Comprehension and production of verbs in aphasic speakers
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Document Version
Publisher's PDF, also known as Version of record

Publication date:
1998

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

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Chapter 6

General discussion

6.1. Introduction

The present study has focused on the comprehension and production of verbs in a group of Dutch Broca’s and anomic aphasics. In this chapter, the results that were presented in chapters 3 to 5 will be summarized and discussed within the framework of some current views on verb processing in aphasia.

The purpose of this study was to find answers to three major questions:

- Do verb-noun dissociations in aphasia exist?
- What is the influence of the type of verb on verb retrieval?
- What do the results reveal on the storage of verbs?

These three questions will be dealt with in the sections 6.3. to 6.5.

6.2. Overview of the results

The overall scores on verb comprehension and production were presented in chapter 3. Verb comprehension was relatively spared in the Broca’s aphasics and the anomics. Although both groups performed worse than the controls on a word-to-picture and a sentence-to-picture matching task aimed at verb comprehension, these tests did not pose many problems for them. Still, there were differences between the aphasics groups. Anomics performed better on both tests than the Broca’s aphasics.

Verb production was problematic for both the Broca’s aphasics and the anomics. Verb retrieval in isolation was tested in an action naming task.
The results were compared to object naming. Action naming was significantly more problematic than object naming in both groups of aphasics. Broca’s aphasics and anomics, however, showed comparable results in both tests. Differences occurred when the errors that were made in these tests were analyzed qualitatively. Broca’s aphasics made more verb-noun substitutions in action naming than the anomics, who produced a larger amount of circumlocutions and semantic paraphasias than the Broca’s aphasics. In object naming, both patient groups produced mostly semantic paraphasias.

Sentence context was not helpful for the aphasic groups to retrieve a verb (but see below). Both groups showed comparable results in verb retrieval in isolation (action naming) and in sentence context. Verb retrieval in sentence context was, nevertheless, better preserved in the anomics than in the Broca’s aphasics.

The frequency of the verb did not play a role on verb retrieval in isolation and sentence context in both types of aphasics.

Performance on the verb production tests was influenced by the type of verb that was used. Transitivity affected verb retrieval in the Broca’s aphasics, but not in the anomics, as was shown in chapter 4. Transitive verbs were better preserved than intransitive verbs in action naming. At the sentence level, this effect disappeared. The group of Broca’s aphasics could, however, be divided into two subgroups: patients who were better in verb retrieval in isolation than in sentence context and patients who revealed the opposite pattern. The first group (word > sentence) was better in naming transitive than intransitive verbs in sentence context, which means that they demonstrated a consistent effect of transitivity at the word and the sentence level. The second group (sentence > word) retrieved, as opposed to action naming, intransitive verbs better than transitive verbs in sentence context.

The subgroups also differed with respect to the production of the syntactic complements in sentences. The group who was worse in verb retrieval in sentence context than in isolation produced a subject and an object most of
the time, when the correct verb was retrieved. The other group often omitted the subject and in particular the object in ‘sentences’ that contained the target verb.

Broca’s aphasics suffer from a syntactic deficit which leads to problems in processing the semantic and syntactic lemma information that is stored with the verb. It was argued that transitive verbs were easier to retrieve than intransitive verbs because transitive constructions are more frequently used in language than intransitive constructions. Broca’s aphasics suffer from a syntactic deficit which leads to problems in processing the grammatical information that is stored with the verb. As transitive constructions are more frequent, the verb phrase that is built for a transitive verb by the grammatical encoder is more readily available, making the lemmas of these verbs easier to process.

Sentence construction is difficult for the Broca’s aphasics because of their syntactic deficit. In the first subgroup (action naming > sentence construction), the effect of transitivity remained the same. If the correct verb was retrieved, then all the grammatical information was processed and complete sentences were produced containing both subjects and objects. Subgroup 1 produced fewer verbs in sentence context than in isolation because, as they process all grammatical information during sentence construction, this is damaging to verb production.

The second subgroup (sentence construction > action naming) produced more verbs in sentence context than in isolation. This means that a sentence frame was helpful for these patients to find the verb. They were, however, unable to grammatically encode all the grammatical information that is necessary for sentence construction. Therefore, these patients produced simple sentences without objects. Intransitive verbs were better retrieved in sentence context than transitive verbs in these patients because these verbs contain less grammatical information.

