zu dessen eigentlicher, figürlicher Bedeutung steht. Die fehlende Überlappung der wörtlichen und figürlichen Bedeutung von *da wird ja der Hund in der Pfanne verrückt* scheinen für Sprecher kein Hindernis darzustellen. Cutting und Bock (1997) gehen daher davon aus, dass Idiome im Mentalen Lexikon des Sprechers mit einem eigenen Eintrag auf konzeptueller Ebene vertreten sind. Diese Annahme erscheint sinnvoll, wenn man davon ausgeht, dass Idiome mehr als nur zufällige Kombinationen von Wörtern darstellen. Idiome haben ihre eigene, spezifische Bedeutung. Als Elemente figürlicher Sprache erlauben sie es dem Sprecher, komplizierte Sachverhalte oder Emotionen in wenigen, aber deutlichen Worten auszudrücken. Ihr Bedeutungsgehalt übersteigt den ihrer wörtlichen Bedeutung um ein Vielfaches. Selbst für eingeschränkte Kollokationen gilt überdies, dass FE allgemein gebräuchliche Ausdrucksweisen darstellen, deren Gebrauch für Muttersprachler obligatorisch ist. So kann ein Sprachlerner eventuell von *braunem Kaffee* sprechen. Wenngleich es sich dabei um eine semantisch und syntaktisch vollständig zulässige Äusserung handelt, enttarnt sie den Sprecher jedoch als Lerner und Nicht-Muttersprachler (Pawley und Syder, 1983) . Von diesen Überlegungen ausgehend ist daher eine eigenständige konzeptuelle Repräsentation von Idiomen (und anderen FE) im Mentalen Lexikon wünschenswert. Ebenso erscheint es sinnvoll, einen solchen Idiom-Eintrag mit den Repräsentationen der Einzelwörter zu verbinden, aus denen sich das betreffende Idiom aufbaut. Eine solche Kompositionalität von Idiomen ergibt sich indirekt aus Cutting and Bock's (1997) Sprechfehlerdaten. Cutting und Bock (1997) repräsentieren diese Eigenschaft von Idiomen mit Hilfe direkter Verbindungen von der konzeptuellen Idiomrepräsentation zu den Einzelwortrepräsentationen der Lemma-Ebene. In diesem Modell fliesst demnach Aktivierung von der Ebene der lexikalen Konzepte

zu den abstrakten, syntaktischen Wortrepräsentationen auf der Lemma-Ebene, und ergibt sich die Kompositionalität von FE aus den multiplen Verbindungslinien von einem Idiom-Konzept zu seinen Einzelwörtern. Diese Einzelwörter sind nicht idiom-spezifisch. Sie haben ihre eigene spezifische Wortbedeutung, und sind daher zusätzlich mit ihrem eigenen lexikalen Konzept verbunden. Ein solches Modell hat den Vorteil, dass es die Produktion ganzheitlicher Idiome mit Hilfe mehrerer gewöhnlicher lexikaler Einträge erklären kann. Es handelt sich damit um ein *Hybrid-Modell* der Idiomproduktion: es kann sowohl den ganzheitlichen als auch den kompositionellen Charakter von Idiomen erklären.

