Structural interference from the source language: a psycholinguistic investigation of syntactic processes in non-professional translation

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Declaration

I hereby declare that this thesis is of my own composition, and that it contains no material previously submitted for the award of any other degree. The work reported in this thesis has been executed by myself, except where due acknowledgement is made in the text.

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Abstract

This thesis explores cross-linguistic structural phenomena in the language production of bilinguals in the specific context of translation.

In recent years, cross-linguistic phenomena on the level of syntax have become an increasingly prominent issue in psycholinguistic research, and are a well-known feature in language productions of multilinguals, from language learners to translators. The work presented here is founded in current psycholinguistic perspectives (discussed in Chapter 2), and takes into account relevant research on bilingualism and advanced Second Language Acquisition (Chapter 3) and Translation and Interpreting (Chapter 4). In conclusion, I consider translation as a special instance of bilingual production, elementary concepts of which are available to all bilinguals.

On this basis, an experimental paradigm for psycholinguistic research into structural phenomena of translation is developed and refined (Chapters 5 and 6) that provides both off-line and on-line data from simple text-to-speech translations. Experiment 1 (Chapter 5) confirms the existence of priming-like, on-line facilitation in translations where source and target sentences are structurally matched. Translations in Experiment 1 involved L1 as the source language, L2 as the target. In Experiment 2 (Chapter 6), two participant groups — one working from L1 to L2, the other from L2 to L1 — carried out translations of source material that permitted several target structures. Significant levels of off-line structural priming are observed for both groups. Evidence on on-line facilitation is not conclusive. Using different materials, Experiment 3 (Chapter 7) obtains more evidence for structural priming from L1 and L2 groups. Concomitant facilitation of primed productions is found only in translations from L1 to L2, which agrees with predictions from research in L2 acquisition. Experiment 4 (Chapter 8) modifies materials from Experiment 3 to make a change of syntactic

structure obligatory in translation, while the location of priming remains untouched. Off-line structural priming in translations from L1 to L2 remains in evidence, but on-line facilitation does not, suggesting that syntactic operations do not add to each other but are processed in one go.

Results are discussed comprehensively (in Chapter 9) and in relation to theories of syntactic production and directionality in translation. Several possibilities for future applications of the approach are proposed.

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Contents

Chapter 1

Introduction

This thesis is concerned with translation, in more than one way.

On one side, it reports experiments that study the translation performance of speakers who are not specifically trained for this task. Their performance in such a task touches on three different areas of research. The field of Translation and Interpreting research appears to be most clearly involved; however, its research is focussed on the skills of, and the approach to translation tasks that is taken by, trained translators and interpreters and aims at their improvement. Another potentially relevant field is the study of multilingualism and Second Language Acquisition, concerned in particular with the proficiency that enables speakers to carry out this task, and with its development over time. Thirdly, translation is of course also an instance of language production, specifically of bilingual production: and as such, also an appropriate study for psycholinguistic research. For the experiments that are reported in these pages, I have taken all three of these research areas into account. In this sense, this thesis is also attempting to translate the findings from these fields into a coherent picture of elementary features of translation.

My particular interest here is on instances of translation where some structural-syntactic feature of the source language is repeated in the produced translation. These instances may result in unusual construction choices in the target language, and I will presently show that the phenomenon of source-language influence is a well-known concern of translators. First, however, it is appropriate to state my main research question: **Are observable phenomena of source-language influence in translation consistent with our current knowledge about *a*) the processing of syntactic features of bilingual production? *b*) the language**

systems of bilinguals? *c*) general features of translation as a cognitive process? My work focussed on the aspect of translation as bilingual language production; the features of bilinguals' language systems and of translation as a cognitive process served as points of reference, guiding and shaping the chosen approach.

1.1 Source-language influences in translation

The influence of the source language can lead to problematic translation results, as already observed in 1530 by German bible translator Martin Luther. With respect to several idiomatic German turns of phrases that he used in his translation, he observed in an *Open Letter on Translating*:

> That is speaking with the proper German tongue of the kind I have tried for, although unfortunately not always successfully. The literal Latin is a great barrier to speaking proper German. [Transl. G. Mann, rev. M. D. Marlowe][1]

It was one of the guiding principles in Luther's work to render the Greek source text in a variety of German that would be comprehensible to his contemporaries. The cited passage reacts to critics who had found issue not only with his choice of words, but in particular also with his departure from the Greek word order. But it is not necessary to delve into details of Greek and German to illustrate the phenomenon that I study in this thesis. Consider, instead, the following alternative translation of the passage cited above:

> That is speaking good German, the kind that I have tried for and, unfortunately, have not always reached or hit upon; for the Latin letters are a great hindrance to good German speech. [Anon. transl.]

Although the language of both translations is grammatical English, the second passage shows a number of peculiarities that are not present in the first. Comparison with the German original shows that the turn of phrase *"not always reached or hit upon"* is a literal, word-for-word translation of German *"nicht allwege ereicht oder getroffen"*. More conspicuously, "*the Latin letters*" is a literal, word-for-word translation of the German phrase *"die Lateinischen buchstaben"*.

While a discussion of this particular case involves also questions of literary style, it is far from uncommon to discover translated texts that show similar traces

[1] Original: "Das heist gut deudsch gered /des ich mich gevlissen /und leider nicht allwege erreicht noch getroffen habe /Denn die Lateinischen buchstaben hindern aus der massen seer /gut deudsch zu reden." (M. Luther, *Sendbrief vom Dolmetschen*)

of the source language, yet are fully acceptable in the target language. The phenomenon is also encountered in translations that are made into the spoken medium, i.e. in Interpreting, although nowhere documented in a fashion as public as Luther's *Open Letter*. However, the presence of these source-language influences in unpremeditated, spontaneously produced translations suggests that such influences are first and foremost a phenomenon of language production, and that stylistic considerations are more of an afterthought.

The proficiency of translators may be a relevant issue for the occurrence of source-language influences — actually, two types of proficiency may be involved. On one side, insufficient proficiency in a non-native language (L2) may lead speakers to borrow syntactic constructions from their native language (L1), not unlike similar phenomena that are observed in Second Language Acquisition and have received ample study. However, many translators and interpreters work exclusively from L2 into L1, as did Luther and his critics. Thus, studies of production in L2 cannot apply, and there has been little work on the possibility of influences from L2 into L1. On the other side, source-language influences may be less frequent in trained translators and interpreters — but even if this is the case, the occurrence of the phenomenon in translations by untrained speakers still needs to be accounted for.

As outlined above, I have attempted to approach the topic of source-language influences in translation by combining relevant findings and theories from the fields of psycholinguistics, Translation and Interpreting Research, and Second Language Acquisition research. On this basis, I focussed my work on the development and application of an experimental approach that allows to elicit translation data under psycholinguistically valid conditions. A series of six experiments studied linguistic features that are well-represented in psycholinguistic research on monolingual and bilingual production, and compared translations from L1 into L2 with translations of the same material from L2 into L1. While I discuss my results in particular as contributions to the (computational) Integrated Model of syntactic representation in bilinguals (Hartsuiker et al., 2004), they show also some clear differences between translations from L1 into L2 and from L2 into L1.

1.2 Structure of this Thesis

In the first part of this thesis, I review literature that is relevant to the study of language production in translations by untrained speakers. My approach will be gradual: first, I will consider the phenomenon as an instance of language production, and of bilingual language production in particular; next, as an example of the language use of bilinguals, and of highly proficient bilinguals in particular; and finally, as the specific type of language processing that is known as translation, carried out in this particular instance by speakers who are not specifically trained for it. Readers will find this approach reflected in the order of the chapters in this part.

In **Chapter 2**, I will discuss existing models of language production. Taking early models of monolingual production as a starting point, I introduce the phenomenon of structural priming and show several models that attempt to integrate it in some form or other. I continue with models of bilingual production. Cross-linguistic structural priming will again be found as a touchstone that models need to account for. In addition, it is a feature of bilingual production that shows strong affinities with the main theme of this thesis.

Chapter 3 is concerned with language skills and language use of non-native speakers. Second Language Acquisition research has collected a considerable amount of evidence on non-native linguistic systems. A general survey of cross-linguistic influences will attempt to point out affinities to, and differences from, the phenomena of translation that are my main theme. I continue by considering in particular the linguistic performance of high-proficiency non-native speakers. This will lead me on to some general cognitive principles which appear to be a common feature of the linguistic representations of all high-proficiency non-native speakers.

Finally, **Chapter 4** discusses translation. Presenting relevant theoretical approaches and research findings, I summarize some discussions in the literature that are pertinent to my main theme. I discuss some general models of cognitive aspects of translation and point out their accounts for related phenomena. In doing so, I will introduce additional relevant research on cognitive aspects of translation, and attempt to outline how these models may connect with models of of language production.

In the second part, I present a series of experiments that is based on the research findings that have been presented up to this point.

Chapter 5 sets the scene by introducing a new experiment paradigm for the elicitation of language production under the strictly controlled circumstances of a translation task. Then, I present Experiment 1, which tests the assumptions that had to be made in the development of the paradigm. The languages that are employed in this experiment are Dutch, as the source language, and English, as the target language. The linguistic structure under scrutiny is verbal voice, i.e. the alternation of actives and passives. After discussing related research, participants and procedure of the experiments are outlined. Presentation, analysis and discussion of the results conclude the chapter, together with an evaluation of the experiment; the paradigm serves its purpose and provides evidence of facilitation according to the principles of structural priming, even though no priming in the 'classic' sense is observed.

In **Chapter 6**, the paradigm is further expanded by application to the dative alternation in Experiment 2, and again I discuss its position in production and bilingual production research so far. The source language in the first part of this experiment (Exp. 2a) is German, the target language English. Different from the previous experiment, here I elicit translations not only from L1 speakers of the source language (and thus L2 speakers of the target), but also — in Experiment 2b — from L2 speakers of the source language, with the target language as their L1. After presenting results, analysis will find that the experiment has been successful to elicit structural priming; possible causes for the absence of evidence from latency data is discussed. In conclusion, production data from the two participant groups is compared to each other and analysed; no difference between their respective priming effects is encountered.

The problems with latency data from the previous experiment are remedied in Experiment 3, presented in **Chapter 7**. While source and target languages remain unchanged, the main construction that is tested for priming must be exchanged. I explore the possibilities of German word order in more detail, focussing on the possibility to 'switch' the order of arguments in a dative structure without changing any other feature of the construction. Again, the experiment is carried out in two runs, once with L1 speakers of the source language (Exp. 3a), and once with L1 speakers of the target language (Exp 3b). Analyses for both parts are carried out separately, in combination, and in combination with construction data from the previous experiment. The results find evidence for separate morphological and syntactic processes in the course of translations, and argue for strong differences in the processing of translations by L1 and L2 speakers.

Chapter 8 follows up on the finding of separate morphological and syntactic processes. After discussion of the surrounding syntactic phenomena, the materials that were used for translations in the previous experiment are transferred into the German narrative past tense, the *Perfekt*, characterised by sentence-final position of the participle of the main verb. In translations into English, the semantic verb must necessarily be moved into a position before both objects — whereas the possibilities for verb position are as in the previous experiment. This, Experiment 4, is carried out by speakers of L1 German who translate into L2 English. Their translations give evidence of structural priming, but suggest also inhibited production as a direct consequence of priming. Based on a tentative account for this observation, I suggest an extension for models of bilingual production.

Chapter 9, finally, sums up this thesis by returning to the research questions that I have stated above. I recapitulate the view on syntactic representation in bilinguals that I have developed, and relate the main characteristics of the experimental paradigm. After a synopsis of my experiment results, I consider the potential for further research not only on the basis of these results, but also with respect to the experimental paradigm and the general combination of approaches from psycholinguistics, Second Language Acquisition, and Translation and Interpreting research.

CHAPTER 2

Literature Review: Language Production

Translation can be described as an act of language mediation that involves (minimally) a segment of comprehension and a segment of production. However, evidence indicates that comprehension for the purpose of translation may differ from comprehension in other situations (discussed in 4).

This thesis focuses on translation as an instance of language production. For this reason, this chapter will take a closer look at language production and the cognitive processes that condition it. Section 2.1 will consider models of language production in general, while section 2.2 is concerned with the special case of language production by bilinguals.

2.1 Models of Language Production

For a better understanding of cognitive processes during language production, it is highly desirable to develop an appropriate model of them that is able to predict realistic output from comparable input. In particular, a model of this type should be able to predict the occurrence of similar production *errors* under comparable conditions. Observational data on speech errors, indicating error types and their relative distribution, allowed the development of early models of language production that could subsequently be refined through experimental work. Differing views on organisational principles of human cognition have led to two different approaches (see Christiansen & Chater, 1999, pp.418-421):

- *Connectionist* modelling attempts to represent cognitive processes in a way that is loosely inspired by neural architecture. Characteristically, connectionist models consist of neural networks where processing units individually produce simple numerical output as a function of their input. More complex output is not produced directly, but emerges from these low-level operations. Dell's (1986) connectionist model of language production, discussed below, is explicitly set up to account for observations and data patterns from collections of speech errors.
- *Symbolic* (computational, 'classicist') models see cognitive features as discrete symbols that trigger specific computational processes. The exact order in which these processes are triggered depends on the nature of these symbols, and when they are applied. Consequently, the order in which cognitive features are activated — their syntax — is of considerable importance, and symbolic approaches show a high affinity with linguistic thinking. An influential account of human language based on a symbolic framework was published by Levelt (1989).

Both approaches strive to describe the same processes and need to account for the same data, be it observational or experimental. In the following, I will discuss examples of each strand of modelling. Bock's (1986b) finding of structural priming proved pivotal for models of language production, as can be seen from the comparison of earlier and more recent connectionist and symbolic models, and the development of a third approach that combines aspects of both. The developing picture will be rounded off by considerations of features that go beyond the structure of the production system but are nonetheless relevant for it.

2.1.1 Early models

Speech errors

Cognitive models hope to achieve a better understanding of cognitive processes by creating plausible accounts of processing that produce results which are similar to the real-world phenomena that they try to explain. The phenomena that lie at the root of early models of language production are speech errors, i.e. the analysis of corpora of "slips of the tongue". Table 2.1 provides a simplified overview of more common types of errors. Similar kinds of mistakes are encountered on various levels of linguistic organization.

Table 2.1: *Speech errors*

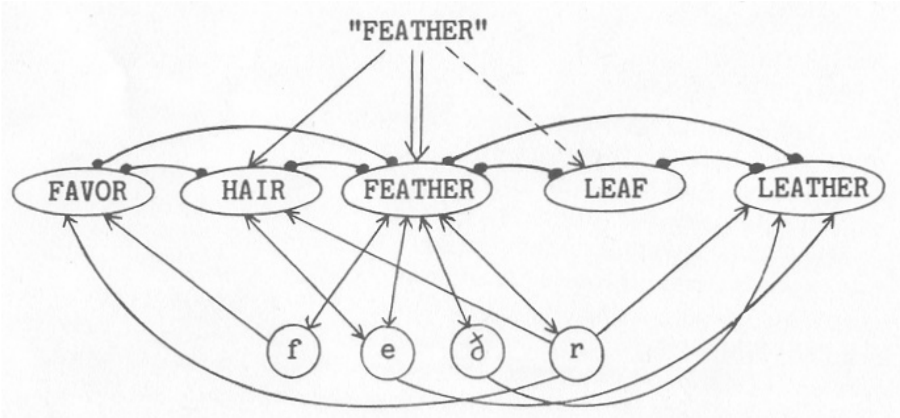
level	type	example
phoneme	perseveration	beef noodle → beef n**ee**dle
	anticipation	reading list → **l**eading list
	exchange	York library → **l**ork **y**ibrary
	addition	winning → winn**d**ing
	deletion	same s**t**ate → same sate
morpheme	perseveration	explain . . . rule insertion → . . . rule **ex**sertion
	anticipation	my car towed → my **tow** towed
	exchange	thinly sliced → **slice**ly **thin**ned
	'shift'	gets it → get it**s**
	addition	to strain it → to strain**ed** it
	(non-contextual) deletion	he relax**es** → he relax
word	substitution: perseveration	class will be about discussing the test → . . . discussing the **class**
	substitution: anticipation	sun is in the sky → **sky** is in the sky
	substitution: exchange	writing a letter to my mother → writing a **mother** to my **letter**
	substitution: exchange	That is true of most cities → **Most cities are** true of **that**
	'shift'	something to tell you all → something **all to tell you**
	'stranding'	the road was flooded → the **flood** was **road**ed
	(non-contextual) substitution	teeth are all red → **tongue is** all red
	(non-contextual) substitution	Liszt's second Hungarian rhapsody → second Hungarian **restaurant**
	addition	the only thing → the only **one** thing
	deletion	I just wanted to **ask** that → I just wanted to that

Note: See Stemberger (1985), Dell (1986, p.285).

Models of language production that were developed in the early 1980s attempted to account for these regularities, choosing not only different approaches, but also different levels of the phenomena as their starting points. Discussions in this section will repeatedly refer back to the errors listed in Table 2.1, as the actual phenomena that models are set up to explain.[1] While doing so, the focus of my discussion will stay on syntactic aspects of production.

[1]The categorization in Table 2.1 is a reduced version of the one used by Dell (1986, p.285), although several examples are taken from Stemberger (1985). For the insertion of stranding with word-level errors, see Dell (1986, pp.314–315).

Figure 2.1: *Stemberger's model: semantic and phonological effects on lexical access*



Note: Figure 5.1 in Stemberger (1985, p.148).

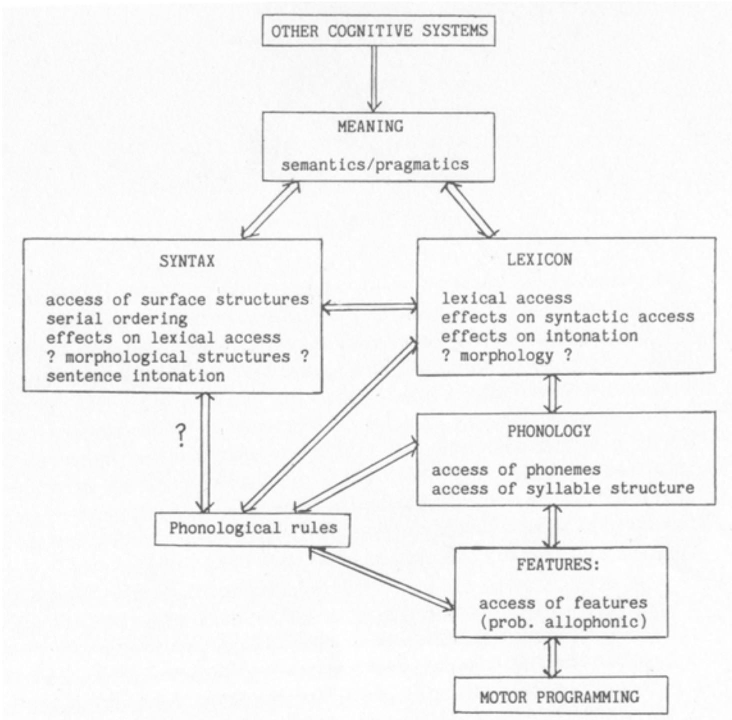
An early symbolic model: Stemberger (1985)

Following a computational approach, Stemberger (1985) adapted McClelland & Rumelhart's (1981) Interactive Activation model to account for language production, and speech error data in particular. His model allows me to introduce some principles of cognitive models that remain relevant throughout this thesis. The following description is based on Stemberger (1985, pp.145–151).

The elementary construction principles of Stemberger's (1985) model are similar to those of many other cognitive models (of the time): *units* in the system are connected by *links* and vary in their level of activity, i.e. their *activation*. While some links are passing on activation bidirectionally between units, others operate inversely so that activation of one unit leads to *inhibition* of another. Links may be *weighted* to increase or decrease their effect, and units have a resting or *default level* of activation to which they return if no other signal comes in through their links.

To become involved in a process, units need to be *selected*. This is achieved not through a lookup procedure that searches for a candidate unit to fulfil a set of conditions, but rather in competitive fashion: all units that fulfil any one condition receive equal activation. The selected unit then is the one that achieves the highest total activation. Thus, selection of an item will lead to a partial co-activation of related items on the same level — e.g. "leaf" and "hair" together with "feather". To prevent repeated selection of the same unit, activation drops

Figure 2.2: *Stemberger's computational model of language production*



Note: Figure 5.2 in Stemberger (1985, p.151).

quickly down to default after a unit has been selected. Moreover, activation is *cascading*, i.e. activation of a unit will be communicated to all relevant units on 'lower' levels of organization. Thus, activation of "feather" will lead to activation of the relevant phonemes, as shown in Figure 2.1, above.

Syntactic structures, according to Stemberger, are created on the basis of phrase structure rules that are initially activated by semantic and pragmatic information, and activate each other in the same fashion as other units. This leads to the generation of sets of syntactic slots to which retrieved words are attached, presumably through matching role tags (of an unspecified kind). The sequential order of the eventual utterance is thus directly due to the hierarchy of phrase structure rules. Once decided, a set of activated structures is held in working memory until the speaker is ready to speak.

The overall structure of the language production system in Stemberger's (1985) model is shown in Figure 2.2, above. Although no explicit example of production is provided, Stemberger appears to suggest that input in the form of the semantic and pragmatic features of an intended meaning instigates processing in the modules of syntax and lexicon. The phrase structure rules of syntax are internally weighted so that their output (e.g. $S \rightarrow NP\ VP$) never leads to an equilibrium of activation (thus, in English it is always NP that is processed first). In this way, a series of empty syntactic slots is generated, and each of these is associated with an entry that has been retrieved from the lexicon. The selected lexical items are connected to phonology, and through it to phonetic features. The entire process is moderated by phonological rules that govern the sequence of events in production and have been activated by lexicon and (presumably) syntax.

Speech errors, Stemberger (1985, p.150–151) argues, are the result of noise in the system. One possible source of noise is random variation in the resting levels of activation. Alternatively, increased frequency of a unit may render it easier to access (which renders high-frequency units less prone to errors). A third possible source of noise lies in the spread of activation to both target and nontarget units, occasioning feedback from the latter.

As a last point in this brief representation of Stemberger's model, it should be noticed that word substitutions (see Table 2.1) are found to provide evidence for mutual influences between lexical and syntactic processing. Frequently, substitutions involve only words of a category that is required by the syntactic framework; but at the same time, the grammatical environment is adjusted to accommodate these unintended units.

In summary, Stemberger's model assumes the passage of a signal through a dedicated processing machinery for language production, module by module, modifying the signal as a string of abstract symbols until speech production can ensue (see Christiansen & Chater, 2001, p.82). This approach is in line with representational theories of mind and Fodor's Language of Thought Hypothesis (see Aydede, 1998, for a detailed discussion). Other approaches to cognitive modelling do not follow a modular approach, but take architectural cues from neuroscience and work with neural networks. The following model belongs to this category.