*Instrumentality* played a role in verb retrieval for the anomics, but not for the Broca’s aphasics, as demonstrated in chapter 5. In action naming, instrumental verbs were better preserved than noninstrumental verbs. It
was claimed that this was due to the fact that instruments were coactivated during the retrieval of the verbs. Anomics are supposed to suffer from a disturbance in finding the phonological form that corresponds to the lemma of a verb. It was suggested that a lemma is too quickly deactivated to retrieve the complete phonological form for these patients. The coactivated instrument may help to reactivate the lemma, creating a greater chance to find the correct phonological form. At the sentence level, the effect of instrumentality disappeared. Instruments were argued to be coactivated at sentence level as well, but this coactivation could result in the activation of the phonological form of the instrument. In these cases, sentences without the target verb were used, giving a reasonable description of the picture (e.g. to mop: the man is using a mop).

Name relation with a noun did not play a role in action naming in either type of aphasics, as far as the production of name related and non-name related instrumental verbs was concerned. This factor did, however, show an effect when action and object naming were compared in the anomics. In contrast to the other types of verbs, no difference was found between action and object naming for name related instrumental verbs and the instruments that belonged to these verbs. It was supposed that the instrumental verbs and the in name related instruments share the phonological form, making them as easy or difficult for patients who have problems with the retrieval of phonological forms.

### 6.3. The verb-noun dissociation in aphasia

The first question that was investigated in the present study concerned the existence of a verb-noun dissociation in aphasia. According to some authors, one has to assume a double dissociation considering problems in verb and noun retrieval. It has been reported that for agrammatic patients verbs were more problematic than nouns, whereas for anomics nouns were more problematic than verbs (e.g. Miceli et al., 1984; Zingeser and Berndt, 1990). There are, however, studies that challenge the existence of a double dissociation. Basso et al. (1990) found no differences between action
naming and object naming for the agrammatic and anomic patients they tested. Williams and Canter (1987) and Kohn et al. (1989) found a specific deficit for verbs in all aphasics, that participated in their studies, among which agrammatics and anomics.

From the sixty-six patients that were tested with the VECTA, only one patient was slightly better in action naming than object naming, two patients revealed comparable scores on both tests, whereas all other patients showed better scores on object than action naming. This means that in this study no double verb-noun dissociations were found. The results are comparable with those of Williams and Canter (1987) and Kohn et al. (1989). At first sight, it does not seem unfounded to conclude that verbs are selectively disturbed as compared to nouns in the aphasics who participated in the current study.

There are, however, two objections to this conclusion. First of all, it should be realized that in the present study the patients have not been exhaustively tested: the number of tests was quite limited (for example, reading aloud and repetition were not assessed), but instead, the items were carefully controlled on linguistic factors. Furthermore, verb retrieval in spontaneous speech was not investigated in the present experiments. A study in which the action naming data of eight Broca’s aphasics and eight anomics who participated in the present study, was compared to verb production in spontaneous speech (Bastiaanse and Jonkers, in press) revealed that there was no correlation between problems in action naming and verb diversity in spontaneous speech in these patients. Although this study did not consider the production of nouns, it shows that when a deficit for verbs is evident in an experimental test, it does not have to show up in spontaneous speech.

The second objection to assuming a specific deficit for verbs relates to the fact that the type of verb was shown to have an effect on verb retrieval in the present study. It was demonstrated, that transitivity and instrumentality influenced verb retrieval, but not in the same way in the Broca’s aphasics and the anomics. This illustrates that in studying verb retrieval there is more than just a distinction between verbs and nouns.
For the anomics, it was found that some verbs (the name-related instrumental verbs), were as easy to retrieve as the nouns they were matched with (the name-related instruments). This suggests that not all verbs are more difficult to activate than nouns, which shows again, that a simple noun-verb comparison is insufficient and therefore not very suitable for studying word retrieval in aphasia.