Die in Kapitel 3 und 4 der hier vorliegenden Arbeit vorgestellten Experimente sind die ersten, die diese Theorie einem Test im Rahmen eines Reaktionszeit-Paradigmas unterworfen haben. Mit Hilfe der hier benutzten Paradigmen ist es möglich, die Verarbeitung von Idiomen während ihrer Produktion gezielt zu manipulieren. Dies stellt einen Vorteil zur Methode der Sprechfehleranalyse dar, welche nur indirekte Schlüsse über die Verarbeitung sprachlicher Einheiten zulässt. Die in Kapitel 3 vorgestellten Experimente testen die Hypothese, dass Idiome bei der Produktion aus Einzelwörtern zusammengesetzt werden, sich aber von "gewöhnlichen" Phrasen dadurch unterscheiden, dass ihre Elemente über eine gemeinsame Repräsentation miteinander verbunden sind. In Experiment 1 produzierten Versuchspersonen niederländische Idiome und kompositionelle Phrasen in Reaktion auf einen zuvor gelernten, visuell präsentierten Reiz. Deutsche Beispiele sind *ermorden - um die Ecke bringen* im Vergleich zu *Besen - in der Ecke stehen.* Zeitgleich mit der Präsentation des visuellen Reizes (*ermorden* oder *Besen*) hörten die Versuchspersonen ausserdem einen akustischen Prime (ein gesprochenes Wort, dessen Präsentation von Einfluss sein kann auf die Vorbereitung einer Äusserung). Dies war entweder ein Identitätsprime (*Ecke*) oder ein zum Substantiv des Idioms unrelatierter Prime (*Bleistift*). Die Reaktionszeiten zeigen einen Haupteffekt von Priming: wenn der akustische Prime identisch ist mit dem Substantiv der geplanten Äusserung (*Ecke* ist zu hören wenn *um die Ecke bringen* gesagt werden soll) sind die Reaktionszeiten signifikant kürzer als wenn er unrelatiert ist (*Bleistift* ist zu hören wenn *um die Ecke bringen* gesagt werden soll). Dieser Effekt zeigt sich für beide Arten von Phrasen (idiomatisch und kompositionell) und lässt sich durch mit der schnelleren Verfügbarkeit des Substan-

tivs für die Produktion erklären. Das gehörte Wort *Ecke* macht es einfacher, *Ecke* selber auszusprechen. Das gehörte Wort *Bleistift* hat dagegen keinen Effekt wenn mann *Ecke* aussprechen soll. Die Tatsache, dass sich der Effekt nicht auf die normalen Phrasen beschränkt, sondern auch bei Idiomen gefunden werden kann, ist ein Argument für den kompositionellen Charakter von Idiomen.

Eine genauere Betrachtung der Daten zeigt ausserdem eine Interaktion von Priming und Phrasentyp. Der Primingeffekt ist stärker für die Idiome als für die kompositionellen Phrasen. Dies lässt sich mit der Verbundenheit der Einzelwörter eines Idioms untereinander über eine gemeinsame Idiomrepräsentation erklären. Aktiviert man eines der Elemente eines Idioms, so verbreitet sich die Aktivierung im Netzwerk der Repräsentationen und erhöht die Verfügbarkeit aller Elemente des Idioms. Aktiviert man dagegen ein Element einer kompositionellen Phrase, so erhöht sich einzig die Verfügbarkeit des Wortes selbst. Es gibt keine Repräsentation im Mentalen Lexikon für die zufällige Kombination dieser Wörter. Experiment 2 in Kapitel 3 zeigte darüber hinaus, dass es sich bei den in Experiment 2 gefundenen Primingeffekten um Effekte auf der Lemma-Ebene des Mentalen Lexikons handelt. Das Experiment stellt eine Wiederholung des ersten Experiments dar, jedoch diesmal mit akustischen Primes, die entweder phonologisch relatiert sind (d.h., eine ähnliche Klangform haben wie das Substantiv der Phrase die es auszusprechen gilt) oder unrelatiert sind. Die in diesem Experiment gezeigte Abwesenheit eines phonologischen Primingeffekts widerspricht dem möglichen Einwand, dass es sich bei den in Experiment 1 erzielten Ergebnissen zumindest teilweise um phonologische Vorbereitungseffekte handeln könnte. Da sowohl Experiment 1 als auch Experiment 2 einen Unterschied in den Reaktionszeiten für Idiome und kompositionelle Phrasen aufweisen (Idiome brauchen mehr Zeit), wurde in Experiment 3 der Versuch unternommen, eventuelle Unterschiede in der Abrufbarkeit der unterschiedlichen Phrasentypen zu eliminieren. Diese Methode erlaubt es zu klären, ob es sich bei dem Reaktionszeitunterschied um einen strukturell bedingten Unterschied zwischen den Phrasentypen handelt, oder aber um ein Resultat der Messmethode. Die Ergebnisse von Experiment 3 sprechen für letztere Erklärung. Macht man beide Phrasentypen gleich schwer abrufbar (indem man Namen als visuellen Reiz benutzt, wie z.B. in *Jan... war aus dem Häuschen* versus *Jan... war in dem Häuschen*, so finden sich keine generellen Reaktionszeitunterschie-

de. Die in Experiment 1 gefundene Interaktion zwischen Priming und Phrasentyp bleibt jedoch gleichwohl erhalten.