An early connectionist model: Dell (1986)

The architecture of connectionist models can be characterised as a neural network (i.e., not modular) of simple units that are connected to each other, so that each passes on some of its activation to all others that are connected to it. The crucial notion in this description is “simple”: input and output of a unit are not symbols, but merely levels of activation that could be expressed numerically.

A first model of language production with this architecture was presented by Dell (1986). It was geared to account for data patterns from observational studies of speech errors in more explanatory detail than Stemberger’s (1985).

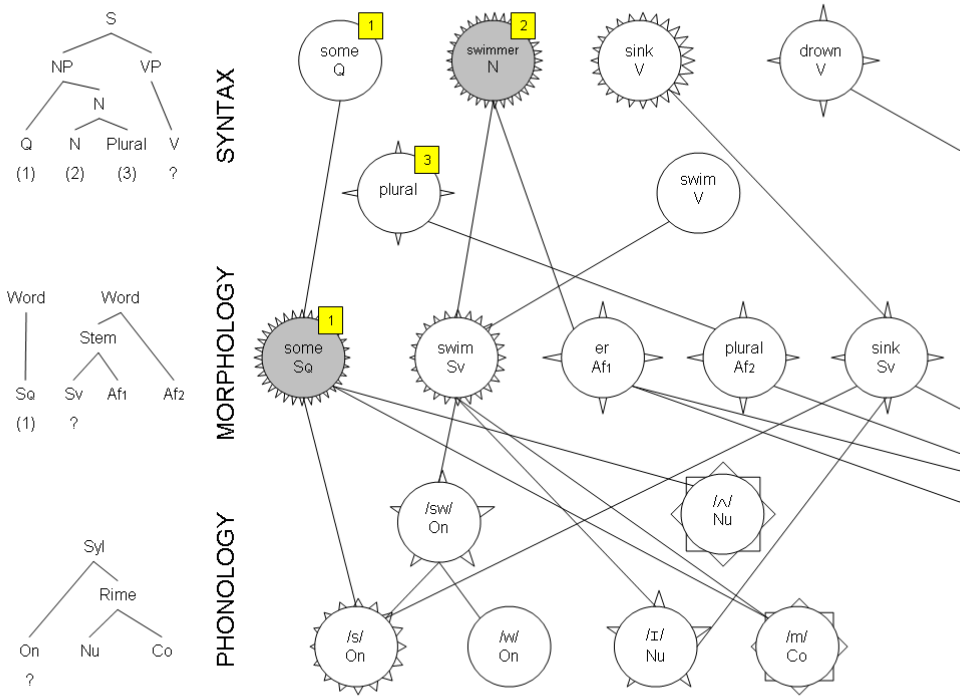
In Dell’s model, input (an activation pattern that corresponds to some propositional content, i.e. a message) runs through an interactive network of several interconnected layers and activates corresponding nodes on each of them. All layers follow the same architectural principles, and allow identification with levels of linguistic organisation — semantic, syntactic, morphological, phonological (Dell, 1986, p.286). Dell’s focus is on the latter three; the model is not concerned with the semantic constitution of an utterance’s message.

On each level, two types of information can be distinguished: productive combinatorial rules that state acceptable combinations of items from the respective level, and non-productive stored knowledge, i.e. the level-specific lexicon. The local representation of a message consists, on each level, of the activated nodes for the required lexical entries. These are combined as indicated by a governing rule, in the slots of a structural frame. This frame determines the exact order in which items are activated; activation of any one item leads to activation of rules and items on the next-lower level of organisation. Once an item has been tagged for a specific position in a structural frame, its activation level quickly returns to zero.

Crucially, activation is not understood as a binary value, but as a real value that will deteriorate over time — without input, the activation level of a node decreases as time passes. However, once a unit has been selected, its activation is reset to zero to avoid repeated selection. Again, activation is cascading: it is not necessary that a representation on a higher level is completed before processing on lower levels can begin. Finally, the connections between units are interactive, and activation information is passed on in the network not only to lower levels, but also to higher ones.

Dell’s (1986) detailed account allows a more detailed discussion of speech errors (see Dell, 1986, pp.284, 292–293). Similar explanation patterns apply to similar types of errors, irrespective of the level of linguistic organisation where they are observed.

Figure 2.3: *Connectionist model of language production (Dell, 1986, p.290)*



Note: Illustration of a moment in the production of the sentence “Some swimmers sink” (based on Dell, 1986, p.290, Fig.1). Combinatorial rules for node categories are indicated on the left, the lexical network on the right. Spokes around nodes indicate activation, boxed number indicate order of selection (per network layer) to fill slots of relevant rules, shading indicates the node that is currently processed on each level (i.e. has maximum activation). Nodes are labeled for category-specific membership, i.e. syntactic *Q*uantifiers, *N*ouns, *V*erbs; morphological *S*tem, *Af*fix; phonological *On*set, *Nu*cleus, *Co*da. — Cascading activation allows processing of a noun “swimmer” on the syntactic level, while the morphological level is still processing the stem “some” and has just initiated the corresponding syllable structure on the phonological level. Interactive connections make it possible for the (morphological) stem “swim” to feed some activation back to the (otherwise unactivated, syntactic) verb “swim”.

The observed types of errors are explained as natural side-effects of the model, resulting — as in Stemberger’s model — from fluctuations in the activation levels (and the subsequent selection) of nodes on each layer (Dell, 1986, pp.290–291).

- **Perseverations** occur whenever the current item does not gather enough activation to outweigh the activation level of a preceding item of the same category that has not yet been reset to zero. Thus, in the word order example for perseveration in Table 2.1, the noun *test* has not attained selection. Instead, the preceding noun *class* is re-activated in spite of a considerable amount of intervening linguistic material. (The higher the organisational level at which a speech error occurs, the more material may intervene — see Dell, 1986, p.293.)

- The mechanism that leads to **anticipation** is similar to the one described for perseverations; inversely, however, it is the current item that cannot outweigh the activation level of an upcoming item of the same category, and the latter is pre-activated.
- **Exchanges** are explained as the result of interlocking perseverations and anticipations. Thus, the phonemic example for an exchange in Table 2.1 is brought about by insufficient activation of the onset /j/, leading to selection of the following onset /l/ instead. The activation of the latter is reset to zero, but — different from an anticipation — cannot gather enough activation to be activated a second time. Instead, /j/ is selected as in a perseveration, as its activation level has not been reset to zero.
- **Additions** appear to present a simple phenomenon: more than one item attains sufficient activation to trigger processing on the levels underneath. Similarly, **deletions** appear to be a simple consequence of insufficient activation of the required item. It is not clear, however, how level-specific rules can accommodate intrusions or elisions of this type. The issue is acknowledged by Dell (1986, p.314), but not discussed in further detail.

To test this model, Dell (1986, pp.302-314) carried out both an experiment to elicit phoneme misordering errors, and a computer simulation of the same phenomenon based on the model. Error distribution was an emergent property of the simulation, and was found to correspond reasonably well with that elicited from human participants, confirming the model as an adequate first approach.

2.1.2 New Data: Priming

Important new impulses for the development of models of language production came from demonstration of structural priming, the persistence of syntactic structures between sentences, by Bock (1986b). While the phenomenon had been observed in the field before, for example by Schenkein (1980) or Levelt & Kelter (1982), Bock's work made it possible to study syntactic production under experimental conditions. The ramifications of priming underline the insufficient involvement of time as a factor in speech production in models such as Stemberger's (1985) or Dell's (1986); the following paragraphs will introduce the phenomenon and give an overview of related research.

Figure 2.4: *Sequence of a priming experiment (based on Bock, 1986b, p.361)*

PRIMING SENTENCES

PREPOSITIONAL:
A rock star sold some cocaine
to an undercover agent.

DOUBLE OBJECT:
A rock star sold an undercover
agent some cocaine.

TARGET PICTURE

In Bock's (1986b) experiment, participants carried out a recognition task on heard sentences and shown pictures. Sentences and pictures alternated. After each exposure, they were asked to repeat the sentence that they heard or describe the picture that was shown. In experimental trials, the sentence contained a ditransitive verb with a double object (DO) or prepositional object (PO) construction, and the following picture showed a ditransitive event (see Figure 2.4).

Results showed that participants were significantly more likely to describe pictures with DOs after hearing a DO, and with POs after a PO. Other experiments tested the same effect with priming sentences in active or passive voice and pictures of transitive events. Here, a similar effect was observed, but was additionally dependent on whether or not the agents of priming sentence and stimulus picture were human or not: while human agents would always lead to a priming effect, nonhuman agents appeared to prime passives only if the agent in the stimulus was nonhuman, as well. Eventually, Bock et al. (1992) found evidence that syntactic priming occurred independently from animacy effects.

In subsequent years, priming research established itself as a significant contribution to psycholinguistics. It was found that the phenomenon itself could be observed in other languages such as Dutch (Hartsuiker & Kolk, 1998) or German (Scheepers, 2003), and in research paradigms other than Bock's (1986b) picture description, such as written and spoken sentence completion (Pickering & Branigan, 1998; Hartsuiker & Westenberg, 2000) or sentence recall (Potter & Lombardi, 1998; V. S. Ferreira, 2003), and even in large-scale corpora (Gries, 2005; Szmrecsányi, 2005). At the same time, the range of constructions on which priming was observed increased beyond object constructions with ditransitives and the voice of transitive verbs, including for example the structure of complex NPs (Cleland & Pickering, 2003), the positioning of verb and auxiliary (Hartsuiker & Westenberg, 2000), or clause attachment (V. S. Ferreira, 2003; Scheepers, 2003).

Over the years, additional features of the priming phenomenon were discovered, each contributing to our understanding of language processing. Thus, the priming effect appears to be increased if the phrasal heads of primed structures are repeated (a "lexical boost"), even though such repetition is not essential for its occurrence (Pickering & Branigan, 1998, for sentences and verbs — see also 2.1.3, below; Cleland & Pickering, 2003, for NPs and their head nouns). Priming has been found to have an effect not only on the syntactic form that is selected for production, but also on the timing of production itself (Smith & Wheeldon, 2001). This effect on timing disappears if the time lag between priming and production stimulus is increased through distractor items (Wheeldon & Smith, 2003) — the effect on linguistic form, however, has been found as relatively long-lasting in spoken production (Bock & Griffin, 2000), but is subject to measurable decay in written production (Branigan et al., 1999). Finally, while Cleland & Pickering (2006) found evidence for priming between writing and speaking, other research discovered also priming phenomena in comprehension (Branigan et al., 2005; Arai et al., 2007). For earlier exploratory applications, see also Potter & Lombardi (1998) for reading-to-speech with an RSVP paradigm, and Branigan et al., 2000, for auditory comprehension to spoken production.

2.1.3 Models based on priming data

Quite apart from more recent findings, the initial observation of priming posed a challenge for models such as Stemberger's (1985) and Dell's (1986), particularly for the mechanisms that were presumed to prevent erroneous repeated activation of the same unit. Grounded in lexical work, both Stemberger and Dell had assumed in their models that the activation of a unit would return to zero immediately after it had been selected. Such a mechanism was in contradiction with observations of priming on the levels of both the lexicon (see Wheeldon & Monsell, 1992) and the syntax — syntactic frames should not have been able to perseverate systematically in subsequent productions if they had been selected before. In the following, I will present a number of more recent models that attempt to account for structural priming in both the connectionist and computational traditions. A third type of model is introduced that focusses on a critical interface in the process of language production and is a direct result of priming research.

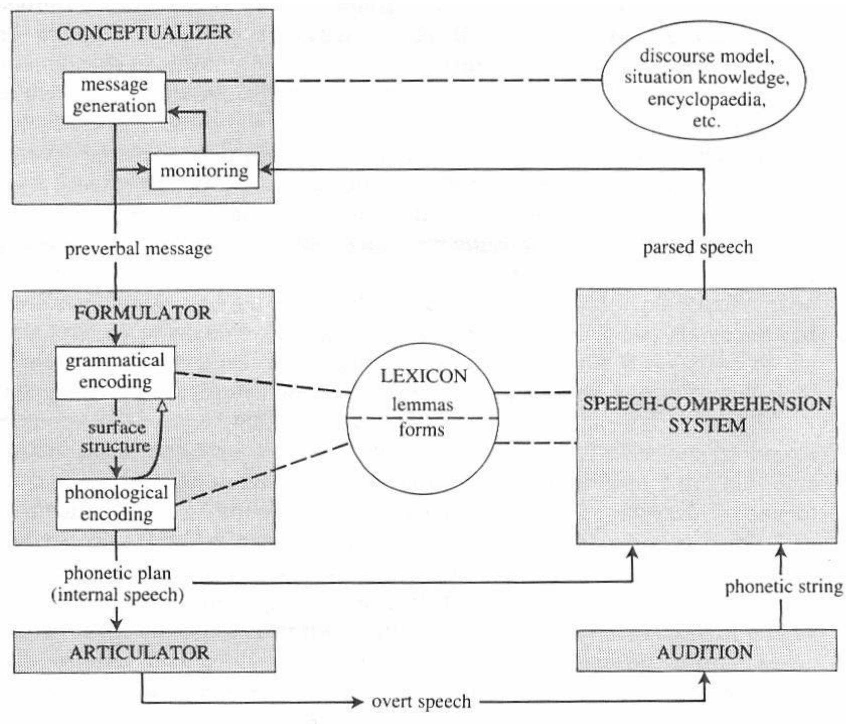
Symbolic models: Levelt (1989) and Bock & Levelt (1994)

In 1989, Levelt published a comprehensive, book-length model of human language, focussing in particular on language production. Structural priming is not really integrated into this model, but still acknowledged (see Levelt, 1989, pp.273–5). Nevertheless, this model has been influential enough to warrant its introduction at this point. It provides not only the background for the partial but more detailed model of Bock & Levelt (1994), but is also a necessary reference for several approaches that will be discussed later on. A detailed discussion of Levelt's (1989) model would be entirely beyond the scope of this thesis, and I will restrict myself to a summary, partially leaning on a section of similar intention in de Bot (1992, pp.3–6).

Figure 2.5 shows Levelt's (1989) model of the cognitive system of human language, the 'blueprint for the speaker'. Language production begins in the general knowledge system (top right), where not only some content is brought forth but also the intention to communicate it. This triggers operation of the conceptualizer component, where the speaker's communicative intentions are adapted so that a preverbal message results.

In the next step, the semantic information that is handed down from the conceptualizer in the shape of the preverbal message is converted to a (phonetic) speech plan in the formulator component. To do so, the lexicon component of the system must be accessed. Units in the lexicon consist of two parts: the *lemma*, representing their semantic and syntactic features, and the *lexeme*, representing their morphological and phonological properties. As the formulator matches lemmas to the semantics of the incoming preverbal message, their syntactic information is accessed simultaneously, leading to formation of a *surface* structure.

Figure 2.5: *Levelt's 'Blueprint' model of language production*



Note: Figure 1.1 in Levelt (1989); Figure 1 in de Bot (1992, p.3).

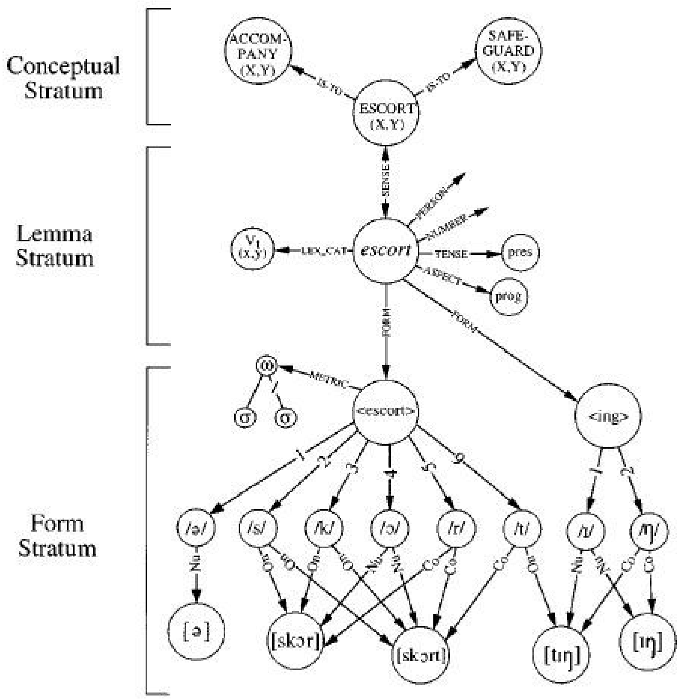
Lemma access activates also the corresponding lexemes, making them available for the development of a (phonetic) speech plan.

The speech plan is implemented by the articulator component and results in the actual utterance. Both speech plan and utterance are fed back into the speech-comprehension system to allow monitoring.

Interestingly, the process of lexical retrieval in Levelt's (1989, pp.18–19, 181–234) model, illustrated in a more recent version in Figure 2.6, is closely related to the principles of Dell's (1986) model: again, the lexical network is conceived of as a set of layers. These, however, are not connected bidirectionally as in Dell, but constitute a feedforward network, i.e. a network where activation can be passed on between nodes in only one direction. From top to bottom, these layers or strata are:

- the *concept stratum*, where the meaning of a word that relates to the preverbal message is stored (in the illustration, the verb *to escort*); concept nodes may be connected to other, related nodes (Levelt et al., 1999, pp.3–4)

Figure 2.6: *Model of lexical retrieval*

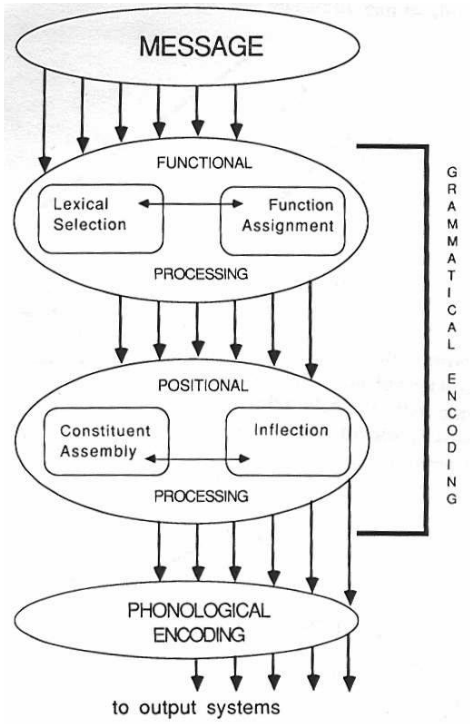


Note: Fragment of the lexical network underlying lexical access, as represented by Levelt et al. (1999, p.4). The feedforward activation spreading network has three strata. Notes in the conceptual stratum on top represent lexical concepts. Nodes in the lemma stratum represent syntactic words or lemmas and their syntactic properties. Nodes in the form stratum represent morphemes and their phonemic segments. Syllable nodes are also located on this level.

- the *lemma stratum*, containing lexical information that pertains to the activated concept in some specific language; this is connected to (syntactically relevant) 'diacritic' features that may have been filled in by the conceptual representation (Levelt et al., 1999, p.4) — in Figure 2.6, transitivity status, tense and aspect; and
- the *form stratum*, containing lemma-specific morphological and phonological information.

For the time being, however, the lexicon's connection to the formulator component will be more relevant for my discussion. The representation of formulator and lexicon in Levelt's (1989) model, and particularly of the interface between them, was developed in greater detail in a joint article by Bock & Levelt (1994). With an update specifically of lexical access by Levelt et al. (1999), and an article that achieves to integrate more recent findings (F. Ferreira & Engelhardt, 2006), the model of Bock & Levelt (1994) may still provide a state-of-the-art computational model of language production.

Figure 2.7: *Bock-Levelt model of language production*



Note: Figure 1 in Bock & Levelt, 1994, p.946.

The model of Bock & Levelt, shown in Figure 2.7, is specifically concerned with the grammatical encoding within Levelt's (1989) formulator component; their model does not extend beyond the preverbal message and the speech plan. Two levels are distinguished within grammatical encoding: *functional processing* and *positional processing*. Both consist of two subcomponents that are presumably accessed in parallel.

The first subcomponent of functional processing is *lexical selection*, the process that retrieves lemmas from the mental lexicon that are suitable to convey the contents of the pre-verbal message. As indicated above, once a lemma has been selected through activation of the corresponding conceptual feature (see Figure 2.6), nodes for all corresponding category information become immediately available, as well.[2] The second subcomponent on the level of functional processing, *function assignment*, takes into account both the message itself and category

[2]Some of the nodes for corresponding category information may have been filled in by conceptual features of the preverbal message, while others still await specification. Although this process is not detailed by Bock & Levelt (1994), the description of the process by Levelt (1989, p.241) appears to imply that this specification is carried out during inflection and based on the end results of functional processing.

information from the lemma, and assigns on their basis "syntactic relations or grammatical functions (e.g., subject-nominative, object-dative)" (Bock & Levelt, 1994, p.947).[3] In summary, functional processing selects a set of lemmas that are appropriate to the intended message, and marks them for their grammatical functions.

At the subsequent stage of positional processing, the subcomponent of *constituent assembly* imposes a sequential order on the selected lemmas, i.e. puts it into a structural frame. (Bock & Levelt, 1994, p.970–971, discuss possible processes for the on-line generation of structural frames, whereas F. Ferreira & Engelhardt, 2006, p.64, assert that frames are ready-stored.) Sequential positions are assigned on the double basis of lemmas' inherent syntactic properties (stored in the lemmas themselves), and of their functions (that have been assigned during functional processing). At the same time, the second subcomponent of positional processing is operative, i.e. *inflection*: wherever an empty slot occurs in overarching syntactic frames or in verbs' subcategorization frames, an appropriate affix or function word is assigned to it. At this stage, items are expanded into small phrasal sub-frames that contain slots for all the features that have been assigned to them (see Bock & Levelt, 1994, p.973; F. Ferreira & Engelhardt, 2006, p.64). The eventual result of positional processing is an ordered plan of the utterance that is ready to be encoded phonologically.

Processing in Bock & Levelt's model is carried out strictly top-down; the information that is available to each level is restricted to the representation that is handed down from the next-higher level. This feature was suggested by experimental work of Bock (1986a), who had found that the choice of a syntactic subject could be influenced by syntactic but not phonological primes. The model at hand conceives of processing again as an incremental process, carried out in cascading fashion — representations do not need to be completed before they are handed down to the next-lower level.

The first stage in the production of an utterance *She was handing him some broccoli* would thus involve lexical selection of lemmas for unspecified masculine and feminine references, and for BROCCOLI and HAND. Selection of these lemmas leads to additional access to their category information, indicating that BROCCOLI is a noun, HAND a ditransitive verb, and the two unspecified

[3] Whereas Bock & Levelt are slightly sketchy about the nature of the functions that are assigned at this point, and name them with terms from traditional case terminology, F. Ferreira & Engelhardt (2006, p.63) designate them unambiguously as subject and object.

references are (presumably) specified as personal pronouns. At the same time, function assignment is carried out (again based on information from the preverbal message), attributing the pronominal feminine referent with the role of subject, the masculine with that of indirect object, and BROCCOLI with direct object.