In summary, several examples have been published of patients who suffer from a selective word class deficit, either in case or group studies. It is not denied that such disorders exist, but it is stated that the binary distinction between grammatical word classes might be too rough and that the conclusions drawn might be overgeneralizations due to poor matching criteria.

### 6.4. The influence of verb type on verb retrieval

It is clear from the results presented in chapter 4 and 5 that verb type influences verb retrieval. In table 6.1., it is summarized which effects were found for the Broca’s aphasics and the anomics.

<table>
<thead>
<tr>
<th></th>
<th>transitivity</th>
<th>instrumentality</th>
<th>name relation</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broca’s aphasics</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>anomics</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Table 6.1.: The effect of the controlled factors on verb production in the Broca’s aphasics and the anomics.

Transitivity was shown to affect verb retrieval in isolation in the Broca’s aphasics: transitive verbs were better preserved than intransitive verbs. In
sentence context, in half of the Broca’s aphasics the same effect was found, whereas in the other half the effect was opposite. Instrumentality influenced the performance of the anomics; instrumental verbs were easier to retrieve than noninstrumental verbs in isolation. No effect of name relation was found.
Furthermore, it was shown that frequency did not influence verb retrieval at the word and sentence level in either group of aphasics. This means that possible effects of verb type are not to be carried back on the frequency of the verbs.

It is concluded that transitivity and instrumentality should be taken into account in studies of verb retrieval, because these factors probably influence the scores in, for example, action naming and sentence construction. The role of these factors is, however, not the same at the word and at the sentence level. An effect of instrumentality was only found at the word level and not in sentence context, whereas the effect of transitivity was similar for some aphasics at the word and sentence level, while for others it was opposite. This shows the importance of studying verb retrieval both in isolation and in sentence context. Remember that the action naming scores and the scores for sentence construction were comparable in both types of aphasics. Only when the effect of verb type was considered did differences arise between verb retrieval in isolation and sentence context.

The fact that transitivity did not influence the performance of all Broca’s aphasics in a comparable way at the sentence level leads to another remark with respect to the outcomes of this study. In accounting for an effect of verb type, one has to be aware of the individual variability in patient groups. It was determined in chapter 1, that group data was used in the present study in order to find tendencies and to draw generalisations. The results in chapter 4 and 5 demonstrate that it was indeed possible to make several generalisations. It was also mentioned that patients who showed a deviant pattern with regard to the aphasis group to which they belonged, should be excluded from the groups. Three patients were excluded because
their scores were outliers. One of these patients is described in a case study by Jonkers and Bastiaanse (1998). This patient, TB, is an anomic patient, who was significantly better in retrieving transitive than intransitive verbs in action naming, whereas no difference was found between instrumental and noninstrumental verbs. This means that his pattern was comparable to that of the Broca’s aphasics. It might be tempting to explain TB’s behaviour by assuming that his anomic aphasia evolved from an original Broca’s aphasia, but this was not the case. TB had no hemiparesis and also his spontaneous speech did not show the least trace of a grammatical deficit. He has to be seen as an anomic patient whose verb retrieval performance is influenced by transitivity. The example of TB shows that one should be careful in assuming a group effect for every single patient that belongs to such a group.

It was suggested in the introduction that an effect of transitivity, being a syntactic factor, might play a role in verb processing in the Broca’s aphasics because these patients are assumed to suffer from a syntactic deficit. In chapter 4, it was demonstrated that this was indeed the case. For the anomics a deficit in verb form retrieval is supposed and therefore an effect of a phonological factor, name relation with a noun, was expected. This was not proved by the data presented in chapter 5. In contrast, instrumentality, a conceptual factor, played a role in the action naming performance of the anomics. It was stated that coactivation of an instrument was helpful in retrieving the correct verb form. The explanations given for the effect of verb type concern aspects of verb processing that play a role in undisturbed language processing. In other words, the fact that a verb phrase is more readily available for a transitive verb and that instruments are coactivated in retrieving instrumental verbs, does hold for every speaker (see also section 6.5.2.). One might therefore ask why these factors do not play a role in all aphasics as well as the controls. With respect to the latter group, the scores are too high to expect an effect of verb type. The data of the aphasic patients reveals, however, that the tendencies with respect to the effect of verb type in both groups of aphasics are comparable: the scores for transitive and instrumental verbs
were higher than for intransitive and noninstrumental verbs in action naming. The effect of the factors is, nevertheless, much larger and only significant if it relates to the underlying deficit in the aphasic groups.