Die in Kapitel 3 beschriebenen Ergebnisse sind kompatibel mit dem oben beschriebenen Idiomverarbeitungsmodell von Cutting und Bock (1997) , in dem Einzelwortrepräsentationen mit einer gemeinsamen Idiomrepräsentation in Verbindung stehen. Das Modell weist jedoch Schwachstellen auf, wenn es um Fragen der syntaktischen Verarbeitung von Idiomen geht. Cutting und Bock (1997) gehen davon aus, dass die syntaktischen Eigenschaften eines Idioms mit Hilfe eines "Phrasal frames" gespeichert werden. Eine aktive Idiomrepräsentation schickt demnach Aktivierung in zwei Richtungen: einmal zu den Einzelwortrepräsentationen, und einmal zu seinem Phrasal frame. In einem weiteren Verarbeitungsschritt müssen dann Syntax- und Wortinformation miteinander verbunden werden. Eine Alternative zu diesem Konzept stellt die in der Diskussion von Kapitel 3 vorgestellte Superlemma-Theorie der Idiomproduktion dar. Sie basiert auf Theorien der Sprachproduktion von Kempen und Huijbers (1983) und Levelt et al. (1999) . Demnach handelt es sich bei syntaktischer Information um Lemma-Information. Das Lemma eines Wortes beinhaltet seine syntaktischen Spezifizierungen, die es erlauben, das Wort in grössere syntaktische Einheiten (Phrasen, Sätze) zu integrieren. Idiome verfügen ebenfalls über spezifische syntaktische Eigenschaften, und so erscheint ein eigenständiger Eintrag von Idiomen auf Lemma-Ebene als sinnvoller Schritt. Ein solches Superlemma ist direkt mit den Einzelwortlemmas des Idioms verbunden. Die Lemmas die zum Idiom *um die Ecke bringen* gehören werden nicht direkt über das Idiom-Konzept aktiviert, sondern von einer syntaktischen Repräsentation, die die Positionen und syntaktischen Funktionen seiner Bestandteile bereits definiert hat. Ein weiterer Verarbeitungsschritt, der Einzelwörter und Syntax miteinander kombiniert, wird überflüssig und das Prinzip der direkten Übertragung von einem Konzept auf ein Lemma bleibt erhalten. Vorwegnehmend auf die Daten in Kapitel 4 kann gesagt werden, dass die in dieser Arbeit beschriebenen Befunde grundsätzlich mit sowohl der Theorie von Cutting und Bock (1997) als auch mit der Superlemma-Theorie vereinbar sind.

Der Unterschied zwischen den Theorien liegt in erster Linie auf dem Gebiet der syntaktischen Repräsentation von Idiomen. Die hier vorgestellten Experimente befassen sich jedoch in erster Linie mit dem Beitrag der Einzelwortrepräsentationen zur Idiomproduk-

tion. In Kapitel 4 wurde insbesondere die Aktivierung von Wortbedeutungen während der Idiomproduktion untersucht. Ausgangspunkt dafür war die Beobachtung von Cutting und Bock (1997) , dass Idiom blends auch dann häufiger auftreten, wenn die beteiligten Idiome sich in ihrer wörtlichen Bedeutung ähneln. Ein solcher Effekt wird von sowohl Cutting und Bock's Modell als auch dem Superlemma-Modell vorhergesagt, da beide Theorien davon ausgehen, dass Idiome gewöhnliche Einzelwortrepräsentationen aktivieren, die einen eigenen Eintrag auf konzeptueller Ebene haben. Die Produktion von Idiomen müsste demnach sensitiv sein für die Präsentation von Primewörtern, die semantisch (d.h. bzgl. ihrer Bedeutung) mit einem der Wörter des Idioms verbunden ist. Die Ergebnisse von Experiment 1 bestätigen diese Vorhersage. Wenn ein Sprecher die Produktion des Wortes *Ecke* als Teil des Idioms *um die Ecke bringen* vorbereitet, dann kann ein semantisch relatierter Prime (*Kante*) die Produktion dieses Wortes (und des Idioms als Ganzes) erleichtern. Dieser Effekt demonstriert, dass die Repräsentation für *Ecke*, die bei der Idiomproduktion aktiv wird, semantisch mit der Repräsentation für *Kante* verbunden ist. Dies deutet darauf hin, dass das Lemma *Ecke* in idiomatischen und nicht-idiomatischen Kontexten aktiv werden kann. Dieser Effekt kann jedoch nur als indirekter Beweis für die Aktivierung der Wortbedeutungen bei der Produktion von Idiomen gelten. Experiment 2 dagegen zeigt, dass auch auf entgegengesetztem Wege Aktivierung messbar ist. Versuchspersonen wurden instruiert, visuell präsentierte Idiome zu vervollständigen. Zusätzlich sollten sie ab und zu ein Wort vorlesen, welches ebenfalls visuell präsentiert wurde (task switching). Auch hier zeigen sich wieder semantische Priming Effekte, diesmal jedoch von dem vorbereiteten "idiomatischen" Einzelwort (das letzte Wort des Idioms, z.B. *Ecke* in *er brachte ihn um die ... ECKE*) auf das zu lesende Zielwort (z.B. *Kante*). Die Ergebnisse sprechen dafür, dass die (vom Sprecher nicht intendierten) Einzelwortbedeutungen bei der Produktion von Idiomen aktiv werden. Ein Wort im Mentalen Lexikon kann demnach auf zwei Arten aktiviert werden: über seinen konzeptuellen Eintrag (wenn seine Bedeutung gefragt ist) oder über einen Idiom-Eintrag. In beiden Fällen handelt es sich um dieselbe Repräsentation.