The output of functional processing is then, at the second stage, subjected to positional processing, and a phrasal frame is retrieved that supports a set of items with the categories and functions that are represented in the output of functional processing. Together with the selection of this frame, affixes or function words are assigned to all those of its slots that are not required (i.e. those that are already filled) by the output of functional processing — in the example, the auxiliary *was*. The verb HAND itself is elaborated as a small phrasal sub-frame of *stem* + *suffix* that accommodates the progressive affix *-ing*.

Speech errors. Because Bock & Levelt's (1994) model is predominantly concerned with issues of syntax, i.e. the order and selection of words in the sentence, empirical data from speech errors relates in particular to the word level (see Table 2.1).

- Non-contextual substitutions are an error type that is specific to the lexical selection part of the functional processing stage: the speaker selects, for instance, CAULIFLOWER instead of BROCCOLI. Subsequent processing integrates features of the erroneously selected item rather than the intended one, as shown in the first non-contextual substitution example in Table 2.1. Additional support comes from the observation that substitution errors commonly agree with their intended items in elementary semantic and syntactic features (Bock & Levelt, 1994, p.947).
- In the function assignment part of the functional processing stage, exchange errors are encountered: available functions are assigned to wrong lemmas, e.g. inducing the example speaker to say ***He** was handing **her** some broccoli*. Again, subsequent processing integrates the erroneously assigned functions, as shown by the fourth substitution example in Table 2.1; the error does not consist of a simple exchange of surface forms (Bock & Levelt, 1994, p.947; see also Bock & Loebell, 1990, pp.2–3).
- No speech error is pointed out that would support constituent assembly; however, Bock & Levelt (1994, pp.970–971) imply that structural priming should be located in this part of the positional processing stage. A possible

mechanism for priming, however, is not described. Yet, it appears entirely feasible to assume that some sort of residual activation may be involved, as the model conceives of language production as a strictly top-down process, while earlier feedback models could not integrate such a possibility.

- Finally, inflection as a part of the positional processing stage finds evidence from (morpheme) shift and stranding errors. Inflectional affixes are more often involved in this type of error than other syllables, indicating that morphological affixes are positioned in the utterance in a process that is separate from phonological processing and the ordering of lexical units (Bock & Levelt, 1994, pp.948–949).

Bock & Levelt's (1994) assumption of *two* stages of processing is supported, on one side, by priming experiments, in particular the findings of Bock & Loebell (1990) and Bock, Loebell, & Morey (1992). They showed that the priming effect occurred independently from additional effects of the conceptual features of the units embedded in the primed constructions. This conclusion is taken one step further by the results of a priming experiment in Dutch, carried out by Hartsuiker & Westenberg (2000). Their experiment provided evidence for priming of the sequential order of a content word and a function word (main and auxiliary verb). As function words lack intrinsic meaning, the result fully excludes explanations of priming as based on conceptual features; thus the location of functional priming is presumably not at the functional stage of processing.

A second source of support for a two-stage model of language processing comes from experiments that elicited attraction errors (see F. Ferreira & Engelhardt, 2006, p.66). In an attraction error, a failure of subject-verb-agreement occurs due to a distractor noun in an intervening postmodifier (Bock & Miller, 1991). The effect of distractor nouns differs, depending on whether they occur in a phrase or a clause: after a phrasal postmodifier, attraction errors are more frequent than after postmodifier clauses. In clauses, distractor nouns are integrated into the argument frame of another verb, but not so in a phrase (Bock & Cutting, 1992). In other words, if the distractor is already an argument of another verb, its influence on the sentence main verb is greatly diminished. From these findings, it follows that agreement relations are processed before the sequential order of the eventual utterance is computed.

However, errors in subject-verb-agreement are hardly ever reported after phrase exchange errors where the subject phrase was involved: as indicated above, verbs in such exchanges will commonly agree rather with the produced subject than with the intended one (Bock & Levelt, 1994, pp.962–963); similarly, case markings in exchange errors with noun phrases will rather reflect the position in which an noun phrase is produced than the intended one. This observation allows the conclusion that inflections cannot be processed before computation of a sequential order has at least started. This is also supported by the evidence from shift and stranding errors that has been quoted above.

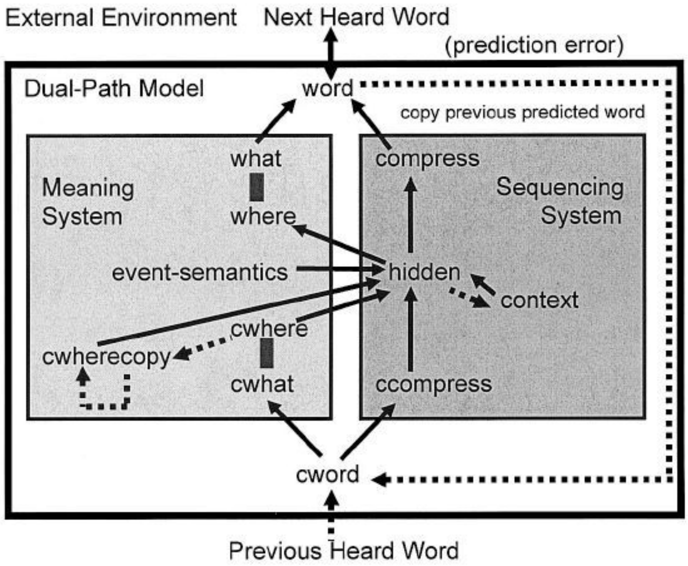
To sum up, the computational model of language production due to Bock & Levelt (1994) gives a more detailed account of the formulator in Levelt's (1989) model. Different from the earlier model of Stemberger (1985), where processing modules are exchanging information in both directions, processing in Bock & Levelt's (1994) model is carried out top-down in a two-stage architecture. The two stages are separately processing functional and positional features of the utterance-to-be-produced, in this order. The phenomenon of priming is attributed to the second, positional stage of language processing; however, no concise account is attempted for the activation patterns that condition it.

The dual-path model: Chang, Dell, &Bock (2006)

Dell, Chang, & Griffin (1999, p.518) observed that "canonical" connectionist architectures (such as Dell, 1986) were not capable of creating temporal sequences. The output activation patterns that they created developed in a parallel, holistic fashion quite unlike incremental human language production (see also 2.1.4, below). Dell et al. (1999) propose various adjustments to the architecture of the connectionist model of language as a remedy. Based on Dell et al. (1993), language processing is now described in terms of a simple recurrent network, i.e. a network in which activation travels monodirectionally from the *input*, the entry point where the network's operation begins, to the *output*, its exit point. Crucially, the processing layers between input and output cannot be accessed through targeted probing — they are *hidden*. No layer contains specific features that would make its operation readily distinguishable from that of others, and they are not obviously interacting with anything but each other. Connections between layer units, and with them the probability that one selection is preferred over its alternative at default activation, are not "hard-wired", but set through backpropagation (Dell et al., 1999, pp.525–526).

During language processing, the activation patterns of hidden layers are fed not only into the output, but also into a *context* layer (see Elman, 1990), i.e. parts of

Figure 2.8: *Dual-path model of language production*



Note: Dual-path model by (Chang, Dell, & Bock, 2006, p.239); *ccompress* and *compress* are sets of compression units. Single arrows are learned weights. Dashed arrows are fixed copy connections. Thick bars are fast-changing message weights. Double arrows are for target comparison (*what* layer output as target for *cwhat* layer not shown).

the hidden network that are not directly involved in the production of current output. This context layer retains a copy of previous activation patterns for some time, feeding it back into nodes in the hidden layer where current processing takes place. In this way, it becomes possible for activation chains to reach units that are closer to the input than their node of origin, which allows for effects similar to those of the interactive connections of Dell (1986). In addition, the introduction of a context layer makes it possible for the activation pattern of a time stage t_1 to influence the pattern at a later stage t_{1+x}. As demonstrated by Dell et al. (1999), this feature allows the model to account for structural priming (see Section 2.1.2). A derived prediction would claim that priming effects should be persistent over time, an effect that was confirmed in research by Bock & Griffin (2000).

Following this line of development, the model of Chang, Dell, & Bock (2006), illustrated in Figure 2.8, is the most recent descendant of Dell's (1986). It intends to account in addition for the human ability to make sense out of new or unusual material. New or unusual material may challenge the language system in one of two ways: as one possibility, an unknown word may be encountered in a known syntactic structure — so that only syntactic, but not semantic information is available initially. Alternatively, a known word may occur in a syntactic function different from the usual (e.g. a last name as a verb) — so that only semantic, but not syntactic information is available initially (see Chang et al., 2006, pp.235–236).

To enable the model to cope with such new situations, Chang et al. (2006, p.236) differentiate between two parallel pathways for linguistic processing: the *sequencing system*, ensuring appropriate syntactic processing, and the *meaning system*, concerned with the actual message. The exact strategies will not be relevant in this thesis; in the following, I will simply give an overview of the resulting system, then proceed to give an example of production in it, and finally discuss the resulting account of structural priming.

The architecture of the *sequencing system* is that of a simple recurrent network with context feeding into hidden layers, as described above. Its input and output are regulated through compression units that enforce the creation of item (word) classes. During language production, a copy of the previously produced unit is fed back into the comprehension system. This copy "helps the model keep track of the kind of sentence that it is producing and where it is in the sentence" (Chang et al., 2006, p.236). However, the 'kind of sentence', the order that is eventually applied to the string of units, should not be understood as a pre-existing frame to which copies are compared. Rather, it is an emerging feature of production, and is as such the result of repeated competition between the various possibilities for continuation that are available after each unit. Not only the activation that is available from each unit is a decisive criterion for the resolution of competitions, but also previous experience with comparable partial structures (see Chang et al., 2006, pp.242–243).

The *meaning system* processes the message, consisting of two parts: concepts and event roles, represented respectively by '*what*' and '*where*' units. While *what*-units represent the lexical semantics of words, the *where*-units are concerned with their thematic function in the current sentence. The weight of the connections between these two types of units is highly temporary. As production proceeds, a copy of the *what* and *where* of all output is retained within the meaning system. The *where*-representations of the meaning system serve as an additional context shell for the hidden units of the sequencing system. This ensures the production of structures of syntactic roles that are licensed to carry the required functional roles. The thematic functions that are represented by *where*-units do not correspond directly to those of any one specific linguistic framework, but subsume traditional thematic functions under three labels X, Y, and Z, while verbs are labelled A (Chang et al., 2006, p.241). There is no assumption of syntactic frames; these are neither part of the syntactic information that is connected with verbs, nor a part of the input: rather, they are an emergent feature of the system.

Example. Chang et al. (2006, pp.242–243) discuss the generation of a sentence *The boy is carried by the grandma*. At the outset, the *what*-units for BOY, CARRY, and GRANDMA are linked to appropriate *where*-units: as a verb, CARRY is linked to the *where*-unit A; BOY, the *what*-unit that is affected by the action, is linked with the *where*-unit Y; and GRANDMA, the *what*-unit that is affecting Y through the action, is linked to *where*-unit X. The relative activation of the concepts in the input (the "event semantics") is a part of the input itself (and indicates in this example lower activation for *where*-unit X), as are other features that pertain to them, such as the definiteness of BOY and GRANDMA.

Ignoring the details leading to the production of the article *the*, a crucial moment arrives when the first noun is about to be produced. Presented with the choice of *where*-units X and Y, the system selects Y over X because of its higher activation, and retains a copy of this in the context layer. Because the system has "learned" (i.e. has most often experienced the situation) that a passive VP will follow as the next unit after a processing situation where only Y has been produced, and no other circumstances intervene, the next selections involve a form of *to be* — which is adjusted so that it agrees with relevant properties of Y —, a participle form of A, and a preposition *by*. Again, copies are retained in the context layer, and *where*-unit X is processed. Thus, selection of the next word that is to be produced depends on the event semantics, on the previously produced segments of the same utterance, and on previous experience of the language system as a whole (i.e. the speaker).

Priming. Chang et al. (2006, pp.245–246) point out two possible accounts for priming, one based on activation, the other on learning. They favour a learning-based account, hinging around the bias for one or the other possible output structure in productions after processing of a priming input (i.e. changes in the weight of connections in the network). The possibility that priming might be connected to mechanisms of implicit learning had been modelled before by Chang et al. (2000), and explored by Bock & Griffin (2000). They had discovered no overall deterioration of priming in human participants who produced up to ten neutral fillers between priming sentence and stimulus picture. Model runs by Chang et al. (2006, pp.248–253) showed a similar resilience and similar general magnitudes of the priming effect as they had been observed with human participants. These results support the proposed connection between implicit learning and priming.

The dual-path model cannot account for the increased structural priming effect with repeated phrasal heads that had been observed by Pickering & Branigan (1998) and Cleland & Pickering (2003). Chang et al. (2006, p.256) acknowledge this shortcoming and suggest as an admittedly *post hoc* explanation that the 'lexical boost' might be due to explicit memory for the wording of the prime. However, their model is not able to provide a conclusive account for timing effects of priming, either (with particular problems arising from Corley & Scheepers, 2002).

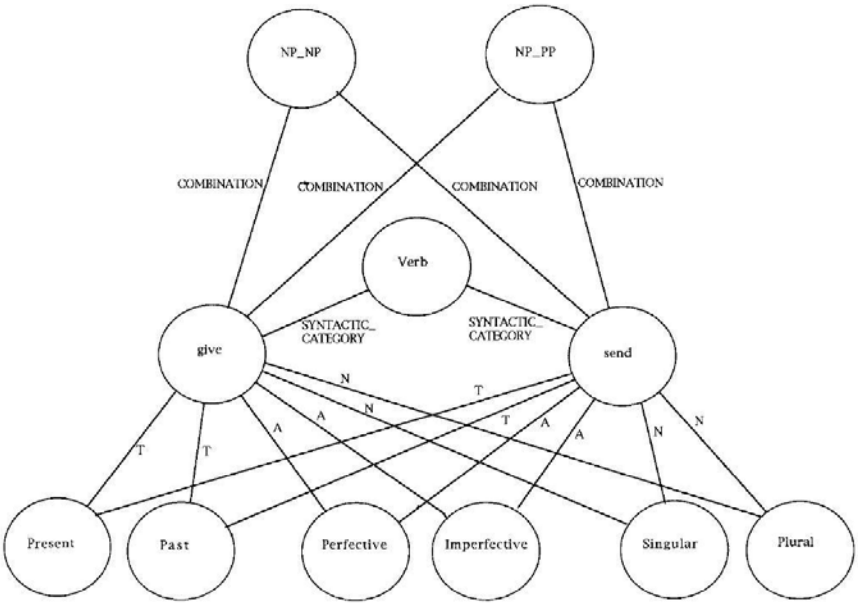
In summary, the dual-path model of Chang et al. (2006) can be characterized as a learning, simple recurrent network where meaning and structure are processed separately, but constantly aligned with each other as production progresses. Syntactic structures are neither stored separately nor with lexical entries for verbs, but emerge in the course of production as a product of the units that are involved in the message and production biases that have been acquired during acquisition.

The combinatorial model: Pickering & Branigan (1998)

Pickering & Branigan (1998) adapted Levelt's (1989) spreading-activation model of lexical access to syntactic purposes. Different from the connectionist and computational models that have been presented so far, their representation targets very specifically the interface between mental lexicon and syntactic encoding, and even more exclusively so than Bock & Levelt (1994).

The model of Pickering & Branigan (1998), shown in Figure 2.9, extends the lemma stratum of Levelt's lexical feedforward network (see Figure 2.6), further breaking down category information (the 'diacritic parameters' of Levelt et al., 1999, see 2.1.3) into *(major) category information*, *featural information*, and *combinatorial information* (see Pickering & Branigan, 1998, pp.633–634). Category information concerns the syntactic category of a lemma, specifying it e.g. as a noun, verb, or adjective. Featural information covers a range of predicative features of the lemma. Their exact nature depends on the category of the lemma: nouns may be qualified by gender, number, and case; verbs by number, person, tense, and aspect. Combinatorial information specifies the subcategorization frame of a word, i.e. how it can combine with other linguistic units to form possible

Figure 2.9: *Combinatorial model of syntactic representation*



Note: Pickering & Branigan's (1998, p.635) partial model of the representation of syntactic information that is associated with verbs at the lemma stratum of the production lexicon. Labels T, A, and N refer to Tense, Aspect, and Number, respectively.

expressions of the language: thus, instantiations of nouns may be pre-modified by adjectives; verbs take a certain number of arguments. As shown in Figure 2.9, the nodes for combinatorial information are directly connected to the verb only, but not to its featural information. In particular, Pickering & Branigan (1998) suggest that combinatorial nodes include a specification of the arguments in individual constructions: thus, an English ditransitive verb that allows dative alternation would have one node specifying the two object arguments as *NP, NP* (the double object construction), and another one specifying them as *NP, PP* (the prepositional object construction). No node is reduplicated; the *NP, NP* node connects to all verbs that allow double object constructions. The nodes for these three types of information are connected to lemma nodes only. This implies that the construction which is encountered with a verb in some utterance is not a property of this particular utterance *with* this verb, but of the verb lemma itself.

Priming. In the production of a sentence *The man gives the dog a bone*, the word *gives* involves activation of the lemma *give*, the category node "Verb", the featural nodes e.g. for third person, singular, Present tense, and the subcategorization node *NP, NP*. In Pickering & Branigan's (1998) model, the activation of nodes and of the links between them deteriorates over time. This makes it possible for nodes to retain residual activation even as a new utterance is produced. If a node with residual activation (such as *NP, NP* in the example above) is available among the activation candidates for the new utterance, it is at an advantage to be selected again. If the example speaker next desires to convey that a rockstar sold an undercover agent some cocaine, *NP, PP* is available together with *NP, NP*, but the latter will require to aggregate less activation until a level is reached that allows is activation.

Evidence. Pickering & Branigan (1998) carried out a series of priming experiments using a sentence completion task where priming constructions and stimuli differed either in the verb that was used, or in number, or in tense, or in aspect. Out of all these variations, only the actual verb used in the stimulus made any difference: the priming effect was stronger if priming and stimulus construction used the same verb. Evidently, the lemma bears some influence on the priming, but featural information does not — which is represented in the model by the absence of connections between featural and combinatorial nodes. A similar effect was encountered by Cleland & Pickering (2003) on noun phrases. Their experiment found that picture descriptions with relative clauses were significantly less frequent after simple noun phrases than after other noun phrases with a relative clause. The effect was enhanced with identical and semantically related nouns, but not with phonologically similar nouns. In both experiments, an observed priming effect was increased by repetition of the phrase head in prime and stimulus. This phenomenon has come to be known as the 'lexical boost' of priming.

To summarize the model of Pickering & Branigan (1998) in terms of Bock & Levelt (1994), it is specifically geared to describe procedures at the stage of functional processing. Where Bock & Levelt only state that 'category information' is accessed, Pickering & Branigan's (1998) model gives a more detailed picture of the connections between verbs and subcategorization frames. As before, function assignment is essentially located in the lexicon, and thus follows the principles of feedforward neural networks that are assumed for it (see Levelt, 1989, pp.181–234, Levelt et al., 1999).

2.1.4 *Resources for processing*

An important notion in all of the above models of language production is that of 'activation': cognitive nodes or subsystems pass around and accumulate some sort of energy or excitation until a threshold is reached where they become available as responses, i.e. where they are 'selected'. However, it is widely assumed in research on cognitive-energetic frameworks for human performance that activation should be considered as a limited *resource* (Green, 1986, p.215; Hockey, 1997, pp.75–76): not all parts of a system can be highly activated at the same time. Closely connected to the resource notion is that of processing *effort*, the mobilisation of activation to maintain a certain activity (see Hockey, 1997, p.76). In the remainder of this section, I will discuss some issues that are connected to the concepts of resource and effort in language production, but are not directly related to any of the models that have been discussed above.

Latency and fluency

The requirement for nodes to aggregate a certain amount of activation before they can be selected is reflected at an elementary level by the well-known and well-researched psycholinguistic frequency effect: lexical items that are in frequent use can be produced more quickly than items that are less frequent. The difference in latency is explained with a lower default activation level for less frequent items, requiring them to accumulate more activation before the threshold level is achieved that allows their selection for production. (For recent work on this issue, see Alario et al., 2002; Jurafsky, 2003.) Going beyond lexical access, research by F. Ferreira (1991) showed that increased activation requirements can also have an effect on syntactic production. Her results showed that an increase in the latency time necessary to repeat a sentence corresponded with the complexity of the sentence's subject; other possible causes could be excluded. Subsequent research by Smith & Wheeldon (1999) found that this effect can be moderated by lemma access; this moderating effect is greater if it is the subject lemma that is accessed, i.e. the first in the string of arguments.

The observation that changed starting levels of activation may lead to changes of latency times in production is relevant for all models of language production in 2.1.3: they all attempt to account for priming through changes in either activation (Bock & Levelt, 1994; Pickering & Branigan, 1998) or its transmission (Chang et al., 2006). In other words, all see priming as the result of a direct or indirect facilitation of selection. It follows that priming should lead to a measurable effect in response latency. This prediction was confirmed by the results of a study by Smith & Wheeldon (2001). Their experiment required informants to describe simultaneous movements of two objects that were carried out either disparately or jointly. Where it was possible to use the phrasal template of the compound subject a second time, measured latency times were significantly shorter. Similar reaction time advantages were observed in an on-line study by Corley & Scheepers (2002). Their experiment involved a sentence completion task under same and different verb conditions, similar to Pickering & Branigan (1998, see 2.1.3). While results in the different-verb condition were found too disparate for analysis, the same-verb condition (i.e, the condition providing the 'lexical boost' of priming, see p.p.31) showed clear evidence of priming in both construction choice and response latencies (Corley & Scheepers, 2002, p.129).

While these results appear to indicate that priming may serve to economise on available processing resources (see V. S. Ferreira & Bock, 2006, p.1013–1014), a follow-up study to Smith & Wheeldon (2001) indicates that reality is more complex than that. Wheeldon & Smith (2003) found that insertion of even one intervening trial between prime and stimulus completely annihilated the effect of priming on latency time. This is quite different from Bock & Griffin's (2000) finding of undiminished construction priming after up to ten intervening trials, and it remains to conclude that research is still necessary to reveal the relations between priming and activation.