The last few years, more studies on the effect of verb type on verb production in isolation and sentence context have been presented. These were all discussed in chapter 1. In table 6.2, an overview is depicted of the outcomes of these studies and the present study for the Broca’s aphasics and the anomics.

The factors that play a role in the verb retrieval of the Broca’s aphasics concern the syntactic and semantic lemma information, except for the effect of name relation found by Bastiaanse (1991), but this effect was not replicated in the present study. Reversibility of roles and thematic structure concern the semantic part of the lemma, verb argument-structure, transitivity, and verb morphology the syntactic part. Reversible-role verbs (e.g. to push) were found to be difficult to retrieve by two of the agrammatics described by Breedin and Martin (1996) at the word and the sentence level. Except for transitivity, the effect of all other factors concerned verb retrieval in sentence context.

<table>
<thead>
<tr>
<th></th>
<th>Broca’s aphasics</th>
<th>anomics</th>
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<tbody>
<tr>
<td>instrumentality (present study)</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>reversibility of roles (Breedin and Martin, 1996)</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>thematic structure (Thompson et al., 1997; Kiss, in press)</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>verb argument-structure (Thompson et al., 1997; Kiss, in press)</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>transitivity (present study)</td>
<td>+</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 6.2.: Overview of the outcomes of studies of the effect of verb type on verb production. (+: has an effect on verb retrieval, -: has no effect on verb retrieval; *: not tested)

<table>
<thead>
<tr>
<th>Factor</th>
<th>+</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>verb morphology (Kiss, in press)</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>name relation (Bastiaanse, 1991; present study)</td>
<td>+/-</td>
<td>+/-</td>
</tr>
</tbody>
</table>

The overview shows that all factors influencing verb retrieval in the Broca’s aphasics are related to the underlying syntactic deficit in these patients. For the anomics, the aspects of verbs that concern the syntactic and semantic lemma information do not play a significant role. It should be remarked, however, that only reversibility and transitivity has been accounted for in the verb retrieval of these patients. Except for the verb types that were investigated in the present study, no other factors specifically influencing verb production were reported for the anomics.

Aside from to studies focusing on the effects of verb type on production, the influence of the type of verb in comprehension has also be investigated, but only in Broca’s aphasics. As was described in chapter 1, the aspects of verbs that play a role concern the semantic lemma information of the verb. Jones (1984) reported on the difficulty of directional motion verbs, Byng (1988) and Black et al. (1991) demonstrated that the assignment of thematic roles was problematic for Broca’s aphasics and Breedin and Martin (1996) described the problems these patients have with reverse-role verbs.

In the present study, an effect of transitivity and instrumentality was only described with respect to verb production. Verb comprehension at the word and sentence level was administered in the Broca’s aphasics and the anomics with tests that used different types of verbs, but the scores of the patients on these tests were relatively good and therefore no further analysis on these data was performed.
The effect of the aforementioned verb types on comprehension was, however, discussed by Jonkers and Bastiaanse (1996b) for a group of twenty-three aphasics with moderate comprehension problems, who belonged to the group of sixty-six patients that were tested with the VECTA. A group of nonfluent and fluent patients was distinguished. Analyses showed that the factor transitivity did not influence verb comprehension in either group of aphasics. Instrumentality and name relation with a noun, however, did affect verb comprehension at the word level. The nonfluent patients were better in comprehending instrumental than noninstrumental verbs and non-name-related verbs were better comprehended than name-related verbs. This shows that the occurrence of an instrument is helpful in comprehending an instrumental verb, unless this instrument is name-related to the verb. In these latter cases, if errors were made, often the name related instrument, being one of the distractors, was indicated. The same holds for the fluent aphasics, who also performed better on non-name-related than on name-related verbs. No effect of instrumentality was found in these patients.

These results reveal that apart from semantic lemma information other factors, like instrumentality and name relation with a noun, may play a role in verb comprehension in aphasics.