Die Intuition, dass es sich bei Idiomen um "besondere" Einheiten handelt, kann daher teilweise bestätigt werden. Wenn wir Idiome produzieren, dann aktivieren wir Wortbedeutungen, welche nicht unter das Konzept fallen, das wir in Worte fassen. *Da wird ja*

der Hund in der Pfanne verrückt bezieht sich weder auf Hunde noch auf Pfannen, sondern auf eine Situation, die chaotisch, unkontrollierbar oder überraschend erscheint. Die Ergebnisse der Experimente in Kapitel 4 zeigen, dass trotz allem die unterschiedlichen Wortbedeutungen aktiv werden, wenn wir das Idiom benutzen. Gemeinsam mit den Ergebnissen der Experimente in Kapitel 3, die die generelle Kompositionalität von Idiomen demonstrieren, aber auch die Notwendigkeit einer eigenständigen Idiomrepräsentation, ergibt sich ein Bild von Idiomen und Idiomverarbeitung, das sich am ehesten mit einem Hybrid-Modell der Idiomrepräsentation im Mentalen Lexikon vereinbaren lässt. Idiome – und FE im Allgemeinen – sind gleichzeitig kompositionell und ganzheitlich. Das Idiom-Produktionsmodell von Cutting und Bock (1997) und das Superlemma Modell entsprechen beide diesen Anforderungen. Die vorliegenden Daten erlauben es nicht, eines der Modelle zugunsten des anderen zu verwerfen. Hieraus ergeben sich Aufgaben für weitergehende Untersuchungen zur Idiomproduktion. Weitere offene Fragen betreffen die Repräsentation und Verarbeitung verschiedener Typen von FE (z.B. eingeschränkter Kollokationen). Die relativ hohen Frequenzwerte für nicht-idiomatische FE, sowie die in Kapitel 2 geführte Diskussion zu den Grenzen des Mentalen Lexikons werfen weitere Fragen auf. Diese müssen jedoch in diesem Rahmen unbeantwortet bleiben.

References

Corpus Gesproken Nederlands The Spoken Dutch Corpus (n.d.) Retrieved January 3, 2003 from CGN homepage, http://lands.let.kun.nl/cgn/ehome.htm, Nederlandse Taalunie.

Baayen, R. H., Piepenbrock, R., & Van Rijn, H. (1993). *The CELEX lexical database (on CD-ROM).* Philadelphia, PA: Linguistic Data Consortium, University of Pennsylvania.

Benson, M., Benson, E., & Ilson, R. (1997). *The BBI Dictionary of English Word Combinations.* Amsterdam: John Benjamins Publishing Co.

Bobrow, S. A., & Bell, S. M. (1973). On catching on to idiomatic expressions. *Memory and Cognition, 1*, 343-346.