Incrementality

The three models of language production at large that have been presented in 2.1.3 describe the overall process of language production as incremental (see Kempen & Hoenkamp, 1987); i.e. it is not necessary for the production of a sentence or utterance that it has been processed in its entirety — speakers need not be fully decided how to end a sentence as they begin to speak. The model of Bock & Levelt (see 2.1.3) assumes that functional processing, positional processing, and phonological spellout may begin their operation while processing of the next-higher layer is not yet completed. Chang et al. (2006) see the next input item for phonological spellout as being selected through constant competition in the network on the basis of network-specific settings, event features from the input, and the growing store of already-produced items.

Evidence for an incremental production of language can be found in studies where participants perform language production tasks under different timing conditions, such as F. Ferreira & Swets (2002). In their study, participants produced answer sentences to arithmetic questions with and without a time limit for their response. With a time limit, the pronunciation length of the set-phrase opening of answer sentences correlated with task complexity, providing evidence that participants were still involved in processing after speech onset. No such correlation had been observed in responses without time limit, where participants had planned their utterances before speech onset. Importantly, latencies in both tasks were found to be dependent on task complexity as well, but independent from incremental processing, showing that participants planned at least some part of their production before speech onset (F. Ferreira & Swets, 2002, p.76).

However, these findings point to a potential problem with latency data for priming: if speakers may still be processing their utterance after speech onset, then it is not entirely clear what is indicated by the onset. Indirectly, this problem has already been adressed in literature that is concerned with latency data for priming. On the basis of earlier research (Schriefers et al., 1998; Smith & Wheeldon, 1999; see also F. Ferreira, 1991), Smith & Wheeldon (2001, p.126) state the explicit opinion that "grammatical encoding is not conducted for the whole of a sentence prior to speech onset but only for the first phrase". They conclude that meaningful latency measures for priming can only be taken on the Subject argument, and apply this in their own experiment.

A different but related approach is encountered in Corley & Scheepers (2002). In an online sentence completion task with ditransitives, they provided participants with subject and verb and measured response latency as the time between display onset and the onset of completion typing. Thus, they measured onset latency not for the subject, but for the first phrase that is produced — which is additionally also part of the (possibly) primed construction.

Still another possibility to access processes of syntactic production through response latencies can be encountered in a study by V. S. Ferreira (1996). He compared reaction times between instances of production where the structural choice for an English ditransitive clause was either made by speakers, or intrinsically provided by stimulus material. In agreement with predictions on the basis of theories of incremental production, his results showed that speakers responded more slowly if the choice for the utterance's object structure was dictated by the material, rather than being their own decision. However, the assumptions made in the experiment of V. S. Ferreira (1996) are in open conflict with the view of Smith & Wheeldon reported above; in their view, a condition where the structure of an utterance is already decided at onset would have to be considered highly unnatural.

I will leave this issue here undecided, to continue with the review of models of bilingual production. In Section 5.1.4 however, this conflict will enter into the discussion again, where I will propose a possible resolution.

2.1.5 Summary

In summary, this section has shown several models that have been proposed to account for phenomena of language production. Observation of priming phenomena has given new impulses for the development of such models, and has to be accounted for by all, irrespective of other theoretical and structural assumptions. Moreover, there is wide agreement that language should be modelled as an incremental process, even though the exact entailments of this requirement still need clarification.

A focal area in particular with respect to the priming phenomenon is the interface of syntax and lexicon. The question here is how the linear order is determined in which elements occur in the eventual utterance. While one answer (Chang et al., 2006) is argued via language-specific preferences and event semantics, another (Bock & Levelt, 1994) invokes structural frames that are part of the lexical entry for the verb, in the sense of a dependency grammar. A third answer (Pickering & Branigan, 1998) posits that structural frames are stored separate from the verb and selected case-sensitively, and is distinguished by being the only one that provides a coherent account of priming so far.

2.2 Models of Bilingual Production

Up to this point, I have discussed models of language production in general as a foundation for the main interest in this thesis: language production by bilinguals.[4] A question that has received much discussion in this respect concerns the exact way in which two or even more languages can be simultaneously present in the cognitive system of one individual, and the possible consequences on language use (see Paradis, 2004, ch.7, for a discussion of the various positions that have been held by research in neurolinguistics). However, only with the development of the relatively exact models of language production that have

[4] A word on terminology: I use the term *bilingual* with its widest possible reference, i.e. to refer to any speaker who has command of more than one language through whichever means of acquisition. Speakers who grew up acquiring only one language as a native language will be described as *natively monolingual*, and those who acquired more than one native language as *natively bilingual*.

been discussed in 2.1 has it become possible to combine conceptualizations of bilingualism with known features of language production in a way that allowed empirical tests of very specific theoretical predictions.

Over the last two decades, at least three different models of bilingual production have been proposed. In this section, I will describe the main characteristics of each model, partially following a comparable discussion in Hartsuiker & Pickering (2008), and match these characteristics to empirical findings of bilingual language use.

A theoretical prerequisite for models of bilingual production is that they should be able to account not only for production in each of the two languages involved, but also for productions that are linguistically different from those of other speakers of the same language. A well-known feature in this respect is deliberate *code-switching* or mixing of languages, e.g. the speaker self-observation "Sometimes I'll start a sentence in English *y termino en español*" [... and end up in Spanish], reported by Poplack (1980). More frequently, productions may simply be perceived as "wrong" by other speakers. While some may be comparable to the monolingual speech errors discussed in 2.1.1, others are qualitatively different by the simple feature of involving linguistic material that is not available to a monolingual. Because many of these errors have predominantly been discussed as indicators of features of language acquisition, I will discuss their exact nature in more detail in the corresponding part of this thesis (Chapter 3.1). Most relevant for the purposes of this thesis is the observation that irregularities and errors of language production may arise from the interaction of languages. In the following, these will be addressed as *cross-linguistic influence*.

2.2.1 *Levelt's (1989) Blueprint of the speaker, bilingual extension: de Bot (1992)*

A bilingual extension of Levelt's (1989, see also 2.1.3) model of human language was proposed by de Bot (1992), and is illustrated in Figure 2.10. The change from a mono- to a bilingual system is achieved with the following assumptions and postulates:

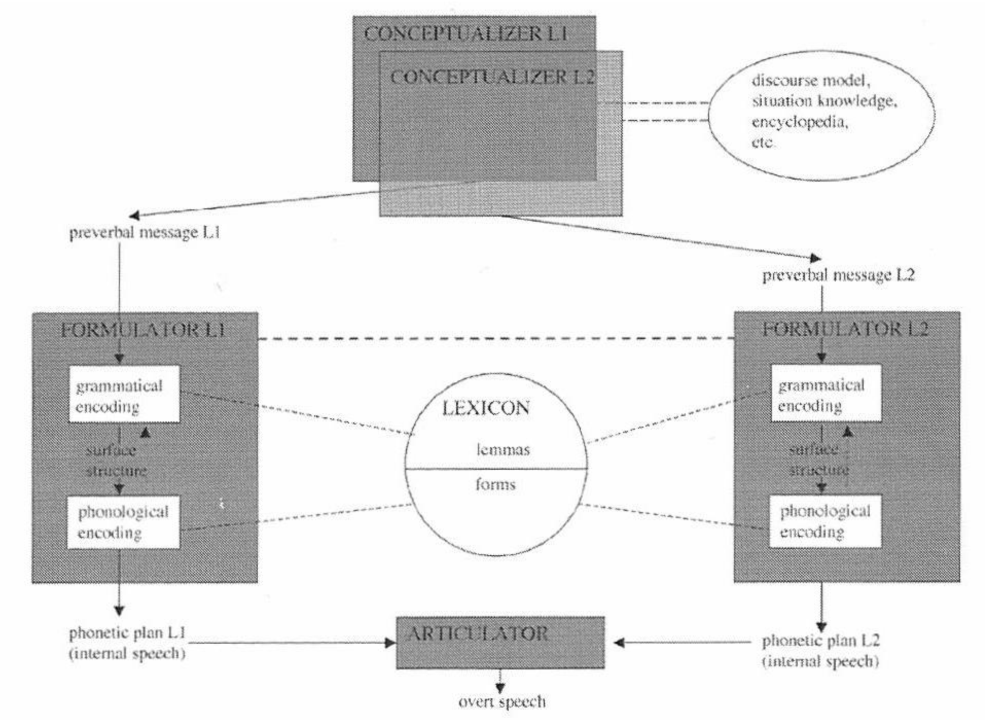
- For each language of a bilingual, there is a language-specific **conceptualizer** component. This feature goes back to Levelt's (1989, pp.103–104) original model, where it is argued by differences in the conceptual reference systems of languages. It is not discussed whether conceptualizers might interact with each other (see de Bot, 1992, p.8).

- There is only one **lexicon** for all languages that are known to a speaker (de Bot, 1992, pp.10–11). This lexical storage component is organised as an activation-spreading network, internally structured as a system of subsets (see Paradis, 1987, p.9): although all linguistic units are contained in the same storage space, the connections between units that belong to different language systems are not as strong as those to units that belong to the same language.
- Each language has its own **formulator** component (de Bot, 1992, p.14), each of them accessing the lexicon on its own account and developing a speech plan (following Green, 1986). At that, the possibility that the formulators of two different languages might interact with each other in some form is not ruled out (de Bot, 1992, pp.9, 19).
- Both language systems of a bilingual operate in parallel, each formulator generating a speech plan. However, only one of these (the formulator of the "selected" language) gets to forward its output to the articulator (de Bot, 1992, pp.12–13).

As a descendant of Levelt's (1989) model, this model of bilingual production model is a cousin of Bock & Levelt's (1994), and can account in the same way for phenomena of language production in general. In addition, de Bot (1992, pp.18–19) discusses the phenomena of code-switching and cross-linguistic influences. Clearly controlled forms of code-switching are accounted for as switches of the "selected" formulator. Cross-linguistic influences are seen as related to context-driven types of code-switching, but no clear account is given for either (de Bot, 1992, pp.13–14, 18–19).

If taken literally, the postulate of two separate, language-specific formulators would serve to exclude *any* form of cross-linguistic influence at the syntactic level (see Hartsuiker & Pickering, 2008, p.481). Although this reading is plausible from the model, de Bot (1992, p.19) appears to favour a less rigid reading, allowing for a limited amount of information exchange between the formulators. Thus, information (activation states) may spread from one formulator to the other, leading to cross-linguistic influence. Because the possibilities of effects between the two formulators are still limited in comparison to those of effects within, the resulting phenomena should be weaker if they occur between two languages than when they are observed within one.

Figure 2.10: *'Blueprint' model of bilingual production*



Note: Model of a bilingual system according to de Bot, 1992 (figure from Hartsuiker & Pickering, 2008, p.481). Conceptualizers for L1 and L2 are partially overlapping. Separate formulators for each language are connected as a function of proficiency (and linguistic distance). Other components (discourse model, semantic memory, lexicon, articulator) are shared between languages. For simplicity's sake, processes of comprehension and monitoring are not depicted.

Another prediction springs from de Bot's (1992) model: because theory predicts that increased proficiency will increase the degree of separation between language-specific parts of the system (de Bot, 1992, p.9), evidence of effects between language-specific parts (conceptualizer, formulator) should be more common from speakers of lower levels of proficiency. (Following this argument, cross-linguistic influences should occur in both directions between languages: the close connection of an initially weak L2 system to L1 makes it possible not only for L1 to influence L2, but also for L2 to influence L1 along the same link.)

2.2.2 The Declarative/Procedural Model: Ullman (2001)

The model presented by Ullman (2001) is less a model of language production and more a neurocognitive model of bilingualism. I include it in this discussion because it provides a view on the mechanisms underlying cross-linguistic influences that comes from a related but different field of research and attempts to integrate different types of data.

The main assumption of the declarative/procedural model is the association of declarative and procedural memory systems with aspects of — respectively — lexicon and grammar (see Ullman, 2001, pp.106ff). The learning ability of the procedural and declarative memory systems develops differently, depending on biological age; procedural learning gets harder with increasing age. Declarative memory, in turn, can acquire some procedure-like, "explicit" rules. Thus, a frequency effect (see p.32) has been observed in aphasics with impaired procedural memory for regular past tenses in English, reflecting that these forms have been committed to memory following the lesion; there is no frequency effect for regular past tenses in healthy speakers (Ullman, 2001, pp.109–110). An "explicit rule" was evident in one group of aphasics where context cues led to overgeneralizing use of the past tense morpheme (occurrence of both *swimmed* and *swammed*).

These differences between memory systems, so Ullman (2001, p.110) proposes, require the grammatical processing of late L2 learners to rely on declarative rather than procedural knowledge at least partially, and at least during the early stages of acquisition. Ullman (2001, pp.111–112) reports supporting evidence from several ERP studies, and also from a group study (Fabbro & Paradis, 1995) of procedurally impaired aphasic patients who performed grammatically worse in their more proficient language or L1.

Being more concerned with features of memory and process localization, the declarative/procedural model has only little to offer in terms of statements about the interface between lexicon and syntax. Still, it allows prediction of some features of language use that should be observable in any healthy bilingual.

Presumably, only parts of L2 processing are carried out in the same part of the cognitive network as L1 processing. Only these parts can reasonably be expected to be prone to any cross-linguistic influence. In other words, influences on syntactic production should be stronger within each of the languages than between them. Moreover, an increase in L2 proficiency will presumably shift the language system's reliance for grammatical processing of L2 towards the procedural system (Ullman, 2001, p.110), i.e. to the space of grammatical processing of L1. This predicts that an increase in L2 proficiency will lead to stronger effects between L1 and L2.

2.2.3 New Data: Cross-linguistic Priming

I have shown that the models of both de Bot (1992) and Ullman (2001) are based on monolingual ones, and attempt to account for bilingualism through reduplication. While the declarative/procedural model assumes that an L2 language system is prevented from development that parallels L1 mostly by features of neurophysiology, de Bot's (1992) model sees bilingualism instantiated through architectural features of the lexicon on one side, but also development of a separate formulator on the other. Both take their empirical foundations from earlier studies that focussed on features of multilingualism or language acquisition.

However, the experimental technique of Bock (1986b) has also been applied to to multilinguals, providing empirical data for bi- and multilingual production. In the first documentation of cross-linguistic structural priming under controlled conditions, Loebell & Bock (2003) placed speakers of L1 German and L2 English in bilingual priming task. Each participant sat through two sessions of the experiment, receiving priming sentences in L1 and describing pictures in L2, once primed in L2 and describing in L1. Apart from this language switch, the experimental procedure followed closely that of Bock (1986b), illustrated in Figure 2.4: participants carried out a recognition task on pictures that were shown or sentences that were read to them. Sentences and pictures alternated. After the recognition task, participants repeated the sentence in the same language in which they had heard it, or described the picture in the other. Experiment runs were consistent in the use of languages so that either all sentences were heard and repeated in L1 and all pictures described in L2, or vice versa. Thus, in one version of the experiment participants would hear either the English DO or PO sentence, decide whether they had heard it before and repeat it in English, then see the picture and decide whether it had occurred previously, and finally describe it in German. In the other version, participants would hear corresponding German dative or prepositional constructions (*Der Musiker verkaufte etwas Kokain an den Agenten* or *Der Musiker verkaufte dem Agenten etwas Kokain*), make a decision and repeat them in German, see the picture, make another decision, and finally describe the picture with an English DO or PO. As in Bock's (1986b) experiment, priming sentences and stimulus pictures were paired to elicit either dative alternation on a ditransitive verb, or verbal voice on a monotransitive verb.

Loebell & Bock's (2003) results showed that structural priming occurred after ditransitive sentences, in both language directions and for both priming constructions, confirming the existence of cross-linguistic structural priming as a factor in bilinguals' language production. However, there was no conclusive evidence of priming for transitive priming sentences that differed in verbal voice, in neither language direction. Loebell & Bock accounted for this finding in terms of differences in the participle placement of passive constructions in English and German, supporting the assumption that structural priming is strictly bound to configurations of surface structure.

Evidence for the essential possibility to prime verbal voice came from Hartsuiker, Pickering, & Veltkamp (2004). Their experiment put L1 Speakers of Spanish through a scripted dialogue picture matching task. Participants alternated with a confederate to describe pictures in English and Spanish, using provided verbs. The participants used only English during the experiment (i.e. their L2), the confederate only Spanish. In experimental trials, the confederate read out a prepared (priming) sentence that described a picture with a transitive event in one of four possible Spanish constructions, as an active *(1a)*, passive *(1b)*, object-raising clitic-left dislocation *(1d)*, or intransitive *(1c)*:

(1a) *El taxi persigue el camión.*
(The taxi chases the truck.)

(1b) *El camión es perseguido por el taxi.*
(The truck is chased by the taxi.)

(1c) *El taxi acelera.*
(The taxi accelerates.)

(1d) *El camión lo persigue un taxi.*
(The truck(chasee) it chases a taxi(chaser).)

In their subsequent own descriptions of (stimulus) pictures, participants produced English passive constructions significantly more often after hearing a Spanish passive than after an intransitive, with no significant differences between intransitives, actives, or clitic-left dislocations.

Interest in cross-linguistic structural priming has already produced a not inconsiderable corpus of research. Most frequently, priming has been studied from other (L1) languages into L2 English, apart from German (Loebell & Bock, 2003) and Spanish (Hartsuiker et al., 2004; Meijer & Fox Tree, 2003) also from Dutch (Desmet & Declercq, 2006; Salamoura & Williams, 2006), French (Pickering et al., 2005), Greek (Salamoura & Williams, 2007), Korean (Shin & Christianson, 2007), and Swedish (Kantola & van Gompel, submitted); less than half of them attempted to explore in the other direction (Loebell & Bock, 2003; Meijer & Fox Tree, 2003; Pickering et al., 2005). Predominantly, these studies targeted priming of ditransitive relationships; voice was addressed only by Loebell & Bock (2003), Hartsuiker et al. (2004), and Pickering et al. (2005); Desmet & Declercq (2006) worked on relative clause attachment. The methods employed were picture descriptions, mostly in the specific situation of Hartsuiker et al.'s (2004) 'dialogue game', sentence completion tasks, and sentence recall tasks.

Of particular interest in many respects are studies by Bernolet et al. (2007), who compared priming of NPs structures from L1 Dutch into L2 English with priming from L1 Dutch into L2 German, and by Schoonbaert et al. (2007), who studied ditransitive priming in all possibile language combinations within and between L1 Dutch and L2 English.

Using an electronic version of Hartsuiker et al.'s (2004) dialogue game, Bernolet et al. (2007) compared priming of NP structures in which an attribute (italicized in examples *(2a)*–*(2f)*) was indicated either as an adjective *(2a)* or as a relative clause *(2b)*. Three experiments found no evidence for a priming of relative structures between L1 Dutch and L2 English. A fourth experiment, however, found clear evidence for priming of relative structures between L1 Dutch and L2 English, and a fifth one between L1 Dutch and L2 German. In German and Dutch, the verb (bold font in the examples) is in final position in subordinate clauses, but not in English.

(2a) **English, adjective:** the *red* shark

(2b) **English, relative:** the shark that **is** *red*

(2c) **Dutch, adjective:** de *rode* haai

(2d) **Dutch, relative:** de haai die *rood* **is**

(2e) **German, adjective:** der *rote* Hai

(2f) **German, relative:** der Hai, der *rot* **ist**

Bernolet et al. (2007, pp.941–3) concluded that general word order played an important role for the occurrence of structural priming, a finding that agreed with the account of Loebell & Bock (2003) for the observed difficulty to prime passives between German and English.

The importance of word order was also suggested by the results of Schoonbaert et al. (2007, p.167). Their experiment tested priming, again in a dialogue game, in all the possible combinations of L1 Dutch and L2 English (i.e. L1→L1, L1→L2, L2→L1, L2→L2). They used only one set of items in translation-equivalent versions. Experiments tested priming of ditransitive constructions and involved a same-verb and a different-verb condition. This found no significant differences of priming magnitudes found in the different-verb condition. The same-verb condition elicited significantly stronger magnitudes of priming in the two monolingual experiments (L1→L1, L2→L2) than in those that involved both languages (L1→L2, L2→L1), corresponding to the 'lexical boost' of priming, see p.31.

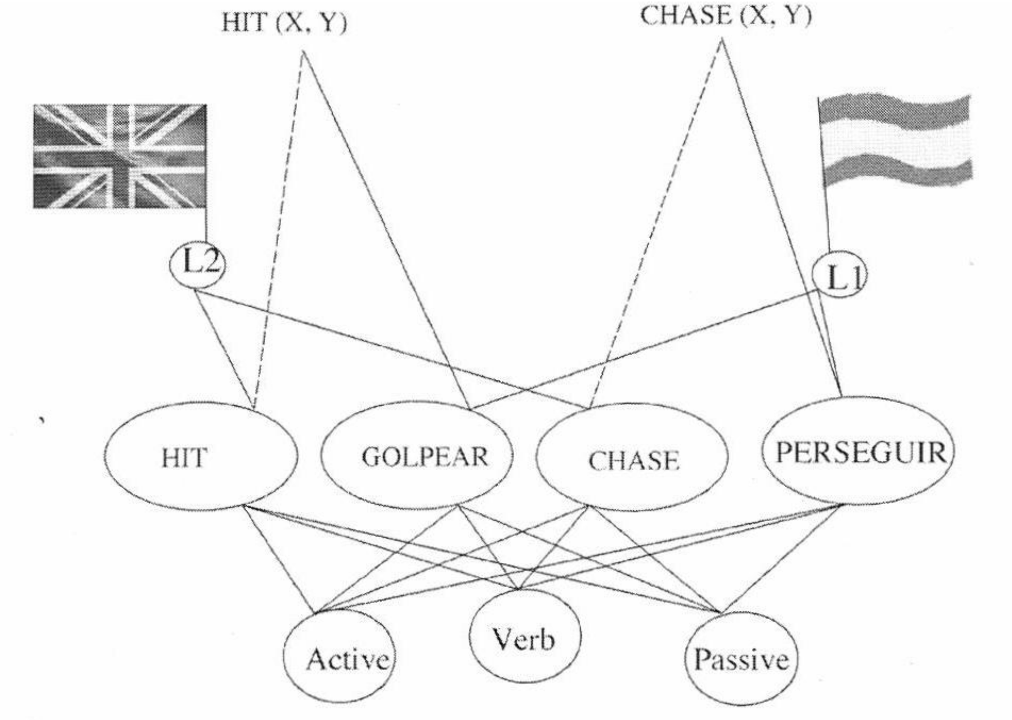
Nevertheless, (Schoonbaert et al., 2007, p.165) also encountered significant differences in the magnitude of the priming effect in the two two-language tasks. Although the priming effect for the same-verb condition in the L1→L2 experiment was significantly weaker than in the same-verb condition of monolingual experiments, it was still significantly stronger than the different-verb condition in the same experiment, suggesting a 'translation-equivalent boost' of priming (Schoonbaert et al., 2007, p.162). No such effect was observed in the same-verb condition of the L2→L1 experiment. There, analysis showed no significant differences between the same-verb and different-verb conditions (Schoonbaert et al., 2007, pp.163).