One major conclusion can be drawn on the effect of verb type on verb production and comprehension. Different aspects of the verb may influence aphasic patients’ performances. Most factors are unique for verbs and concern the different layers of information of the lexical entries for verbs: meaning, thematic information, argument structure, syntactic structure, and phonological form.

### 6.5. The storage of verbs

Different explanations have been given in the literature in order to explain the problems some types of aphasics or all aphasics encounter with verbs. These explanations will be discussed in the first part of this section, taking the results of the present study into account. In the second part of this
section, it will be attempted to relate the findings of the present study to the storage of verbs in normal language processing.

6.5.1. Former explanations for verb finding deficits

Two theories have been described in the introduction, relating verb finding problems to the way in which verbs are stored. The first emanates from the point of view that there is a subcomponent for verbs in the lexicon, the other associates difficulties in verb retrieval with the localisation of the lesion of the patients. Both theories will be discussed below.

Miceli et al. (1984) and Williams and Canter (1987) assumed separate components for verbs and nouns in the lexicon. Agrammatics or all aphasics were considered to have a disturbance in (the access to) this subcomponent.

Miceli et al. (1988) concluded that not only separate subcomponents for nouns and verbs had to be assumed with respect to production (output lexicons), but also with respect to comprehension (input lexicons), because verb retrieval may be selectively disturbed in agrammatics in production and comprehension. Caramazza and Hillis (1991) stated that different output subcomponents of the lexicon for verbs and nouns should be accepted for reading and writing as well, as they found two aphasic patients suffering from a specific deficit for verbs as compared to nouns, in reading and writing respectively.

The assumption that (eight) different subcomponents for verbs and nouns exist opposes the general principle of economy. Apart from this, it has been shown to be incompatible with the results of this study in regard to verb production. The first objection to the existence of different components for verbs and nouns is the effect of transitivity that has been found in this study. The separate components of verbs were assumed in the output lexicon and therefore concern the verb form level. The effect of transitivity found in the Broca’s aphasics related to the grammatical information of the verb lemma.
The better performance on transitive than on intransitive verbs for the Broca’s aphasics can be explained by relating it to their syntactic deficit and not by suggesting a disturbance in the access to a subcomponent of the lexicon, unless if one assumes that different sublexicons for transitive and intransitive verbs exist.

There is, however, a second objection, which comes from the fact that in the anomics some verbs were more difficult than nouns, whereas others were comparable in difficulty to nouns (i.e. the instrumental verbs and the name related instruments). In this respect, name-relation between the verb and the noun played a role in verb retrieval. It is impossible to explain this effect of name-relation if verbs and nouns are stored separately.

In conclusion, it is argued that the distinction between verb and noun representations is not straightforward. The mental representations of verbs are highly complex (although this does not necessarily make them more difficult to process) and several levels can be differentiated in these representations. Just comparing naming, comprehension, reading aloud, or writing of nouns and verbs and finding some significant results is an insufficient basis on which to accept separate lexicons or separate routes in a processing model, just as the present results are no reason to assume separate lexicons for, for example, transitive and intransitive verbs.

Comparable criticism can be given to the ‘localisationists’, who try to connect the verb retrieval problems of nonfluent aphasics and the noun retrieval problems of fluent aphasics to the localisation of their lesion (e.g. Damasio and Tranel, 1993; Daniele et al., 1994; Gainotti et al., 1995). According to this theory, the conceptual representations of actions are stored in the frontal part of the brain, where the execution of actions is controlled, whereas the representations of objects are stored in the posterior part of the brain, where the sensoric features are processed. Agrammatics have lesions that at least concern the anterior part of the brain, causing problems in verb retrieval, whereas anomics suffer from posterior lesions and therefore experience difficulties with the retrieval of nouns. This assumption is not in line with the results of the present study,
as the anomics have more problems with action than with object naming. Additionally, this theory does not suit for the reported effects of verb type. The transitive and intransitive verbs used in the present study, for example, both concern actions and should therefore be parallelly disturbed in Broca’s aphasics, which was not the case. Furthermore, the comparable scores for some verbs and nouns in the anomics are also difficult to explain within this theory. These objections show that relating problems with verbs or nouns to lesion site leads to distinctions that might be too rough. The absence of evidence for separate cortical representations for verbs and nouns was also reported in two recent neuroanatomical studies. In a reaction time experiment in non-language disturbed subjects, Gomes, Ritter, Tartter, Vaughan and Rosen (1997), did not find electrophysiological indices for different anatomical representations for nouns and verbs. Topographic differences between nouns and verbs in N-400 were absent. Comparable findings were found in a PET-study by Warburton, Wise, Price, Weiller, Hadar, Ramsay and Frackowiak (1996). They reported on the absence of differences in the locus of activation in a fluency task, focused on noun and verb generation.