Cacciari, C., & Glucksberg, S. (1991). Understanding idiomatic expressions: The contribution of word meanings. In G. B. Simpson (Ed.), *Understanding word and sentence* (p. 217-240). North Holland: Elsevier Science Publishers.

Cacciari, C., & Tabossi, P. (1988). The comprehension of idioms. *Journal of Memory and Language, 27*, 668-683.

Cowie, A. P. (Ed.). (1998). *Phraseology: Theory, analysis, and applications.* Oxford: Clarendon Press.

Cox, H. (Ed.). (2000). *Van Dale Spreekwoordenboek* [Van Dale dictionary of Proverbs]. Utrecht, Antwerp: Van Dale Lexicografie.

Cutting, J. C., & Bock, K. (1997). That's the way the cookie bounces: Syntactic and semantic components of experimentally elicited idiom blends. *Memory and Cognition, 25*(1), 57-71.

De Coster, M. (1998). *Woordenboek van populaire uitdrukkingen, clichés, kreten en slogans.* The Hague, Antwerpen: SDU, Standaard.

De Groot, H. (Ed.). (1999). *Van Dale Idioomwoordenboek: Verklaring en herkomst van uitdrukkingen en gezegden* [Van Dale idiom dictionary: Explanation and etymology of fixed expressions and sayings]. Utrecht, Antwerp: Van Dale Lexicografie.

Dell, G. (1986). A spreading activation theory of retrieval in language production. *Psychological Review, 93*, 283-321.

Flavell, L., & Flavell, R. (1992). *Dictionary of idioms and their origins.* London: Kyle Cathie.

Gibbs, W. R., & Nayak, N. P. (1989). Psycholinguistic studies on the syntactic behavior of idioms. *Cognitive Psychology, 21*, 100-138.

Gibbs, W. R., Nayak, N. P., Bolton, J. L., & Keppel, M. (1988). Speakers' assumptions about the lexical flexibility of idioms. *Memory and Cognition, 17*(1), 58-68.

Glaser, W. R., & Düngelhoff, F.-J. (1984). The time course of picture word interference. *Journal of Experimental Psychology: Human Perception and Performance, 10*(5), 640-654.

Glucksberg, S., & Keysar, B. (1993). How metaphors work. In A. Ortony (Ed.), *Metaphor and Thought.* Cambridge [England, New York]: Cambridge University Press.

Hörmann, H. (1979). *Psycholinguistics. An introduction to research and theory* (2nd ed.). New York: Springer-Verlag.

Jackendoff, R. (1995). Idioms. Structural and psychological perspectives. In M. Everaert, E.-J. Van der Linden, & R. Schreuder (Eds.), (p. 133-165). Hillsdale, NJ: Erlbaum.

Jescheniak, J., Schriefers, H., & Hantsch, A. (In press). Utterance format affects phonological priming in the picture-word task: Implications for models of phonological encoding in speech production. *Journal of Experimental Psychology: Human Perception and Performance.*

Katz, J. J. (1973). Compositionality, idiomaticity, and lexical substitution. In S. R. Anderson & P. Kiparsky (Eds.), *A Festschrift for Morris Halle* (p. 357-376). New York: Holt, Rinehart & Winston.

Kempen, G. (1996). Computational models of syntactic processing in human language comprehension. In T. Dijkstra & K. De Smedt (Eds.), *Computational Linguistics: symbolic and subsymbolic models of language processing.* London: Taylor and Francis.

Kempen, G., & Harbusch, K. (2002). Performance grammar: A declarative definition. In M. Theune, A. Nijholt, & H. Hondorp (Eds.), *Computational linguistics in the Netherlands 2001.* Amsterdam: Rodopi.

Kempen, G., & Huijbers, P. (1983). The lexicalization process in sentence production and naming: Indirect election of words. *Cognition, 14*, 185-209.

Kuiper, K. (1996). *Smooth talkers. the linguistic performance of auctioneers and sportscasters.* Mawah, NJ: Erlbaum.

Laan, K. Ter. (1988). *Nederlandse spreekwoorden, spreuken, en zegswijzen.* Amsterdam: Elsevier.

Levelt, W. (2002). Picture naming and word frequency: Comments on Alario, Costa and Caramazza. *Language and Cognitive Processes, 17*(3), 299321.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation.* Cambridge, Mass.: MIT Press.