As discussed above, the models of bilingual production of both de Bot (1992) and Ullman (2001) had both predicted weaker cross-linguistic effects between languages than within; this postulation, however, is directly contradicted by the absence of differences in the priming magnitudes of all four experiment runs by Schoonbaert et al. (2007). The asymmetric 'translation-equivalent boost' poses an additional problem for these accounts. An explanation appears more feasible in a third model, introduced by Hartsuiker et al. (2004) as a direct consequence of their priming work.

2.2.4 *The Integrated Model: Hartsuiker, Pickering, & Veltkamp (2004)*

The model of Hartsuiker, Pickering, & Veltkamp (2004) is an expansion of Pickering & Branigan's (1998, see above, p.29) representation of the interface between lexicon and syntax, again on the basis of experimental observations. Based on the evidence of cross-linguistic structural priming, Hartsuiker et al. (2004) propose

Figure 2.11: *Integrated model of bilingual syntactic representation*



Note: Partial representation of the lemma stratum of lexical entries for 'to hit' and 'to chase' in Hartsuiker et al.'s (2004) Integrated Model. Each lemma node (*hit*, *golpear*, *chase*, *perseguir*) is connected to one conceptual node (HIT(X, Y), CHASE(X, Y)), to one category node (Verb), to one language node (represented by flags), and to combinatorial nodes (e.g., active, passive). Dotted lines account represent weak links between conceptual and (L2) lemma nodes, integrating the findings of Schoonbaert et al. (2007). (Figure from Hartsuiker & Pickering, 2008, p.481.)

an integrated (i.e. shared lexicon, shared syntax) account of bilingual language representation, illustrated in Figure 2.11.

The model assumes a shared lexicon for all languages. Each lemma is connected to one language node, and connects to language-specific category information, and shared conceptual information. As in Pickering & Branigan (1998), combinatorial nodes are shared between *all* nodes to which they may apply; importantly, the language node of the lemma is not relevant for this. Thus, verb lemmas from different languages may share a grammatical rule, i.e. access the same combinatorial node — provided that their rules are sufficiently 'similar', i.e. if they involve the same word order (Hartsuiker & Pickering, 2008, p.486).

It has already been shown out that Bernolet et al. (2007) were able to demonstrate the important role of word order. Similar results were also achived by Salamoura & Williams (2007), who attempted to prime dative ditransitive constructions, prepositional ditransitive constructions, and a 'shifted' prepositional ditransitive construction (i.e. with inverted order of recipient-PP and theme-NP) from Greek into English. Whereas Greek dative ditransitives primed English double object constructions and Greek prepositional ditransitives primed English prepositional object constructions, the Greek 'shifted' prepositional construction was found to prime neither English construction, performing close to unprimed baseline (Salamoura & Williams, 2007, p.645).

From the integrated model, a direct prediction concerning the interface between lexicon and syntax becomes possible: syntactic influences between the two languages should be as strong as they are within each. Not included in this prediction, however, is the 'lexical boost' of priming (see Section 2.1.3): an explicit precondition for this phenomenon is access to the *same* lemma node, which cannot be substituted by nodes for translation-equivalent verbs. Moreover, if the constructions in question are 'sufficiently similar', proficiency should not lead to any difference in the magnitude of cross-linguistic influences (see Hartsuiker & Pickering, 2008, p.482). The only condition here is that overall proficiency in L2 should be at a level that renders the construction accessible. As shown, this prediction was confirmed by the results of Schoonbaert et al. (2007). The concomitantly observed asymmetric translation-equivalent boost may be accounted for by weaker connections between verb lemmas and concepts in L2 (Schoonbaert et al., 2007, p.165).

2.2.5 *Summary*

In this section, I have discussed several models of language production by bilinguals. The phenomenon of priming has also been observed cross-linguistically, and must be appropriately accounted for by any model. I have shown that this is most satisfactorily achieved by the Integrated Model (Hartsuiker et al., 2004), based on the assumption of a shared storage for linguistic features. Experimental work has provided some support for it, but has also opened up new questions, e.g. for differences in the processing of a speaker's L1 and L2. Yet, as pointed out by Hartsuiker & Pickering (2008, p.487), research on bilingual production is still relatively scarce, and a number of predictions (among them the influence of language proficiency) is still waiting to be tested under controlled conditions for all the models that have been discussed.

In the following chapter, I will consider characteristics of bilinguals' production from the perspective of studies in Second Language Acquisition and multilingualism. It will be found that proficiency in a non-native language, although undoubtedly a factor language production, is not always a confound when L2 data is elicited for other purposes than the study of proficiency itself.

CHAPTER 3

(Advanced) Bilingualism

In this chapter, I will discuss characteristics of bilinguals' language use from the perspective of the study of Second Language Acquisition. One issue here is the question if, and how, bilinguals use language in a way that differs from monolinguals. This has been touched upon very briefly in the previous chapter (see p.36), but will be discussed in more detail in Section 3.1. Attention will be drawn in particular to features of bilingual production by high-proficiency non-native speakers, and Section 3.2 will present two accounts that have been proposed to account for them, relating them also to principles of production as introduced by the models in Chapter 2.

3.1 Linguistic Performance of Non-native Speakers

This section will look in more detail at features that may distinguish the speech of bilinguals from that of monolinguals, and deal with various attempts to categorize them. A distinction that is mostly based on the circumstances of language production has already been introduced in Chapter 2.2, and 3.1.1 will elaborate on this in more detail. An approach that is based on cognitive conditions is outlined in 3.1.2. A typology of bilingual speech events that goes back to older research is introduced in 3.1.3, and some conclusions are drawn in 3.1.4.

If the following discussion refers mostly to possible influences of a native onto a non-native language, this is of course not to claim that influences from L2 to L1 are impossible. I have shown in 2.2 that cross-linguistic influence of this kind have been theoretically predicted and empirically observed, although with certain constraints. However, linguistic research into cross-linguistic influences from L2 into L1 has been relatively infrequent, and theories have primarily targeted the inverse direction. (Cross-linguistic influences from L2 into L1 are still a relatively new topic in psycholinguistic research; see van Hell & Dijkstra, 2002, for a discussion.)

3.1.1 Code-Switching

Section 2.2 has already distinguished between *code-switching* and *cross-linguistic influences* as (respectively) more and less intentional combinations of elements from two language systems. In linguistic discussion, the term 'code-switching' refers to instances where one speaker uses material from more than one language in the same conversation (Thomason, 2001, p.132). This may occur not only between two sentences, but also within the same sentence. Thomason (2001, p.132) reports an example involving a switch between Yiddish and English: ***Dos hot meyn shvester gemakht*** *a long, long time ago* "My sister made this…". Switches within sentences, however, do not appear to occur at random.

Early research on code-switching, such as Poplack's (1980) or Pfaff's (1979), suggested that occurrences of intrasentential code-switching were restricted to points where the syntactic structures of the two languages involved were overlapping. Subsequent research, however, found this description inadequate. Another account, Myers-Scotton's (1992; 1993) Matrix Language Frame model, posited a functional distinction between the two languages that are involved in a code-switched utterance. One, the 'matrix' language, presumably provides the syntactic frame for the utterance; the other, 'embedded' language, provides lexical items to fill some or even all available slots in this matrix. In recent years, the Matrix Language Frame model has been criticised for not offering clear criteria to identify the matrix language; the possibility to describe certain observed code-switches both ways reduces its explanatory power vastly (see Gardner-Chloros & Edwards, 2004; MacSwan, 2005). For example, it has been proposed to identify that language as the source language that provides the majority of function words in a code-switched utterance. As pointed out by Gardner-Chloros & Edwards (2004, p.118), however, this is problematic in the light of code-switches that *only* involve function words, as in *(3)*:

(3) Et lui qui n'est la que trois mois **odder** deux mois **odder** quatre mois
'And with him being there only three months ***or*** *two months* ***or*** *four months'*
French/**Alsatian** (from Gardner-Chloros & Edwards, 2004, p.118)

More relevant for this thesis is the observation that, just as monolingual speakers are capable of using various regional and/or formal registers of their language depending on the specific situation, bilinguals can direct their speaking efforts to control whether code-switching occurs in their speech, and if so, to what degree. For example, Gardner-Chloros & Edwards (2004, pp.106–107) report an instance where a speaker, in the course of one day, was observed to speak (with different interlocutors) monolingually in standard French, monolingually in regionally marked French, in (Germanic) Alsatian dialect with technical terms in French, code-switching between French and Alsatian in a way where motivations for switches were clearly discernable, and code-switching at a high rate and in a way that could not be accounted for as easily. Whatever the exact cognitive characteristics of code-switched speech, there is little doubt that bilinguals are typically able to suppress code-switching in situations where it is considered inappropriate.

Overt code-switching, i.e. overt unsolicited use of words from the source language, is inappropriate in a translation situation, and thus presumably suppressed. Although professional interpreters have been observed to 'miss' the situational target language altogether, producing utterances in the source or still another language instead, this is by no means common; a collection of case reports (Proz.com, 2004-2005) suggests that exhaustion is a major factor in incidents of this kind. I conclude that code-switching, although not without interest with regard to language production, is not a relevant issue for language production in translation, and thus beyond the scope of my thesis.

Rather, I will focus on phenomena where non-native speakers cannot consciously prevent producing utterances that are qualitatively different from those of native speakers. Chapter 2.2 has introduced the term *cross-linguistic influences* for these phenomena, and shown how three models of bilingual production attempt to account for cross-linguistic structural priming. The next subsection will consider the cognitive environment of cross-linguistic influences, both as features of bilingual speech and as features of bilingual language systems.

3.1.2 *Cross-linguistic influences: a cognitive approach*

Færch & Kasper (1989) attempted to apply cognition-based models of speech production to theories of language acquisition, with particular respect to cross-linguistic influences. In doing so, they were not specifically concerned with the psycholinguistic mechanisms underlying individual speech errors, but rather acquisitional phenomena at large. While several of the described mechanisms are directly or indirectly driven by the speaker's attention, one plausible mechanism depends on how much the processing of linguistic units is "automatized" (Færch & Kasper, 1989, p.176). Units are said to "win" their way into processing, a description that corresponds with the principle of selection through competition for activation potentials that has been introduced in Chapter 2.1.1 (see p.10) as an elementary principle of cognitive networks. Specifically, Færch & Kasper (1989) suggest that L1 units may be preferred for selection because they are more highly automatized, i.e. easier to access than competing L2 units. Their main focus, however, is with larger features of cross-linguistic influence.

Concerning the degree to which cross-linguistic phenomena are integrated into an L2 system, Færch & Kasper (1989, p.175) distinguish between *synchronic* and *diachronic* cross-linguistic influences. Under this terminology, synchronic cross-linguistic influences are observed in instances of non-standard L2 production that are the direct result of L1 effects during their production, i.e. they are features of a speaker's performance. Diachronic cross-linguistic influences, in turn, are observed in instances of non-standard L2 production that are the result of an L2 system that was affected by L1 effects during its development, i.e. during acquisition. In other words, diachronic cross-linguistic influences are built-in features of speakers' representations of an L2.

An additional set of categories by Færch & Kasper (1989, pp.174–175) generalises cross-linguistic influences according to their origin in the speaker's language system.[1]

- Cross-linguistic influences during *comprehension*: processing of an incoming utterance in L2 is modified by activation of cognitive representations that are specific to L1, i.e. the representations that are already available for the speaker affect the intake, the information that can actually be drawn from the overall input. For example, a speaker of L1 Italian may encounter phrase *(4)* in her L2 English, and have difficulties parsing it.

  (4) What does he want that he does not have?

  Because her L1 grammar contains the construction 'want + finite clause', illustrated in *(5)*, she misunderstands the relative clause for a finite clause, comprehending *(4)* as meaning 'What does he want to have not?'

[1] The example used in the following discussion is my own elaboration of an example by Gass (1996, p.318).

(5) Voglio **che** tu venga. *'I want you to come.'*

- Cross-linguistic influences during *production*: the way in which an utterance in L2 is processed for production is modified by activation of cognitive representations that are specific to L1. For example, a speaker of L1 Italian produces utterance *(6)*. Presumably, she applied the 'want + finite clause' construction — see *(5)* — from her L1 grammar when processing the utterance.

  (6) I want **that** you come.

- Cross-linguistic influences during *acquisition*: the cognitive representations of L1 may affect the way in which hypotheses about strategies and structures of L2 are developed. This may occur with or without support from L2 intake. For example, the L1 Italian speaker may just assume that object clauses for *want* are constructed in English in the same way as in her L1, without external cue. However, an encounter with *(4)* may provide — mistaken — support for this assumption.

These categories do not allow a comprehensive classification of cross-linguistic influences, but can help to approach the complexity of the phenomena that are involved. In particular, L2 acquisition is a phenomenon in time, and thus connected with the category of diachronic cross-linguistic influences. Features of synchronic language production and comprehension may result from the speaker's representation of the specific language in use; as shown above, language comprehension may influence the actual intake that speakers draw from available input — possibly curtailing in this way opportunities for acquisition.

For example, consider the case of the speaker of L1 Italian who produces utterance *(6)*. As shown above, it is possible to analyze the occurrence of a relative rather than an infinitival construction as an instance of synchronic cross-linguistic influences during production. However, this assumes that the speaker has a target-like representation for uses of *want* at her command, and would have been in the position to produce the same proposition with a non-finite clause as its object, *I want you to come*. This may not be the case; her representation of L2 English may have developed at an earlier point to contain a feature '*want* + finite clause', parallel to an according feature in the representation of L1 Italian. In this case, production of *(6)* would actually constitute an instance of diachronic cross-linguistic influences during acquisition. But finally, the inclusion of such a feature may have found support at an earlier point through encounter with *(4)*, again in the fashion discussed above. Thus, synchronic cross-linguistic influences during comprehension may lie at the very root of the non-standard production of *(6)*.

Further conclusions from Færch & Kasper's (1989) cognitive approach will be discussed in 3.1.4. First, however, I will consider several categories of cross-linguistic influence that have been suggested by another approach.

3.1.3 Cross-linguistic Influences: some categories

Similar to early approaches in the study of speech errors (see 2.1.1), early research on cross-linguistic influences compiled examples of the various manifestations of nonstandard language productions that are specific to non-native speakers, and attempted to develop a typology. Although some main categories could be distinguished, this approach did not lead to development of an overarching theory, as observed by a recent handbook article (Odlin, 2003, p.475). This subsection will outline the three major categories of *transfer*, *avoidance*, and *over-use*. This will allow me to introduce some of the characteristics pertaining to each, and discuss some of the principles that have been introduced. In line with the orientation of this thesis, examples for each category will be provided with particular reference to syntax, even though cross-linguistic influences have been observed on all levels of linguistic organization.

Transfer

Among the most conspicuous manifestations of cross-linguistic influences are situations where an L2 utterance is produced that consists partially of forms that belong to L1 (Sharwood Smith & Kellerman, 1986, p.1; Ellis, 1994, pp.300ff; Gass, 1996, p.318; Murphy, 2003, p.3). A secondary distinction between phenomena of transfer classifies instances where the integrated feature corresponds correctly with a feature of L1 as *positive transfer*, and all others as *negative transfer*.

- An instance of morphosyntactic negative transfer is observed in the instance of a German or English learner of French who hypothesises that gender-marking for French possessive pronouns agrees with the possessor in the same way as it does in German or English *(7)*, leading to production of *(8)* (example from Færch & Kasper, 1989, p.174).

  (7) Frank trifft **seine** Mutter. *'Frank meets* his *mother.'*

  (8) Frank rencontre ***son** mère.

- Syntactic negative transfer is exemplified in the case of an Italian learner of English discussed above, producing *(6)* in reflection of *(5)*.
- Syntactic positive transfer is encountered in the case of a German learner of Danish who generalizes subject-verb-inversion after adverbials from German *(9)*, to produce acceptable Danish *(10)* (example from Færch & Kasper, 1989, pp.174–175).

  (9) Morgen **regnet es** wieder. *'Tomorrow there will be rain again.'*

  (10) I morgen **bliver det** regnvejr igen.

  Different from negative forms of transfer, positive transfer results in acceptable productions of L2. Hence, it is not as conspicuous as negative transfer; its role in language acquisition may be generally underestimated, and it has seen only little empirical research, as pointed out by Ringbom (1992, pp.88, 104–106).

Early classificatory approaches to transfer have often made reference to a requirement of typological 'similarities and differences' between the two languages, with particular respect to the element where transfer is observed (see Ellis, 1994, p.300; Gass, 1996, p.324; Odlin, 2003, p.436–440, for discussions of the vagueness of this terminology). In Andersen's (1983, cited from Murphy, 2003, p.4) *Transfer to Somewhere* principle, this prerequisite is described more concisely as structural congruence. There is, however, no objective measure of 'structural congruence'; it exists in speakers' perception by virtue of a subjective '(mis-)generalization'. Kellerman's (1995, p.141) complementary *Transfer to Nowhere* principle deals with the notion of 'generalization' as a phenomenon of psychotypology, i.e. speakers' sets of beliefs about what is unique in their L1 in relation to other languages (Kellerman, 1983). The impetus for generalization, according to Kellerman (1995), is a bias towards retention of a L1-based conceptual representation, which is presumably a general feature of L2 production. Thus, transfer into L2 may occur that is not warranted by any surface 'similarity' but by a speaker's desire to express a feature that is not perceived as being specific to L1 (Kellerman, 1995, p.137).

Beyond typology and psychotypology, other factors have been discussed as influences on transfer. In the following, I will list only those that are pertinent to the topic of translation, drawing in particular on Murphy (2003), where a more detailed discussion of other factors can be found.

- *Frequency*: The less frequent a linguistic feature is in L1, the less likely it is to be transferred into L2 (Murphy, 2003, p.15). This factor relates most directly to psycholinguistic conditions of language processing, and correlates with the psycholinguistic frequency effect discussed in Section 2.1.4.
- *Proficiency*: Negative transfer has been found to be particularly strong in the earlier stages of languages acquisition, but decreases as proficiency increases. Other forms, however, are still in evidence at higher levels of proficiency (Murphy, 2003, p.7).
- *Exposure to non-native language*: The exposure to L2 that a speaker has experienced is closely related to proficiency and can be operationalized through both the amount of instruction they have received, and the length of their residence in an L2 environment. These types of L2 exposure are both reported to decrease the likelihood of positive and negative transfer (Murphy, 2003, p.8).

Avoidance

Another manifestation of cross-linguistic influences is *avoidance*, a tendency for speakers to **not** use a structure in their own productions if it has no close correspondence in L1. This was first reported by Schachter (1974), comparing syntactic productions in essays in L2 English by native speakers of Persian, Arabic, Japanese, and Chinese. These languages differ with respect to the formation of relative clauses on several dimensions (pronominal reflex, subordination markers, clause position relative to head noun). Schachter's (1974) most relevant results, however, are related to the syntactic surface structure — which is also most relevant in the context of this thesis. For this reason, discussion here restricts itself to these data and results.

In English, just as in Persian and Arabic, a relative clause that modifies a noun typically follows after it (as in this sentence). In Japanese and Chinese, however, relative clauses precede their head nouns. It follows that the formation of postnominal relative constructions in L2 English is clearly different from that in L1 Japanese or L1 Chinese; thus, native speakers of Japanese and Chinese could be expected to produce more ungrammatical relative constructions in English than native speakers of surface-matching L1 Arabic or L1 Persian.

Contrary to expectation, however, Schachter's (1974, pp.209–210) results indicate that the dissimilar group produced significantly *less* ungrammatical postnominal relative clauses than the group with 'more similar' native languages. Yet, at the same time, they attempted significantly less often than speakers of 'more similar' languages to produce this construction; the rate of attempted postnominal relative clauses by native speakers of 'similar' Arabic and Persian was comparable to that of native speakers of English. This increased propensity to make an attempt at producing the construction increased again the odds for native speakers of 'more similar' languages to produce ungrammatical utterances. Compared to this, native speakers of Japanese and Chinese, whose L1 lacked a postnominal relative construction in first place, appeared to produce postnominal relative clauses only in situations where they felt relatively confident. In all other situations, the 'dissimilar' construction was *avoided*. Instead, they employed paraphrases as shown in *(11)*, *(12)* (Schachter, 1974, p.212).

(11) We put them in **boxes we call them** rice boxes. (L1 Chinese; emphasis RM)

(12) As far as you are a human being, that is a normal **thing. Every teacher** has to get through. (L1 Japanese; emphasis RM)

This appears to provide an instance of the Transfer to Somewhere principle: speakers of L1 Arabic and L1 Persian seem to perceive relative structures of L2 English as structurally congruent with those of their L1s, and thus access features of L1 to process L2. For speakers of L1 Chinese and L1 Japanese, no such processing support is available. They seem to have a representation of postnominal relative clauses (they *do* make attempts to use the construction, after all), but apparently access it less frequently. It follows that they have acquired the structurally unfamiliar construction: however, it is not a possible target of transfer, and thus accessed less frequently. This frequency effect is similar to the one that is observed with infrequent lexical items (see 2.1.4) — in other words, the acquired structure is integrated only weakly into the representation of L2.

3.1.4 Cross-linguistic Influences: Conclusions

This section has shown a number of principles that apply to the production of bilinguals. In 3.1.1, it was pointed out that bilinguals' intentions play a strong role for the occurrence of explicitly code-switched utterances. This additional influence of intention places code-switched productions rather at par with deliberate word-plays than with speech errors. It follows that they may provide insight into the constraints of bilingual language use, but they must be rated suboptimal as sources on fundamental features of bilingual production. Hence, I focus on characteristically bilingual features of production that are not subject to speakers' intention.

Subsequently, I have taken a look (in 3.1.2) at the cognitive conditions of unintentional non-standard productions by bilinguals. While no complications are discovered with the mechanisms of language production that have been described in Chapter 2, unambiguous descriptions of bilingual phenomena are difficult to attain if the diachronic process of acquisition is taken into account. Non-standard productions in L2 may be described equally as results of acquisition (i.e. the speaker's representation of L2 grammar), or as immediate events of transfer (i.e. a synchronic feature of production).

In 3.1.3, the various observed phenomena of bilinguals' non-standard productions have been considered in detail. The Transfer to Nowhere principle suggests that an impetus for the development of non-standard structures in a non-native language system comes from conceptual and/or pragmatic features of L1. The older Transfer to Somewhere principle attempts to specify elements of L2 that are particularly prone to be processed through, and affected by, transfer from L1.

The following section will discuss the extent to which proficiency issues are still a concern if we attempt to avoid large phenomena of acquisition by focussing on learners who have achieved an advanced stage of L2 acquisition. Two models are introduced that have been proposed particularly with regard to this group. The last part of this section will apply insights from these models to issues of non-standard L2 representations and non-standard processing.