The explanations that were given in the present study for problems with verb retrieval were related to the general deficit that is assumed in the different types of aphasics. For the Broca’s aphasics, this is a syntactic deficit. Zingeser and Berndt (1990) argued that the syntactic deficit in Broca’s aphasics leads to problems with verbs as such. Verbs carry more syntactic and semantic information than nouns, for example, information about argument structure and subcategorization. The authors assumed that in an action naming test, all information belonging to the verb has to be retrieved. As verbs carry more syntactic information than nouns, the former are harder to retrieve from the lexicon for patients with a syntactic deficit. This theory, however, falls short in explaining the phenomena found in the present study. First, it was shown that anomics, who are not supposed to suffer from a syntactic deficit, also have problems in verb retrieval. Next, it was
demonstrated that the Broca’s aphasics have more problems with intransitive than transitive verbs, although the latter contain more information than the former. This reveals that the amount of information is not a factor that makes verbs more difficult than, for example, nouns. Therefore, the question remains why verbs are more difficult to retrieve than nouns in both the Broca’s aphasics and the anomics. Everyone will agree that verbs and nouns differ syntactically. There are, however, more differences between verbs and nouns, which could lead to a different performance in action and object naming. Gentner (1981) summarized some differences between verbs and nouns that go beyond their syntactic difference. Verbs are worse remembered than nouns, both in item-recognition and in item-recalling tasks. Furthermore, verb meanings are acquired later than noun meanings by children and this is seen cross-linguistically. Verbs have broader defined meanings than nouns, as measured by the number of word senses per dictionary entry. Moreover, verbs alter more in meaning if they are paraphrased than nouns. If subjects have to retrace the meaning of a word after it is paraphrased they are far more accurate in tracing back the meaning of a noun than of a verb. Another difference between verbs and nouns is the cross-linguistic variation in the meaning of verbs as compared to nouns. Gentner referred, for example, to the way in which manner of motion is conflated into a verb. In English, the direction of motion is expressed by a preposition, into, whereas in Spanish this direction is incorporated in the verb. In connection to this, there is evidence that verbs are less stable in translation than nouns. If texts are translated into another language and then translated back, verbs are more likely to change than nouns. According to Gentner, these differences between verbs and nouns can be derived from one underlying cause, i.e. the greater inherent complexity of the conceptual representation of verbs. Verbs are relational, whereas nouns are unrelational. This means that in order to interpret verbs, understanding of the relational concepts is needed, whereas nouns only require single-object reference. The conceptual structure of a noun is largely given by the perceptual world.
It is assumed that this difference between nouns and verbs is reflected in the problems aphasic patients encounter in noun and verb retrieval. Nouns are conceptually less complex than verbs and therefore easier to retrieve.

In the present study, however, it is assumed that the specific information that is stored with a verb at different levels is a more important factor than the factor that verbs are difficult as such. It was shown which piece of the verb information affected verb retrieval in the Broca’s aphasics and the anomics. In the next section, the explanations that were given for the problems in verb retrieval in these aphasics, will be related to the storage of verbs in normal speech processing.