Levelt, W. J. M., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioural and Brain Sciences, 22*(1), 1-75.

Levelt, W. J. M., Schriefers, H., Vorberg, D., Meyer, A. S., Pechmann, T., & Havinga, J. (1991). The time course of lexical access in speech production: A study of picture naming. *Psychological Review, 98*, 122–142.

Mel'čuk, I. (1995). Phrasemes in language and phraseology in linguistics. In M. Everaert, E.-J. Van der Linden, A. Schenk, & R. Schreuder (Eds.), *Idioms. Structural and psychological perspectives.* Hillsdale, NJ: Erlbaum.

Meulendijks, J., & Schuil, B. (1998). *Spreekwoordelijk Nederlands.* Baarn: Tirion.

Miller, G. (1991). *The science of words.* New York: Scientific American Liberary.

Miller, G. A., & Johnson-Laird, P. N. (1976). *Language and perception.* Cambridge, Mass.: Harvard University Press.

Moon, R. (1998). *Fixed expressions and idioms in English. a corpus-based approach.* Oxford: Clarendon Press.

Nooteboom, S. G. (1999). Sloppiness in uttering stock phrases. In *Proceedings of the XIVth congress of phonetic sciences.* San Francisco.

Nunberg, G. (1978). *The pragmatics of reference.* Bloomington: Indiana University

Linguistics Club.

Nunberg, G., Sag, I., & Wasow, T. (1994). Idioms. *Language*, *70*(3), 491-538.

Pawley, A., & Syder, F. (1983). Two puzzles for linguistic theory: Nativelike selection and nativelike fluency. In J. Richards & R. Schmidt (Eds.), *Language and communication* (p. 191-226). London: Longman.

Peterson, R. R., Burgess, C., Dell, G., & Eberhard, K. M. (2001). Dissociation between syntactic and semantic processing during idiom comprehension. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *27*(5), 1223–1237.

Peterson, R. R., & Savoy, P. (1998). Lexical selection and phonological encoding during language production: Evidence for cascaded processing. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *24*(3), 539-557.

Roelofs, A. (1992). A spreading-activation theory of lemma retrieval in speaking. *Cognition*, *42*, 107-142.

Schriefers, H., Meyer, A. S., & Levelt, W. J. M. (1990). Exploring the time course of lexical access in language production – picture word interference studies. *Journal of Memory and Language*, *29*(1), 86-102.

Schriefers, H., & Teruel, E. (1999). Phonological facilitation in the production of two-word utterances. *European Journal of Cognitive Psychology*, *11*(1), 17-50.

Schuurmans, H. J. (Ed.). (1998). *Huizinga's spreekwoorden en gezegden.* Baarn: Tirion.

Stemberger, J. P. (1982). Syntactic errors in speech. *Journal of Psycholinguistic Research*, *11*, 313-333.

Swinney, D. A., & Cutler, A. (1979). The access and processing of idiomatic expressions. *Journal of Verbal Learning and Verbal Behavior*, *18*, 523-534.

Tabossi, P., & Zardon, F. (1993). Idioms: Processing, Structure and Interpretation. In C. Cacciari & P. Tabossi (Eds.), (pp. 145–162). Hillsdale, NJ: Erlbaum.

Titone, D. A., & Connine, C. M. (1999). On the compositional and noncompositional nature of idiomatic expressions. *Journal of Pragmatics Special Issue: Literal and figurative language.*

Van Sterkenburg, P. G. J., & Verburg, M. E. (1996). *Van Dale handwoordenboek van hedendaags Nederlands* [Van Dale dictionary of contemporary Dutch]. Utrecht,

Antwerp: Van Dale Lexicografie.

Vosse, T., & Kempen, G. (2000). Syntactic structures assembly in human parsing: A computational model based on competitive inhibition and a lexicalist grammar. *Cognition*, *75*, 105-143.

Weinreich, U. (1969). Problems in the analysis of idioms. In J. Puhvel (Ed.), *Substance and structure of language* (p. 23-81). Berkeley: University of California Press.

Zipf, G. (1932). *Selective studies and the principle of relative frequency in language.* Cambridge, MA: Harvard University Press.

Zwitserlood, P. (1994). The role of semantic transparency in the processing and representation of Dutch compounds. *Language and Cognitive Processes*, *9*(3), 341-368.

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