3.2 L2 at high proficiency

The requirement to study non-native speakers who are 'not in a state of acquisition anymore' is not entirely unproblematic — what measure would allow to ascertain this status? Could speakers still qualify if their productions give evidence of cross-linguistic influences like avoidance or transfer? Alternatively, is it reasonable to expect that SLA should result in native-like command?

Questions about ultimate attainment in Second Language Acquisition have long been discussed in the light of the Critical Period Hypothesis of First Language Acquisition. The Critical Period Hypothesis holds that native-like language acquisition is possible only during a critical period — a particularly receptive window — in human cognitive development. While still contested by some (but see

Long, 2005, for a criticism of the criticisms), the Critical Period Hypothesis has found strong support by recent findings of age effects on variation in L1 (Kam & Newport, 2005). Considering ultimate attainment of non-native languages, opinions converge: the proficiency of high-level non-native speakers will either approach a native-like level only very rarely (if ever) and more often stall at an earlier stage, or it will turn out as being qualitatively different altogether. Both views suggest that the performance of high-end non-native speakers approaches an upper limit, where the influence of general principles of learning on non-native speakers is comparable to their influence on native speakers. Notice that this argument is only concerned with the influence of acquisitional features; it is secondary for this purpose whether the representation of L2 that has been achieved at this point is qualitatively different from that of native speakers or corresponds with it. Thus, the representation of L2 in high-proficiency non-native speakers can be seen as relatively stable; the importance of acquisitional processes as sources of cross-linguistic influences is greatly reduced at this point. All instances of cross-linguistic influences that are still observed will be a result either of the speaker's (diachronically developed) representation of L2, or of (synchronic) performance phenomena that result from the language system's bilingualism. It remains to be seen whether it is possible to tease apart the synchronic from the diachronic.

3.2.1 *Optionality at high proficiency levels: the Interface Hypothesis*

In an attempt to find empirical evidence against or in favour of the possibility of native-like attainment by non-native speakers, Coppieters (1987) collected grammaticality judgements from native and non-native speakers of French about common and productive features of French grammar. Some items were included that were controversial even among native speakers, eliciting also native speaker variations of judgement that allowed comparison with the variations in non-natives. The proficiency of non-native speakers was rated as being at maximum level and had been developed during their adulthood. Apart from a debate concerning approaches to data and measurements (see Birdsong, 1992; Long, 2005), Coppieters' (1987) research has also raised questions about the meaningfulness of data that is elicited through items that are controversial even in L1 (Long, 2005, p.305):

> If native speakers cannot agree on the correctness of responses in a GJ test [Grammaticality Judgement], ... how meaningful is it to judge the native-likeness of non-native subjects' performance by that standard?

However, Coppieters (1987, p.568) found that his data seemed to provide evidence for strong deviations of non-native from native usage particularly in those areas of grammar where there was evidence for cross-linguistic influences: a subdivision of test items on linguistic criteria dicovered result patterns in non-native speakers that corresponded closely with (the language family of) their L1s (Coppieters, 1987, pp.559, 560, 562, 564). The overall differences between native and non-native speakers suggested that the two groups had qualitatively different representations of French. At the same time, considerable convergence between the two groups could be discovered in other, more 'overt' areas of grammar (Coppieters, 1987, p.568). The fact that responses to grammaticality judgements for an L2 are indicative to some degree of a speaker's L1 may also suggest qualitative differences between L1 groups; however, a more detailed analysis was not possible given the small size of samples (Coppieters, 1987, p.565).

Assuming that mechanisms of selection play a role in language production (see 2.1.1), and also for the occurrence of cross-linguistic influences (3.1.4), these findings of Coppieters (1987) allows partial rejection of Long's question: If the grammatical judgements of L1 speaker groups for items of L2 grammar are characteristic for each of these groups, i.e. if generalisations are possible per L1 group, then a comparison of the divergence patterns on disputed items between one such group and a native group may throw more light on the L2 group's representation of the language.

Coppieters' line of research was continued in a study by Sorace (1993) that considered the choice of auxiliary verbs in Italian. In constructions with embedded unaccusative verbs, Italian offers the option to use either of its auxiliary verbs (13a). If, however, the embedded construction is additionally involved in a (optional) clitic-climbing construction, use of one specific auxiliary is required (13b).

(13a) (a casa), Mario è/ha dovuto andarci.
'(home), Mario is/has had to go there.'
'(home), Mario had to go there.'

(13b) (a casa), Mario ci è/*ha dovuto andare.
'(home), Mario there is/has had to go.'
'(home), Mario had to go there.'

Sorace elicited acceptability judgements from native speakers of Italian and from highly advanced non-native speakers with L1 French or L1 English. French alternates auxiliaries between unaccusative verbs as well, but on different principles;

there is no construction in French that involves a restructuring similar to that observed in Italian clitic-climbing. In English, there are unaccusative verbs but no auxiliary alternation with them, nor any restructuring that would be comparable to Italian clitic-climbing. Considering grammatical judgements on the acceptability of restructuring, participants with L1 French L2 Italian converged with L1 Italian speakers; their judgements on auxiliary changes, however, diverged from those native speakers in a way indicative of a different set of principles for auxiliary use. The judgements of the L1 English group were indeterminate for all constructions, i.e. at chance level. Table 3.1 presents these results in tabular fashion.

In summary, the L1 French participants of Sorace's (2005) experiment appear to have acquired the strategy of syntactic restructuring that applies to clitic-climbing in Italian, but seem to be challenged by the semantic criteria that apply to it. L1 English participants appear to be challenged by the semantics of auxiliary choice in the first place.

Table 3.1: *Grammaticality Judgements in Sorace (1993)*

<table>
<tr><th colspan="4">feature</th><th>languages</th><th>domain of selection</th></tr>
<tr><td colspan="4">category: unaccusative verb</td><td>Italian, English, French</td><td>-</td></tr>
<tr><td colspan="2">Aux=avere</td><td colspan="2">Aux=essere</td><td>Italian, French</td><td>sem. (Verb)</td></tr>
<tr><td>default</td><td>restructured</td><td>default</td><td>restructured</td><td>Italian</td><td>synt.</td></tr>
<tr><td>Y</td><td>N</td><td>Y</td><td>Y</td><td>judgement L1 Italian</td><td></td></tr>
<tr><td>Y</td><td>N</td><td>Y/N</td><td>Y</td><td>judgement L1 French</td><td></td></tr>
<tr><td colspan="4">Y/N</td><td>judgement L1 English</td><td></td></tr>
</table>

Y: feature combination is predominantly judged acceptable

N: feature combination is predominantly judged unacceptable

Y/N: feature combination is judged at chance level

Note: The table is mirrored at its horizontal middle axis. The top half shows the morphosyntactic features that were judged by Sorace's (1993) participants, in downwards increasing order of specificity. In addition, languages that contain this feature are listed, and the level of linguistic organisation where it is selected. The bottom half indicates the judgements of participant groups in upwards increasing order of specificity. In this example, the judgements of L1 French speakers follow similar feature categories as those of L1 Italian speakers, while the judgements of L1 English speakers are apparently impeded by the necessity to select an auxiliary, on semantic grounds.

Hopp (2004) compared the grammaticality judgements of non-native speakers on scrambling, *(14a)* and *(14b)*, and topicalisation in German subordinate clauses *(14c)*. German employs infinitival *(14a)* and NP scrambling *(14b)*, the latter being subject to a definiteness constraint that requires the scrambled NP to be definite.

(14a) [Den Wagen zu reparieren]$_k$ hat Peter schon t_k versucht.

'The car to repair has Peter already attempted.'

'Peter has already attempted to repair the car.'

(14b) [Die Reparatur des Wagens]$_k$ hat Peter schon t_k versucht.
'The repair of-the car has Peter already attempted.'
'Peter has already attempted a repair of the car.'

(14c) Ich glaube, dass [den Wagen zu reparieren]$_k$ Peter schon t_k versucht hat.
'I believe that the car to repair Peter already attempted has.'
'I believe that Peter has already attempted to repair the car.'

The non-native speakers in Hopp's (2004) study had L1 English (which topicalises and marks definiteness, but does not scramble) or L1 Japanese (which topicalises and uses infinitival scrambling, but does not mark definiteness). All groups converged in their judgements on topicalisation. The L1 Japanese group converged with native speakers in their judgements of infinitival scrambling, but judged NP scrambling indeterminately, i.e. at chance level. Participants with L1 English showed indeterminate judgement of scrambled constructions and diverged from native speakers in general. Table 3.2 presents these results in tabular fashion.

In summary, the L1 Japanese participants of Hopp's (2004) experiment appear to have acquired the strategy of syntactic restructuring that applies to scrambling in German, but seem to be challenged by the semantic criteria that apply to its use with NPs. L1 English participants appear to be challenged by the pragmatic conditions of scrambling in the first place. Neither group shows any difficulty with strategies of topicalization.

Table 3.2: *Grammaticality Judgements in Hopp (2004)*

<table>
<tr><th colspan="4">feature</th><th>languages</th><th>domain of selection</th></tr>
<tr><td colspan="4">argument reordering</td><td>German, English, Japanese</td><td>synt.</td></tr>
<tr><td rowspan="3">topicalisation</td><td colspan="3">scrambling</td><td>German, Japanese</td><td>prag.</td></tr>
<tr><td rowspan="2">infinitival</td><td colspan="2">NP</td><td>German</td><td>synt.</td></tr>
<tr><td>[+det]</td><td>[–det]</td><td>German, English</td><td>sem. (NP)</td></tr>
<tr><td>Y</td><td>Y</td><td>Y</td><td>N</td><td>judgement L1 German</td><td></td></tr>
<tr><td>Y</td><td>Y</td><td colspan="2">Y/N</td><td>judgement L1 Japanese</td><td></td></tr>
<tr><td>Y</td><td colspan="3">Y/N</td><td>judgement L1 English</td><td></td></tr>
</table>

Y: feature combination is predominantly judged acceptable
N: feature combination is predominantly judged unacceptable
Y/N: feature combination is judged at chance level
Note: This table shows morphosyntactic features and speaker judgements in Hopp (2004), and is organised in similar fashion as Table 3.1. In this example, judgements of L1 Japanese follow those of L1 German speakers to the level of syntactic choice between constructions but are impeded in their judgements by the semantic criterion of NP determinacy; the judgements of L1 English speakers concur for topicalisation (an available strategy in English, see main text), but are impeded by the pragmatic conditions for scrambling.

A recent study by Valenzuela (2006) studied the intuitions of L1 English speakers of high-proficiency L2 Spanish concerning topicalisation strategies.

(15a) Eses flores, las he comprado en el mercado.
'These flowers CL I-have bought at the market.'
'I bought these flowers at the market.'

(15b) Flores, compro todas las semanas.
'Flowers I-buy all the weeks.'
'I buy flowers every week.'

By default, Spanish employs clitic-left dislocation (CLLD) *(15a)* to topicalise, but requires a contrastive left dislocation (CLD) structure *(15b)* if the topicalised item is unspecific. English uses a CLD structure for purposes of topicalisation, but is not sensitive to specificity. With regard to CLLD, the judgements of Valenzuela's participants are best described as diverging from those of native speakers in a way that suggested application of different grammatical principles, but with a strong bias towards convergence. Their judgements on CLD constructions diverged from those of native speakers at random level. Table 3.3 presents these results in tabular fashion.

Table 3.3: *Grammaticality Judgements in Valenzuela (2006)*

feature				*languages*	*domain of selection*
topicalisation				Spanish, English	prag.
CLD		CLLD		Spanish	synt.
[+specific]	[–specific]	[+specific]	[–specific]	Spanish	sem. (LD item)
N	Y	Y	N	judgement L1 Spanish	
Y/N		Y	Y/N	judgement L1 English	

Y: feature combination is predominantly judged acceptable
N: feature combination is predominantly judged unacceptable
Y/N: feature combination is judged at chance level
Note: This table shows morphosyntactic features and speaker judgements in Valenzuela (2006), and is organised in similar fashion as Table 3.1. Notice that, in this example, the judgements of speakers of L1 English follows that of speakers of L1 Spanish as far as CLD is concerned (an available strategy in English, see main text), but cannot follow the semantic criterion of NP specificity; CLLD, not available in English, has apparently been acquired, but acquisition does not include the semantic criterion of specificity.

In summary, the L1 English participants of Valenzuela's (2006) experiment appear to have acquired the strategy of syntactic restructuring that applies to CLLD in Spanish, but seem to be partially challenged by the semantic criteria that apply to its use. They appear to be challenged in general by the semantic criteria that apply to the use of CLD in Spanish.

The results of the experiments that have been reported discover a frequent and potentially general feature: highly proficient non-native speakers appear to experience difficulties whenever syntactic features of L2 are selected not on the basis of syntactic contingencies alone, but involving other domains of cognition (e.g. semantics, pragmatics). Thus, the L1 English speakers of Hopp (2004) have been unable to develop a consistent representation of scrambling as a pragmatically motivated alternative strategy of syntactic restructuring. Those of Valenzuela (2006) have managed to do so, and with a prominent syntactic alternative — they are not able to attune their judgements to comply with an additional semantic criterion.

Generalisation over the above observations leads to the *Interface Hypothesis* (IH) (Sorace, 2005; Sorace & Filiaci, 2006). In correspondence with the distinctions that are apparent in the results of the experiments reported above, IH distinguishes between syntax proper or 'narrow syntax' and 'interface syntax', syntactic features that operate on an interface with other fields of cognition. According to IH, narrow and interface syntax differ in terms of the level of attainment that is possible in each: whereas interface syntax may never be acquired by NNSs to its full extent, narrow syntax can. It is predicted that L2 narrow syntax will eventually converge with that of L1, even though developmental delays may occur.

As Sorace (2005, pp.68–70) points out, this should not be understood as a claim that syntax is intrinsically 'easier' to acquire; rather, the difficulty for an L2 learner lies in the development of the ability to coordinate syntactic knowledge with knowledge from other cognitive domains. The distinction between syntactic processes themselves and the way in which they interact with other processes is not entirely new: Sorace cites Jakubowicz (2000), who assigns higher syntactic complexity to structures that require knowledge from other domains, and Avrutin (2002), who considers 'discourse' as a separate cognitive subsystem that deals with non-syntactic symbols and encodes various features that are traditionally seen as part of pragmatics.

In summary, IH explains the impossibility (or rarity) of native-like attainment in Second Language Acquisition through characteristics of the general cognitive system into which language is embedded. In the second part of this section, I will introduce a different approach to the same question that attempts to found its argumentation on the language system alone.

3.2.2 "Good enough" comprehension in L2: the Shallow Structure Hypothesis

Is it a problem for communication if the language systems of non-native speakers do not converge with those of native speakers? Presumably, it is not disastrous, as long as the divergence is not excessive. Not even the language systems of native speakers are fully convergent; not one of the optional features studied in the experiments described above attracted 100% agreement from native speakers. The linguistic signal tends to encode information redundantly, rendering communication less prone to disruptions by mere noise. Considering a simple sentence like "The boy eats cherries", the noun phrase "the boy" is indicated as the agent of the propositional action in (at least) three different ways: by syntactic position, by verb agreement, and (although only weakly) by semantic plausibility.

Experiments related in F. Ferreira, Bailey, & Ferraro (2002) explored this feature in a monolingual context and found evidence that language comprehension tends to rely not on the entire linguistic signal, but only parts of it. Specifically, they discovered a tendency to interpret implausible passive clauses ("The dog was bitten by the man") on the basis of semantic likelihood rather than explicit syntactic roles (see also F. Ferreira, 2003). Similarly, the misrepresentations of ambiguous sentences ("After Bill drank the water turned out to be poisoned") tended to be retained even after successful reanalysis. This confirms similar, earlier results by Christianson et al. (2001), and F. Ferreira et al. (2002, p.13) conclude that (syntactic) representations are not particularly robust and require reinforcement on other levels. If reinforcement is insufficient, however, input may be comprehended in a "good enough" fashion, on the basis of other available representations.

If a "good enough"-approach is at work in monolingual comprehension, is there any evidence for it in bilingual comprehension? If so, what does this mean for bilingualism in general? Independent from F. Ferreira et al.'s (2002) study, Clahsen & Felser (2006) take a similar approach from studies of grammatical processing in First and Second Language learners (see Clahsen & Felser, 2006, p.34, for a related discussion of F. Ferreira et al.'s results) and arrived at the *Shallow Structure Hypothesis* (SSH). The Shallow Structure Hypothesis posits that L2 comprehension by adult non-native speakers is carried out on syntactic representations that are "shallower and less detailed than those of native speakers" (Clahsen & Felser, 2006, p.32).[2]

Clahsen & Felser's review focussed in particular on differences in the L2 processing of morphological and syntactic information. Differences between native and non-native speakers that are observed in morphological processing are generally attributed to differences in proficiency (Clahsen & Felser, 2006, p.12). In syntactic processing, however, cognitive limitations can be excluded as a major factor, as can incomplete acquisition (Clahsen & Felser, 2006, p.27–29). This claim is supported with evidence from a series of experiments by Papadopoulou & Clahsen (2003), Felser, Roberts, Gross, & Marinis (2003), and Marinis, Roberts, Felser, & Clahsen (2005).

The experiments of Papadopoulou & Clahsen (2003) and Felser et al. (2003) tested the attachment preferences for relative clauses with genitive antecedents *(16a)* vs PP antecedents *(16b)* in complex NPs among high-proficiency non-native speakers of Greek (Papadopoulou & Clahsen) and English (Felser et al.). (Examples provided for English only.)

(16a) The dean liked the secretary *of* the professors who was/were reading a letter.

(16b) The dean liked the professors *with* the secretary who was/were reading a letter.

In both experiments, PP antecedents elicited a general preference for low attachment from all participant and control groups. For complex genitive antecedents, however, the non-native speakers in both experiments echoed neither the attachment preferences that were encountered in native speakers, nor those of their respective L1s — their preferences diverged indeterminately.[3] Felser et al. used an on-line reading time study to complement the off-line judgement task, which produced parallel results. In other words, both studies found no evidence among non-native speakers for phrase structure based parsing principles.

A study by Marinis, Roberts, Felser, & Clahsen (2005) complements these findings. Like Felser et al., they measured reading times in a segment-based self-paced reading task for L1 speakers and four groups of L2 speakers of English

[2]Clahsen & Felser (2006) provide no definition of 'shallow structure'. In view of their argumentation, the term may be related to the principle of shallow parsing in Computational Linguistics — see Sanford & Sturt (2002).

[3]See also Dussias (2003), who compared L2 English with L2 Spanish, and Frenck-Mestre & Pynte's (1997) study of L2 French. Both report preference for low attachment of genitives in L2 for all groups. However, genitives in English, French and Spanish involve prepositional constructions, but in Greek, case.

with sentences that contained one or two syntactic gaps (e_i), both relating to the same subcategorizer (who_i). (Example sentences (17a), (17b) taken from Marinis et al.)

(17a) The nurse who_i the doctor argued e'_i that the rude patient had angered e_i is refusing to work late.

(17b) The nurse who_i the doctor's argument about the rude patient had angered e_i is refusing to work late.

The reading times measured from native speakers at gap e_i was significantly shorter in *(17a)* than in *(17b)*. In sentences of type *(17a)*, they had previously encountered the intermediate gap e'_i, which had already required them to extract the same memory information. This effect had already been observed in earlier research (Gibson & Warren, 2004) and can be seen as evidence for the presence of intermediate gaps in the mental representations that are computed during parsing (Marinis et al., 2005, pp.70–71). However, L2 speakers from four different L1 backgrounds did not show this effect, nor did they show reliable extraction effects at the intermediate filler. L1s were typologically different from each other (Chinese, Japanese, German, Greek) and varied in the availability of a comparable feature (Marinis et al., 2005, pp.70–71). This behaviour of non-native speakers contradicts the deep structure account that had been confirmed in experiments with native speakers. However, Clahsen & Felser (2006, p.32) point out that it is entirely consistent with the lexical-semantic information that is available at the gaps (i.e. the argument structure of the verb directly preceding them).

Following these findings, SSH posits that L2 speakers are not able to apply 'deep' syntactic representations to their input in the same way as L1 speakers, but need to rely on lexical-semantic and pragmatic information to the same degree or even more than native speakers. Clahsen & Felser (2006, pp.29–31) discuss their results in terms of differences between processing of L1 and L2, and point out that they cannot be accounted for in terms of Ullman's (2001) Declarative/ Procedural Model (see 2.2.2), but provide no detailed discussion of possible cognitive causes of SSH. Still, it is possible (Clahsen & Felser, 2006, pp.33–34) to discover concepts that are related to SSH in current models in Computational Linguistics — shallow parsers and Sanford & Sturt's (2002) underspecification account of comprehension — and in Psycholinguistics — F. Ferreira et al.'s (2002) "good-enough" account of L1 comprehension. However, both these principles must be seen as options or possibilities in their field of application, whereas SSH postulates that L2 speakers can process shallow structures *only*.

Clahsen & Felser (2006, pp.27ff) present a detailed discussion of processing differences between L1 and L2 that excludes cognitive factors such as processing speed or working memory, incomplete acquisition, or transfer of L1 processing strategies as possible causes of these differences. However, they do not address the question *why* non-native speakers cannot apply 'deep structures'. Because incomplete acquisition is excluded as a factor, two equally plausible accounts remain: either detailed structures *are* acquired and thus available but cannot be applied consistently during comprehension, or they are *not* available because they were not acquired in the first place. Both views raise questions about the linguistic features of 'deep structures' that prevent either their consistent use in L2 or their acquisition. In this light, SSH — although providing a conclusive account for observed phenomena — does not give a satisfactory answer to the question about causes of the differences in performance between L1 and L2 speakers.

3.2.3 Cognitive principles and optionality

I have shown that a strictly linguistic approach, as represented by SSH, cannot (yet) fully account for the performance differences between L1 and L2 speakers. This, however, does not invalidate the findings cited by Clahsen & Felser (2006). All models of bilingual production that have been presented in Chapter 2 address the fact that structural processing is embedded into a larger cognitive framework: both de Bot's (1992) bilingual 'Blueprint' model (2.2.1) and Hartsuiker et al.'s (2004) Integrated model (2.2.4) are ultimately based on Levelt's (1989) model (see Figure 2.5), in which a (structure-oriented) Formulator component exchanges information with a Lexicon component, and Ullman's (2001) Declarative/Procedural Model (2.2.2) is entirely based on the idea of a separation of grammatical and lexical processing.

On these grounds, it appears appropriate to consider plausible features of non-natively acquired language systems and other cognitive systems in more detail, under the perspective of their status as cognitive networks. Readers will notice that the following discussion takes it initial cues from the discussion of SSH, above, and later observations may still pertain to it. However, in view of the dominant concern of SSH with comprehension, I will not follow these connections in more detail; the main interest of this thesis is bilinguals' language production. Finally, the Declarative/Procedural Model will not be taken into further consideration here — it is not geared towards the relatively fine-grained level of discussion that is interesting in this thesis.