6.5.2. The storage of verbs in normal language processing

Transitivity
Transitive verbs were claimed to be easier to process than intransitive verbs for patients with a syntactic deficit, because transitive constructions are more frequently used in language than intransitive constructions. This explanation was based on the findings of Bastiaanse et al. (1996), who found that in the spontaneous speech of non language-disturbed Dutch, English, and Hungarian speakers, transitive verbs occurred at least three times as much as intransitive verbs. How does this fit with the theory of Levelt (1989) that was used to explain the Broca’s aphasics’ data? According to Levelt, a lemma is retrieved when it satisfies the conceptual specifications. The syntactic category of a lemma calls a so-called categorial procedure. This procedure starts a building instruction for the phrasal category that is used in sentence construction. For verbs, this means that a VP is built. As transitive constructions are frequently used, it is assumed that the VP-building procedure is more readily available for transitive verbs, making these verbs easier to process for the Broca’s aphasics.

Instrumentality and name relation with a noun
The effect of instrumentality was explained by using the spreading activation theory of Dell (1986; 1989). Within this theory, it is claimed that
semantically related lemmas are coactivated while activating lemmas. When forms are activated, phonologically related forms are coactivated. It was suggested that anomics, having problems in retrieving the complete phonological form with the verb lemma, profited from the coactivation of the lemma of an instrument, when they had to retrieve an instrumental verb. This is depicted in figure 6.1.1.

Figure 6.1.: The activation of the verb *to stir*

Descriptions of the spreading activation theory often emanate from coactivation of lemmas of the same grammatical category. It means that at the lemma level, next to the target noun or verb, only related nouns or verbs are coactivated. This can be carried back to the fact that the spreading activation theory is mostly based on speech errors in normal language processing and psycholinguistic experiments.

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1 In figure 6.1. and 6.2, for reasons of clarification the form level is underspecified. Only phonemes are depicted.
Substitutions of words that do not belong to the same grammatical class, like verb-noun substitutions, rarely occur in speech errors. Garrett (1992) mentions that in normal errors, the correspondence between the grammatical category of the target and the error is a very powerful constraint. According to Garrett, it is difficult to find out if this constraint also holds for aphasics, because often picture naming is used to evaluate verb and noun retrieval. In picture naming, the grammatical category of the target is constrained by the procedure. However, the results of the present study show that in particular in the Broca’s aphasics verb-noun substitutions often occur in action naming, which reveals that this constraint is not so powerful in aphasics.

The occurrence of verb-noun substitutions shows that in lemma activation, also the lemmas of words from another grammatical category are coactivated.

When the instrument that is activated with the verb is name-related to the verb, also the word form of this instrument is coactivated. This is shown in figure 6.2.
In this example, the verb and the noun share the phonological form. This is in conformity with the spreading activation theory, but within the descriptions of this theory, it has rarely been noted that words from different grammatical classes may have the same phonological form. For the anomics, it was claimed, that this was the reason why instrumental verbs and the name-related nouns that belong to these verbs were equally difficult.

The spreading activation theory assumes that coactivated elements can be intrusive, when they get a comparable or higher amount of activation than the target word. The present study shows that this may also hold for coactivated instruments, but only at the sentence level. In action naming, where only a verb is evoked, coactivation of a noun seems not to be intrusive, but helpful instead to find the complete verb for the anomics.

Figure 6.2.: The activation of the verb to rake
6.6. Conclusion

The production of verbs in isolation and sentence context in Dutch aphasics was evaluated in the present study. With respect to verb finding in isolation, it was found that almost all patients had more problems with verbs than nouns. Verb retrieval in sentence context was comparably disturbed to verb retrieval in isolation. The verbs that were used in the tests were closely controlled on linguistic factors. It was shown that two of these factors, transitivity and instrumentality, influenced verb production in the Broca’s aphasics and the anomics respectively, whereas name relation with a noun and frequency did not play a role.

The fact that verbs were more difficult than nouns in the Broca’s aphasics and the anomics does not support the existence of a double dissociation for problems with verbs and nouns. Therefore, claims based on this double dissociation, like the assumptions that sublexicons for nouns and verbs exist or that problems with verbs or nouns can be related to lesion site, are probably based on overgeneralizations.

The effects of verb type on difficulties with verb retrieval may be even more subtle than discussed here. The overview of effects on verb processing in chapter 1 and in this chapter shows how careful one should be in generalizing over performance patterns. The generalisation that can be drawn from this study is that each single aspect of the information stored in the lexicon may influence word retrieval. A next step is to investigate the exact relationship between these factors and to find out how they relate to lesion site.