I have pointed out that one possible cause for performance differences between L1 and L2 speakers may be the complete failure to acquire a feature of L2. Acquisitional processes do not belong to my main concerns here, but it is possible to assume that processing of corresponding intake will either have failed to create representations, or have done so using appropriate features from available sources (typically, L1). These two possibilities may lead, respectively, to production phenomena of total avoidance or full transfer, as discussed in 3.1.3.

More interesting and not explored in the discussion up to this point, however, is the possibility that non-native speakers may acquire an L2 feature, but use it inconsistently. In other words, selection of the target feature alternates with selection of other features (which may belong to L2 or have become available through transfer from L1). This suggests a competition for activation between target and other features. In this case, the varying outcomes of the competition must be understood as the result of the context-dependent co-activation of other features.

As indicated above, competition for activation is widely taken to be the mechanism of cognitive selection (see p.10). As I hope to have made clear, its principles provide a rather detailed account of (syntactic) *optionality*, the availability in a speaker's grammar of more than one construction for the expression of the same, semantically unchanged, set of concepts (Sorace, 2000, p.93). Remarkably, cross-linguistic influences of a specific type are rarely if ever observed in *all* learners of a language. Thus, Schachter noticed in her (1974) experiment that native speakers of Chinese and Japanese attempted to produce relative constructions *less frequently* than native speakers of Arabic and Persian (for whom a transfer of relative structures was possible), but more successfully so whenever they did. The construction was available to them as an option, but accessed only infrequently — as indicated above, *zero* attempts would have been observed if they had not acquired it at all. Having acquired the structure from scratch, it had not been possible for them to associate it — even if only initially — with structures from their L1s. Thus, Transfer from Somewhere was not a viable possibility for them, and the representation of relative constructions ended up as relatively weakly integrated into their language system of L2 English.

It is time now to integrate the discussion in this chapter with the discussion of language production in the previous one. In 3.1.2, I discussed how Færch & Kasper (1989) have described the selection of features of L1 or L2 for processing in terms of the same mechanism of cognitive selection that is a feature in models of language production (see p.10). I have also discussed the possible interactions of their categories of synchronic and diachronic cross-linguistic influences; in these terms, it is now possible to describe optionality as an instance of a diachronic influence. If no L1 features are co-activated and/or accessed during the processing of a L2 feature that is to be acquired (i.e. if no transfer is possible), then a new representation of this feature will be developed in the diachronic course of acquisition. Due to the lack of co-activation, however, this new representation is mostly accessed directly and not well-integrated into the system of L2 as a whole. At any synchronic instance of language production, it remains difficult to access, and thus difficult to process.

If, on the other side, co-activation of L1 features (i.e. transfer) *is* possible for a feature of L2, these will continue to be accessed together with the L2 feature. If this transfer is not dispreferred in the diachronic process of acquisition (i.e. if it has received occasional reinforcement and has not become too weak in comparison to competing links), then it will be available for access and processing at any synchronic instance of language production.

It would be possible at this point to further explore the implications of this competition account for cross-linguistic influences for acquisitional processes; however, this is not a core concern of this thesis. But if it is possible to account for acquisition in terms of cognitive networks, then the principles outlined above will help to account for the productions of learners at any level of proficiency.

3.3 Summary

The first part of this chapter has considered the performance of bilinguals from a more observational angle. The finding that the occurrence of code-switching is conditioned by a speaker's intentions guided my discussion towards acquisitional phenomena of cross-linguistic influence, where it is not necessary to control and account for speakers' intention. The early cognitive approach of Færch & Kasper (1989) has pointed out the problematic effects of acquisitional processes. I have also described the principle of Transfer to Somewhere, suggesting structural congruence as an important factor for cross-linguistic influences, and the related principle of Transfer to Nowhere, pointing out the dependence of this congruence on psychotypology (see p.53) and pragmatic concerns (which are both presumably based on L1).

In the second part of this chapter, I developed the possibility to study cross-linguistic influences on data from highly proficient non-native speakers. Corresponding research was found to lead to the Interface Hypothesis, holding it that the syntactic system of a non-native language may correspond with that of a native speaker only in terms of 'narrow', structural-only features. If, however, cognitive features of the L2 system are located at an interface with another subsystem of cognition, they cannot be fully aligned with the usage of L1 speakers (whether through restrictions of acquisition or of processing). Instead, resort is taken to cross-linguistic influences. A second model, the Shallow Structure Hypothesis, could not fully account for the causes of incomplete acquisition. Finally, a consideration of the linguistic system in terms of the cognitive models presented in the previous chapter has led to a tentative account for the observational phenomena reported in the first part.

Thus, it is feasible to account for acquisitional phenomena in terms of cognitive networks. How well a L2 feature is integrated into learners' cognitive systems appears to depend on their L1. Hence, the accessibility of L2 features can be expected to vary depending on speakers' native language: the degree of features' integration into the language system is not a simple function of L2 proficiency.

In the following chapter, I will turn to translation. Translation tasks, as a special case of bilingual production, can be expected to provide further instances of cross-linguistic influences.

Chapter 4

Translation: a special case of bilingual production

This chapter will discuss processes of translation as specific instances of language production that are carried out by bilingual speakers. My approach here is interdisciplinary, and I will attempt to convey these issues more from the angle of Translation and Interpreting research, with references to parallel discussions and effects that have been discussed in Chapters 2 and 3. In 4.1, I will discuss some features that are characteristic for processes of translation; 4.2 will consider some cognitive models of the translation process with respect to the general themes of this thesis.

The term 'translation' will be used in this thesis to refer to processes in which a message is transferred from one language into another, from a *source* into a *target*. There is a considerable number of forms in which such tasks may occur. In the context of this thesis, however, I will only be concerned with a distinction that is based on the form in which the result of a translation is produced: it is brought forward as spoken language in *Interpreting*, while it is produced in written form in (upper-case) *Translation*. Use of the (lower-case) term 'translation' as a cover term for both follows the practice of other researchers, such as Barik (1971), Paradis (1994), or Macizo & Bajo (2006).

The issues discussed in this chapter will predominantly be valid for translation in general. Because my theme is cross-linguistic influence in the spontaneous language production of bilinguals, I will give preference to Interpreting-related perspectives wherever applicable, and indicate this in the text.

4.1 Translation: Facts and Phenomena

This thesis is concerned with the processes underlying the language production of bilinguals, and considers translation as a special case of bilingual production — it can only be carried out by bilinguals, and it is not possible in the case of translation to compare bilingual and monolingual productions. In 4.1.1, I will discuss two strategies of translation that are widely assumed in the literature, and attempt to point out empirical findings that support this assumption. In 4.1.2, two fundamental cognitive approaches to translation are introduced; I will show that they cannot be clearly separated, and have considerable affinities with the strategies of translation discussed before. The question whether skills in translation and bilingual skills are connected (and if so, how), will be discussed in 4.1.3. This consideration will show that it is possible and legitimate to conduct research on elementary cognitive issues of translation on the basis of data from untrained speakers. This approach is confirmed in 4.1.4; certain problematic features of production are shown to occur in translations by both trained and untrained speakers. Another potential influence on the outcome of translations, unrelated to translation strategy and training, is the status of source and target languages as speakers' L1 or L2, an issue that is discussed in 4.1.5.

4.1.1 Strategies of translation: form-based or meaning-based?

I have defined translation widely as a process in which a message is transferred from one language to another. This definition, however, is not very precise in terms of the linguistic distinction of *signifiant* and *signifié*: the signified message, a concatenation of non-verbal concepts, is represented through a string of linguistic symbols of the source language as its signifier. What is it then that a translation should transfer into the target language: the form or its content?[1]

In any translation task, both approaches are available problem-solving strategies, a circumstance that has been more or less prominent in the awareness of translators since antiquity (see Schäffner, 2004, pp.107–108). Under various names,

[1]For an educated (modern, early 21st century) reader, this question may appear easily answered: with the exception of stylized literary texts (e.g. poetry), meaning should take primacy. However, 'the' meaning of a sentence is crucially multifaceted; while its semantic, syntactic, and pragmatic components may all be clear and understandable, it may not always be possible to transfer all these aspects of meaning into another language. Solutions involve either lengthy rephrasing, or the addition or deletion of aspects of meaning that are considered to be less crucial. Decisions about the latter will often have to be subjective because there is no time or occasion for consultation with the author/speaker of the source.

this dichotomy is present throughout modern literature on translation. To name but a few, the reader may refer to Nida's (1964) distinction between 'formal' and 'dynamic' equivalence; to Seleskovitch's (1976, pp.92–96) distinction of 'code-switching' and 'interpretation', of 'purely linguistic translation' and 'interpretation entirely based on meaning'; to Gile's (1995, p.40) 'transcoding' and 'high-level Translation'; to Lörscher's (2004, p.260) 'zeichenorientiertes Übersetzen' [symbolically oriented translation] and 'interkulturelle Kommunikation' [intercultural communication]; and to Christoffels et al.'s (2003, p.202) 'transcoding' and 'meaning-based interpreting'.

In this thesis, I will refer to this dichotomy under the terminology of Dam (2001, p.27), who distinguishes between these approaches as form-based and meaning-based strategies of translation:

- A *form-based* approach to translation can be described "as a more or less direct transmission of source text structures to corresponding structures in the target language", i.e. it retains formal characteristics of the source text as much as possible. This would suggest a translation of individual words with cognates (e.g. English *hammer* as Czech *hamr* rather than *kladivo*), a retention of surface word orders (e.g. English *I want a ticket, please* as German *Ich will eine Fahrkarte, bitte*), and a retention of constructions (e.g. English passive as Spanish passive) wherever available.
- *Meaning-based translation*, in turn, "produces the target text only on the basis of a conceptual [...] representation of the meaning of the source text", i.e. the resulting target production conveys the same content message as the source. (In the above examples, this would suggest choice of *kladivo* rather than the specialist term *hamr*, of a colloquial German request *Ich hätte gerne eine Fahrkarte* rather than one with contradictory politeness markers, of a Spanish clitic-left dislocation rather than the passive.)

Professional literature on Interpreting and Translation gives unanimous preference to a meaning-based strategy and tends to describe productions under a form-based approach as clumsy (Gile, 1995, p.76) or inadequate (Lörscher, 2004, p.259). While seen as the appropriate approach to the translation of lists and enumerations (Isham, 1994, p.206, Gile, 1995, p.40), form-based translation is traditionally perceived as evidence for some sort of processing difficulty on behalf of the translator (Seleskovitch, 1976, p.112, de Groot, 1997, p.31, Dam, 2001, p.28). The literature provides no other, more specific indication of the factors that may lead a translator to switch between these two strategies of translation; professional translators are commonly assumed to rely on meaning-based translation.

An experiment by Isham (1994) could provide empirical evidence for the existence of two strategies of translation that result in different states of cognition. Isham compared verbatim memory in untrained high-proficiency bilinguals who were merely listening to texts with trained translators who translated them (both groups had L1 French, L2 English; translations were carried out from L2 into L1). Crucially, texts varied across groups in the constructions that were heard immediately before the recall signal: identical sequences of words occurred in one condition in the same sentence, in the other condition in different sentences (examples from Isham, 1994, p.194):

(18a) The confidence of Kofach was not unfounded. *To stack the meeting for McDonald, the union had even brought in outsiders.*

(18b) Kofach had been persuaded by the officers *to stack the meeting for McDonald. The union had even brought in outsiders.*

Earlier research (Jarvella, 1971, cited from Isham, 1994, pp.193–194) had shown that verbatim recall for the most recent clause *the union had even brought in outsiders* was always better than for the previous clause. However, if the previous clause *to stack the meeting for McDonald* was contained in the same sentence (as in (18a)), i.e. in the last syntactic unit that was heard before recall, it was remembered better than when it was not. While the results for the listening group matched those of earlier experiments (Isham, 1994, p.197), it was found that interpreters behaved overall different. Subsequent analysis suggested that two different response patterns had been observed, without external indicators for their occurrence. While one response pattern differed from that of listeners only by degrees, the second was more clearly distinct from the results of other experiments of this kind (Isham, 1994, pp.200–202). On the basis of these findings, Isham (1994, pp.206ff) comes to the conclusion that the Interpreters in his experiment employed two different strategies of translation. Although his further conclusions leave considerable room for reservations (as do certain aspects of his data approach), his study is (to my knowledge) the first to suggest that correlates of form-based and meaning-based translation may be observable on empirically measurable features of translators' language production.

The issue of form-based vs meaning-based approaches to translation, more specifically to Interpreting, was addressed more directly in a study by Dam (2001), through the associated claim of their dependence on difficulty of the source. She elicited Simultaneous Interpretations (i.e. on-line translations) by trainee translators, for two texts that had previously been rated as posing substantially different challenges. The resulting productions were then rated for their similarity in terms of semantic and phrase structures, following a strict protocol. Dam (2001, pp.49–50) discovered high incidence of similarities (i.e. evidence of form-based translation) in translations of both texts, but more pronouncedly so for the easier one.

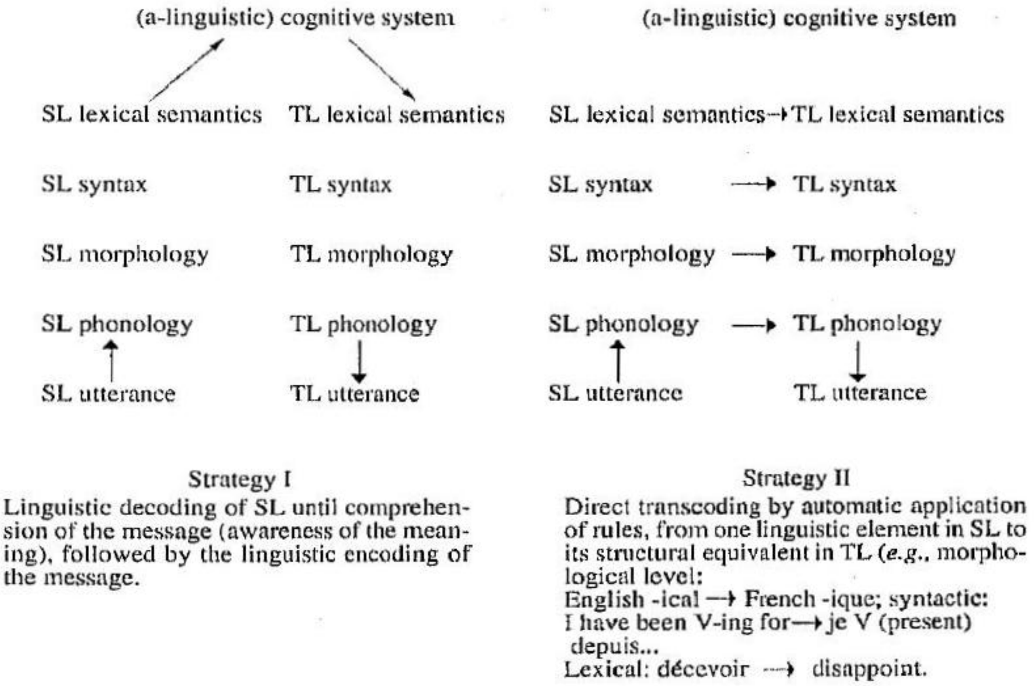
While this appears to contradict the assumption that meaning-based translation serves as a default, it is possible to object that Dam's (2001) data was elicited from translator *students*. It has long been observed (see Gile, 1994, p.44) that the performance of trainee informants may differ from that of experienced professionals. This allows the interpretation that Dam's (2001) translators may not yet have been fully habituated to the application of a meaning-based strategy under all circumstances, and did so only with a text that posed a challenge for comprehension.

Although neither of these two studies is entirely conclusive, they still suggest cognitive correlates to the two strategies of translation, and also that their products might turn out to be empirically distinct. In the light of the discussions in Chapters 2 and 3, the principles of a form-based translation strategy show a strong affinity to cross-linguistic influences. This issue will be discussed more detail in 4.1.4.

4.1.2 *Models of translation: horizontal or vertical?*

The differences between the meaning-based and form-based approaches to translation are illustrated in Figure 4.1. A meaning-based strategy, shown on the left, will first process a source text entirely through source language comprehension, and then express the retrieved message through target language production, never accessing the language system that is not required at the current stage. Under the form-based strategy shown on the right, in turn, there is a constant exchange of information from the comprehending source language system to the producing target language system.

Figure 4.1: *Schematic presentation of meaning-based and form-based strategies of translation*



Note: Figure 4 in Paradis (1994, p.329). The "(a-linguistic) cognitive system" corresponds to the conceptualizer in Levelt's (1989) model of language (see Figure 2.5), or the message level in Bock & Levelt (1994) (see Figure 2.7).

Following the assumption that the meaning-based approach to translation constitutes the default strategy, Seleskovitch (1976, p.96) discussed the process of translation as "understanding followed by a rendering of ideas" and described its stages under this premiss. Under optimal conditions, she posits, the process of translation will proceed in strictly linear fashion from the source text, through a deverbalized conceptual stage, to the target text; no cross-connections between language systems are employed. Importantly, this *vertical model of translation* (de Groot, 1997, p.31) does not imply mechanic transcoding, but involves an evaluation of the comprehended source message on the basis of contextual and pragmatic knowledge before a target utterance is produced (Seleskovitch, 1976, pp.106–109). This model of translation has the advantage of simplicity: it does not require processes that are specifically dedicated to the translation task. SL comprehension and TL production are simply placed back to back; other language-relevant processes are not involved.

However, not even Seleskovitch (1976, p.94) is a fervent advocate of a vertical model, but admits that the two strategies will in practice frequently be encountered in 'a mixture', although no attempt is made to discuss this amalgamation in detail. Form-based 'linguistic' strategies are described as inferior and seen as strongly associated with, and stronger in, processes of (written) Translation (Seleskovitch, 1976, p.95).

If translation is carried out in a way that corresponds predominantly with a vertical model of translation, i.e. involving only language skills, this leads to two predictions about translator training. The professional education of translators should lead to an improvement of at least one of the relevant linguistic subskills: professional translators, then, should outperform untrained bilinguals in terms of comprehension or production (or both) in L1 or L2 (or both). If, in turn, no clear evidence is found for any of these improvements, a vertical model must lead to the assumption that professional training does not actually have an influence on the cognitive processes that condition translation performance.[2] In this case, the performance of a bilingual with appropriate background knowledge should not be distinguishable from that of a translator.

I will presently show in 4.1.3 that experimental and observational data warrant neither of these predictions, which suggests that the approach through a predominantly vertical model is not appropriate. Before I turn to this evidence, it should be pointed out in conclusion for the discussion at hand that researchers of translation processes in more recent years have leaned towards a *horizontal model of translation* (de Groot, 1997, pp.30–31; Padilla et al., 1999, pp.65–66; de Groot & Christoffels, 2006). It should be pointed out that even a horizontal model will by necessity contain certain vertical aspects — 'higher' levels would not be able to interact without activation from 'lower' levels along the vertical axis. While a vertical model places source language comprehension and target language production essentially back to back and leaves little space between them, a horizontal model is more accepting of an involvement of other fields of cognition e.g. as a means of coordinating the processes that take place on the several horizontal layers.

Taking the differences between a horizontal and a vertical model of translation as their theoretical starting point, Macizo & Bajo (2006) predicted that horizontal processes should allow early processing of source text input even before comprehension is completed — an effect that would be excluded in a vertical model.

[2] Of course, this should not be understood as saying that translator training would be entirely useless in this case; after all, the daily work of a translator requires a plethora of subservient professional skills.

To test this prediction, they had bilinguals and professional translators read and comprehend sentences in L2 in a self-paced reading paradigm. One block of the experiment required participants to repeat what they had read, while the other required them to translate it. Comprehension was measured as the reading time for critical words (cognates or non-cognates in one experiment, ambiguous or unambiguous words in the other). Their results found clear differences between reading-for-translation and reading-to-repeat in both participant groups, suggesting that comprehension processes were executed differently depending on task. In the translation task only, critical items displayed the predicted effect (faster for cognates, slower for ambiguous words) in both groups, providing evidence that horizontal processes occur during translation before full comprehension is achieved (Macizo & Bajo, 2006, pp.25–26).

At this point, I conclude that the shortcomings of the vertical model of translation appear to withdraw support from earlier assumptions of the dominance or defaultness of the underlying meaning-based strategy of translation. While a strictly horizontal model is not warranted, either, the underlying form-based strategy (see Macizo & Bajo, 2006, p.26) seems to be prevalent.

4.1.3 Connections between skills in language and translation?

The experiment of Macizo & Bajo (2006) compared the L2 comprehension of bilinguals and professional translators, finding support for a horizontal model of translation. As pointed out before, however, it remains to be seen whether the predictions for a vertical model of translation are confirmed by empirical evidence: the vertical approach leads to the expectation that it is either the case that trained translators perform above-average on the entirety or at least in a significant subset of their language skills, or that *any* bilingual is in principle capable of acceptable performance as a translator, and without specialist training.

In the following, I will present a number of studies that have considered the possibility that translation practice might in some way be yoked to language proficiency. If this should be the case, then a direct qualitative comparison between the linguistic abilities of translators and those of untrained speakers is presumably not warranted: in this case, professional translation practice would be equivalent to L2 practice and would lead them very quickly to elevate their proficiency levels far beyond those of otherwise comparable untrained bilinguals.

Recent research by Proverbio, Adorni, & Zani (2007) compared the language access of natively bilingual high-proficiency speakers without translator training, natively monolingual high-proficiency L2 speakers with translator training (conference interpreters), and monolinguals (of the translators' L1). For this purpose, they employed a semantic judgement task (excluding in this way any direct involvement of translation skills) and measured reaction times for judgements. The authors found that the reactions of the translators (who had not acquired L2 from early childhood) were more akin to those of monolinguals than to those of bilinguals — thus, the main differentiating factor between participant groups was not proficiency or translator training, but age of acquisition. No effect was observed that could have been attributed unambiguously to highly developed translation skills (Proverbio et al., 2007, pp.39–40).

The differences between translators and native bilinguals in Proverbio et al.'s (2007) study argue, together with the similarities between translators and monolinguals, against the assumption that proficiency as a translator would entail significant changes in general linguistic cognition, and in particular not in L1 comprehension. However, their results are not entirely conclusive, because the main comparison of their study was between trained translators and natively bilingual speakers, i.e. two special groups of L2 speakers. It appears not advisable to draw conclusion from these about L2 in general. Hence, I consider it the most reliable finding of Proverbio et al. that L1 comprehension in translators and monolinguals is comparable.

An experiment by Dillinger (1994) compared text comprehension in professional translators (habitually and by training translating L2→L1, see 4.1.5) and untrained speakers. Both groups qualified as highly proficient bilinguals who used both languages actively on a day-to-day basis. The experiment required them to produce spoken translations of prerecorded L2 sources. Comprehension was operationalized through the correlation of representational categories (on the level of semantics and thematic functions) between source and target. This allowed comparisons of various textual or syntactic conditions such as proposition type, embedding, proposition density, or text type. The overall performance of professional translators was found to be considerably more accurate than that of untrained participants. Apart from this, comprehension patterns in the two groups were found to be essentially identical, with only marginal indication that translators might be more selective in their processing of surface information

(Dillinger, 1994, pp.165–169). This finding indicates that translation training had not revolutionized translators' L2 comprehension.

A study of Malakoff & Hakuta (1991) compared translations by bilingual children, one group coming from a 'densely bilingual' background that required them frequently to step in as language mediators, the other recruited at random from participants of a bilingual education program. All participants were of comparable age and education level. Both groups were put to story translation tasks in both language directions, and the resulting translations were coded for error types. However, no consistent error patterns emerged, and Malakoff & Hakuta (1991, p.161) concluded that the performance of the two groups was similar even though the groups were clearly different in terms of bilingual practice. It follows that the increased practice in bilingual production does not correlate with the overall ability to translate.

A study by Christoffels et al. (2003) targeted cognitive processes in Interpreting. From a larger set of subskills that might be relevant for performance in an Interpreting task, they focussed on memory and language skills. Their participants were speakers of L1 Dutch and L2 English without any translator training, and carried out various tasks to gauge their proficiency in both languages (picture naming, word translation), their working memory (reading span) and short term memory (digit span), and their interpreting performance (L2→L1). To operationalize interpreting performance, interpreting productions were rated twice on different aspects by independently raters. Christoffels et al.'s (2003) analysis found that only the performance on word translation and reading span tasks correlated with Interpreting performance directly — i.e., lexical retrieval and working memory. Notice that this study was carried out with untrained speakers only.

Christoffels et al.'s (2003) experimental evidence indicates lexical retrieval as an influential factor in translations by untrained speakers. Dillinger (1994) and Proverbio et al. (2007) had not found differences in L1 or L2 comprehension between trained translators and appropriate untrained comparison groups. However, Christoffels et al. (2003) had deliberately tested lexical retrieval in a bilingual task (word translation) *and* in a monolingual task (picture description). At the same time, increased bilingual immersion was not found to have an impact on speakers' translation abilities (Malakoff & Hakuta, 1991). Thus, there is no indication for a direct improvement of translation skills through bilingual practice (as it would be expected under a vertical model of translation), but there is no striking evidence for above-average language skills in translators, either. The observation of differences between monolingual and bilingual performance, however, is hard to account for under the vertical perspective.

Under the wide-spread assumption that translation is a specialist skill that can only be acquired in professional courses (see Malakoff & Hakuta, 1991, p.144), it may be surprising to see that all authors cited above were able to find so many untrained participants who were nevertheless capable of carrying out a translation task. It has been suggested that the wide availability of bilinguals with at least rudimentary translations skills finds an explanation in the wide use that language classrooms have made of Translation (most commonly into L2) since antiquity, albeit with different degrees of intensity and different pedagogical purposes (for discussions, see Schjoldager, 2004; Popovic, 2001; Bonyadi, 2003). An alternative explanation was proposed by Harris's (1977, p.100) suggestion that translation skills are not actually 'acquired', but rather occur as a natural skill that is available and accessible for *all* bilinguals.

To corroborate this claim, Harris & Sherwood (1978) carried out a partial metastudy of accounts of children who grew up in bi- and multilingual settings. Their particular focus was on reported instances of spontaneous translation. Findings indicate that early translation skills develop in parallel with children's general linguistic and cognitive development. An early stage is found in translations of own utterances for different interlocutors (i.e. repeating oneself in a different language), which is reported from ages as early as 1;9 (Harris & Sherwood, 1978, p.166). Evidence for translation in a narrower sense, as a mediation between two interlocutors who are known to use different languages, is encountered from age 2;6 (Harris & Sherwood, 1978, p.164). There is no evidence of significant differences or characteristic problems that would distinguish the linguistic and general cognitive development of these early translators from that of other natively bilingual children. Hence, Harris & Sherwood (1978, p.168) conclude that the elementary ability to translate is essentially 'innate', or at least a predisposition of the human language faculty that is brought to light as a by-product of bilingualism.[3]

Harris & Sherwood's (1978) report gives no indication of the translation strategies that may have been evident in these early translators.

[3] Harris' use of the term 'innate' is in line with linguistic *zeitgeist* of his time, yet the notion of an inborn ability to translate is very problematic. In the following, this thesis conceives of translation skill as a concomitant or side effect of bilingualism.

Natural Translation

The availability of translation as a natural skill does not challenge the importance of translator training. In the words of Harris (1977, p.100), "we do not teach students to translate — not basically ... we do try to teach them to translate better." To allow better differentiation from professional translation by specifically trained speakers, Harris introduced the term *Natural Translation* (NT) for translation by untrained bilinguals.

Interest in NT productions dates back even before Harris' coining of the term. With the intention to develop essential categories of translation errors, Barik (1969) compared spoken translations by trained and untrained translators. In recent years, this approach has been criticised for its implicitly prescriptive approach towards translation performance; early criticism, however, targeted the inclusion of untrained speakers as informants. The possible contributions of NT to research on Translation and Interpreting were likened to those of "people's singing under the shower to musicology" (reported in Harris, 1977, p.109, note 2). The harsh rejection of NT is indicative of the strictly applied and pedagogical interests of Translation and Interpreting research. In the light of growing demand for research on the basis of translations by untrained speakers in recent years (see de Groot, 1997, p.28; Padilla et al., 1999, p.66; Bajo et al., 2001, p.31; Valdés & Angelelli, 2003, p.70; Lörscher, 2005), it appears appropriate to reconsider NT and clarify its relation to professional translation.[4]

4.1.4 Source Language Interference

Barik has already been introduced as an early researcher on differences and similarities between professional translation and NT. His experiment involved

[4]In the light of the very strong opinions that have been expressed with respect to the concept of Natural Translation (see Valdés & Angelelli, 2003, pp.69–70), my position needs clarification. In this thesis, I follow Harris & Sherwood (1978) in assuming a predisposition for translation within human language, the performance of which is referred to as 'Natural Translation'. At the same time, I also agree with the view (expressed e.g. by Gile, 1994, pp.44–45) that performance on the basis of this skill is not to be equated with performance on the basis of professionally developed translation skills, and the two should only be compared with great caution. In this sense, the label of NT provides a useful distinction between the two types of performance. I consider it possible that NT is one of several starting points for the development of professional translation skills, although any confident claim to that effect (not to mention even a rough outline of the processes that transform one into the other) must be considered far beyond the limitations of this thesis. Hence, its contribution to the study of Translation and Interpreting can be only very small. The main purpose of my work here is a contribution to the psycholinguistic study of bilinguals' language production.

speeches in French and English, that were interpreted (translated into speech) by native speakers of French and English with high proficiency in the other language, and with undeveloped or trained translator skills. Quite apart from the categories of 'errors' that he set out to develop, Barik (1971, p.135) observes that

> [translations] by amateur T[ranslator]s are typically very literal, being in many instances almost word-for-word "verbal transpositions" rather than translation, whereas those by professional T[ranslator]s are substantially more in agreement with the idiom of the target language.

Barik's choice of words suggests that the translations in question can be rated as "form-based", in the terminology of this thesis. Moreover (Barik, 1971, p.136),

> less-qualified T[ranslator]s are characterized by generally better performance when translating from their dominant into their weaker language, showing on average fewer disruptions [...] in that direction than when translating from their weaker into their dominant language. (Their translations, however, are to some extent even more literal when translating from dominant into weaker language.)

In summary, Barik claims that the NT of untrained translators follows the structure of the source text more closely than the productions of professional translators, and even more so when translating L1→L2. At the same time, the evidence of disruptions appears to suggest lower overall task difficulty when translating L1→L2 (i.e. "against the grain" of translation directionality (see 4.1.5, below).

Unfortunately, this finding was not directly related to the main purpose of Barik's study, and he provides no direct evidence for the observation. However, the characterization of NT productions as "very literal ... almost word-for-word 'verbal transpositions' rather than translation" suggests strong reliance on form-based translation.

A corresponding observation comes from a recent study by Lörscher (2005), who collected thinking-aloud protocols during (written) Translation as a method to gain insight into associated mental processes. His participants were natively monolingual bilinguals with and without translator training with L1 German and L2 English. Translations were carried out in both language directions. The results indicate that untrained speakers follow a predominantly form-based approach to translation, whereas data from trained translators indicates preference for a meaning-based approach. More specifically, thinking-aloud protocols show that untrained speakers focussed on smaller units of the source text, allowing them to discover translation problems before they started to work on them, but restricting the range of problems that could be noticed. (This was further augmented by a tendency to check only problematic segments after completion of the translation.) Trained translators, in turn, tended to focus on larger units of the source and showed more concern for problems with formulation in the target language.

While Barik's (1971) observations are not more than a suggestive suspicion, the findings of Lörscher (2005) indicate strongly that a form-based approach to translation is particularly characteristic of the productions of untrained speakers, and hence of NT. While the ability to switch between form-based and meaning-based strategies for translation appears to be supported or enhanced by professional training, as suggested already by Seleskovitch (1976, p.112), the findings make a case to see untrained speakers connected with (certain kinds of) form-based translation performance.

The occurrence of form-based translation in professionals' productions has of course drawn some interest by researchers in Translation and Interpreting, where it is studied as a type of *source language interference*. It has already been mentioned that, according to Seleskovitch (1976, p.95), instances of form-based translation should be frequent in (written) Translation; this view has received partial confirmation in recent studies of Translation corpora by Mauranen (2004, 2006). Comparing written translations into Finnish from various source languages, the language use in translated texts (i.e. the lexical items that are employed) is found to be different from 'normal' uses of the target language. At the same time, the language that is used in translated texts in general shows certain common characteristics that occur in different distributions depending on a text's source language (Mauranen, 2004, pp.77–78). Other researchers found that features that are unique to the target language are underrepresented in translations, and that those that have a direct counterpart in the source language are overrepresented (Mauranen, 2006, pp.96–97). It follows that translated texts differ from other texts of their target language in both lexical and syntactic choices, but can be grouped together on the basis of their source languages.

At this point, I remind of the earlier observation that the principles of form-based translation bear a strong resemblance to cross-linguistic influence. The findings reported above appear to bear out this comparison: a form-based translation strategy appropriates structures from the source language into the target language (compare with transfer as an instance of cross-linguistic influence, 3.1.3); underrepresentation occurs for language features that have no direct equivalent in the source language (compare with avoidance as an instance of cross-linguistic influence, 3.1.3); and translated texts (L1 productions from highly proficient bilinguals) display similar group behaviour as the L2 productions of highly proficient bilinguals (see 3.2). The overlap in the characteristics of these phenomena of bilingual production suggests that form-based translation and cross-linguistic influences may be conditioned by a common cognitive source.

4.1.5 Directionality of translation

Although all professional translators are high-proficiency bilinguals, it is hardly if ever claimed that they should be capable to translate equally well between all (or only the most proficient ones) of their languages. As evident from publications of professional organisations (AIIC, 2004; ITI, 2006; ATA, 2002; NAATI, 2003), it is widely considered practical and appropriate to distinguish between two language groups, here termed 'active' and 'passive' languages:

- *Passive languages* are languages that in which the translator has achieved a proficiency level that allows her or him to comprehend all texts that are presented in them. In other words, they are the *source languages* that are available to the translator, i.e. the languages that she or he can translate from.
- *Active languages* are languages in which the translator has achieved a level of proficiency that corresponds with full, native-like fluency in all contexts. They are the *target languages* that are available to the translator, i.e. the languages into which she or he can translate without detrimental effects to fidelity or linguistic quality of the product.

Most professional translators can only claim one active language — their L1; all other languages are inherently passive languages, provided sufficient proficiency. With the exception of natively bilingual professionals, translators can achieve active status for a non-native language only very rarely. Even if they do, cautionary custom suggests (see AIIC, 2004) that the language should only be employed as a target language for content-oriented technical purposes, and not in stylistically demanding rhetoric situations.

The requirement to work into a language that is known at a 'native-like' level is not so much an obligation but rather a desideratum. Not infrequently, it is in opposition to practical constraints and may appear as a theoretical restriction of individuals' possibilities, and on-going debates in the Translation and Interpreting research community have questioned whether it is in fact justified or applicable (see Schäffner, 2004, pp.112–113). Is directionality a self-imposed restriction, is it an artifact of training, or does it have some 'real' cognitive background?

It is not the purpose of the discussion here to follow these questions in more detail to arrive at a preliminary conclusion about directionality. Nonetheless, several recent findings have been mentioned that may relate to this issue, in particular the asymmetric occurrence of the 'translation-equivalent boost' of priming between L2 and L1 (see 2.2.3), the rarity or impossibility of native-like L2 acquisition (see 3.2), and the persistent conditioning of translators' linguistic performance by L1 (see 4.1.3). It remains to conclude that issues of directionality are involved in current research in several fields. Although there are (to my knowledge) no empirical findings in this respect yet, they are certainly in the range of the immediately possible.

4.2 Translation: Cognitive aspects

The psycholinguistic conditions of output production and cognitive models of the translation process are not among the foremost concerns of Translation and Interpreting theory. The cognitive applicability of Seleskovitch's (1976) model, discussed in 4.1.2, is an exception. More frequently, models of translation take discourse or semiotic perspectives and attempt to describe the differences of meaning constitution within vs across languages, and to specify the role of the translator in this procedure (see models and discussion in Lörscher, 2004, pp.261–267). A more psychologically informed approach has become evident in models of the translation process that attempt to account for real-time problem solving strategies. Even though their empirical foundations are weak, they have provided valuable impulses for research (see Valdés & Angelelli, 2003, p.60); they are, however, not directly concerned with issues of language production, and will not be of further concern in this thesis.

However, a small number of pedagogically oriented models has attempted to describe aspects of the cognitive environment of language production during translation. This section will introduce two of them, and discuss them with particular respect to the psycholinguistic models of production that have been presented in Chapter 2. Both models were formulated for general teaching purposes; neither has generated 'hard' predictions that would have allowed experimental testing. For this reason, each model will be complemented with a short discussion of other research that touches upon the same issues. Eventually, I will briefly discuss the relevance of these models with respect to models of bilinguals syntactic representation.

4.2.1 *Access/Availability*

In everyday life, the ability to "know the word for X in language Y, without a dictionary" is often seen as a characteristic of high-proficiency bilinguals, and of translators in particular. Although this view is slightly mistaken (translators will frequently ask back for clarification of the context, instead of "just saying the word" — see also Seleskovitch, 1976, p.101; Lörscher, 2004, p.259), the ability to retrieve rapidly and reliably entries from a target lexicon that correspond in some way with a given source is undoubtedly relevant for the process of translation. (See also the models of lexical retrieval by Stemberger, Figure 2.1, and Levelt, Figure 2.6.)

The Gravitational Model

To illustrate features of lexical access and proficiency during translation, Gile (1995, pp.216ff) introduced the *Gravitational Model of linguistic availability*, in its essence a pedagogically streamlined frequency account of lexical retrieval. Noteworthy features involve:

- Units of the model include lexical items, pragmatic units (set phrases), and "linguistic rules" (Gile, 1995, p.217) — which can presumably be identified with the syntactic frames of Bock & Levelt (see p.18) or the combinatorial information of Pickering & Branigan and Hartsuiker et al.
- All units of the model are stored together (see Gile, 1995, p.222), i.e. a shared lexicon is assumed, similar to de Bot (see p.36).
- Accessibility is represented through a spatial metaphor; basic accessibility is determined by frequency but may change through repeated use or non-use.
- Changes of accessibility affect the accessibility of all its — conceptually, semantically or formally — connected units in the same direction ('Escort

Effect'). This corresponds with the activation spread that is a common feature of all activation-based models presented in 2.1. This effect is held directly responsible for phenomena of source-language interference (see Gile, 1995, p.222).

From a general angle of models of language production, the Gravitational Model contains no surprising features. The reason why I include it in the discussion here is the account of source-language interference/cross-linguistic influence that is provided by the Escort Effect. Its account is of a more indirect nature, whereas the priming-based models that were presented in 2.2 involve previous direct activation as a main factor.

The initial event for cross-linguistic influence under the account of the Escort Effect is a change in the accessibility of an individual unit through repeated selection, e.g. of the English word *control*. This unit is connected to others, e.g. English *controller*, *command*, *dominate*, German *Kontrolle*, *kontrollieren*, or French *contrôleur* (which may or may not be connected among each other). The accessibility of this cohort changes together with that of the initial unit, and thus their likelihood for later selection. Gile (1995) provides no exact account of this process, but it may already be sufficient to assume that connections between units are not affected by a change of one unit's overall accessibility.

To my knowledge, there have been no attempts to draw empirical predictions from the Gravitational Model. Presumably, this is due not only to its strictly pedagogical orientation, but also because it does not account for a considerable number of other issues in translation research, such as the selection of only one language for production, the directionality of translation, or the differentiation between form-based and meaning-based translation.

Word translation: proficiency

I have mentioned that Christoffels et al. (2003) used a word translation task to gauge the lexical access skills of their participants. This approach is based on a number of earlier studies by de Groot and her colleagues (see, for example, de Groot, 1992; de Groot et al., 1994; de Groot & Poot, 1997; also metastudy in Tokowicz et al., 2002). In the following, I will exemplarily discuss de Groot & Poot (1997) findings on word translations in both directions between L1 and L2.

In their experiment, de Groot & Poot (1997) elicited word translations in both directions between L1 Dutch and L2 English from natively monolingual speakers without any translator training, at three different levels of L2 proficiency (after 2.5, 4.5, and 6 years of acquisition). Analyses of translation errors, omissions, and response latencies revealed a number of facilitatory effects:

- Translations L2→L1 were significantly faster and more reliable than translations L1→L2, with the exception of the highest proficiency level (de Groot & Poot, 1997, pp.248ff). This finding corresponds with earlier research (de Groot et al., 1994; La Heij et al., 1996). In addition, shorter response latencies and higher reliability were encountered in higher proficiency groups.
- Less abstract (and thus conceptually more accessible) stimuli led to shorter response latencies, i.e. their production was facilitated. This effect is equally present on all levels of proficiency.
- Cognate target items were produced significantly faster and with less omissions than non-cognates.
- In translation L1→L2 only, less abstract stimuli with high word frequency led to shorter response latencies. This facilitation suggests better connection to conceptual memory for these items.
- When low-proficiency speakers produced non-cognate translations for less abstract stimuli, response latencies were significantly shorter. This suggests that, for this group only, conceptual accessibility had a facilitatory effect if the word form provided no cue.

In terms of manner of performance, de Groot & Poot (1997, p.247) observe that translation L1→L2 elicited less errors, but more omissions; the pattern had already been noticed in earlier studies (de Groot et al., 1994; compare also Barik, 1971).

To summarize, de Groot & Poot (1997, pp.248ff) conclude that concept activation is relatively easy with L1 stimuli, as shown by the directionality of the abstractness effect after high-frequency source items. Moreover, they conclude that retrieval of L1 word forms as targets is relatively easy after L2 stimuli, as evident from the absence of an interaction between abstractness and cognate status at higher proficiency levels.

4.2.2 Translation as a complex process

A second consideration in this review of cognitive aspects of translation is the composite nature of the task. I have described how a vertical model of translation, as an attempt to explain the process exclusively in terms of the involved language systems, falls short of the observed phenomena. The more cognitive processes are involved, however, the more interaction between them can be expected.

The introduction of this chapter has pointed out that the term "translation" is used here as a cover term for several similar tasks, all sharing the feature that linguistic messages are transferred from one language system into another. It follows that processes that are specific for translation must be present in all of these, but embedded in different constellations of other processes in each.

Given the interest of this thesis in cognitive aspects of translation, I focus in particular on Interpreting tasks, and here again particularly on simultaneous Interpreting — a task where only very few non-translation processes are involved, and the number of possible interactions between processes is greatly reduced; only an additional time factor is introduced and must be taken into account. In the following, I will first present a theoretical model that considers translation as a complex task and allows for time pressure as a factor, in particular in Interpreting. To complete the picture, I present some recent research that continues in the lines of de Groot & Poot (1997) (where time was already involved as a measure of lexical retrieval) with a comparison between interpreters with two groups of untrained high-proficiency bilinguals.

The Efforts Model

The *Efforts Model* of translation (description in the following based on Gile, 1997) comprises a set of models that are geared to specific types of translation tasks, and intends to shed some light onto general dependencies between the sub-tasks that are involved in translation. In the following, I will give an outline of the essential principles that are expressed in all variations of the Efforts Model. Its primary intention is to provide an account for breakdowns in the process of translation, i.e. for instances where translators are not able to convey all the essential concepts of the source message, or even change them. In addition, it must be pointed out that the Efforts Model is predominantly a theoretical construct; there is little empirical data to support or refute it at the current point.

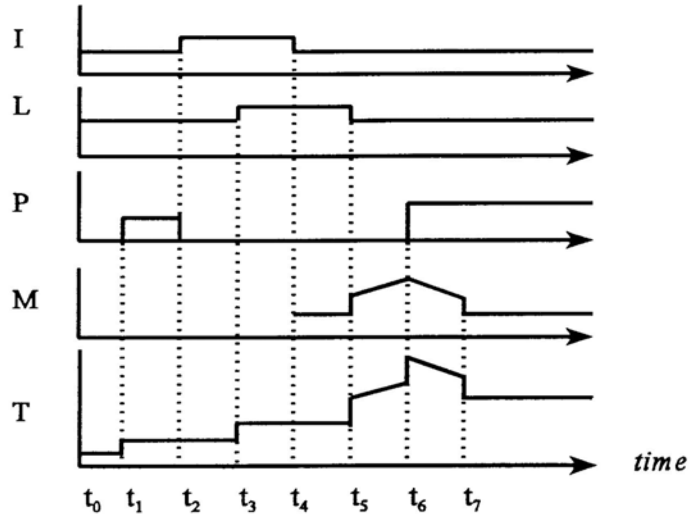
The Efforts Model attempts to express the changes in cognitive load that are experienced by a translator in the course of the task. For this purpose, translation tasks are treated as divided-attention tasks where it may be necessary (to varying degrees) to carry out a set of cognitive tasks simultaneously. In broad terms, three types of sub-tasks are distinguished (Gile, 1995, pp.161–169; Gile, 1997, p.198): *a*) a *comprehension* task; *b*) a *memory* task, concerned with storage and retrieval of information for strategic or linguistic reasons (e.g. because the structure of the target utterance does not yet allow prodction); and *c*) a *production* task. A fourth process is concerned with *control* and coordination of the available cognitive resources so that the activation requirements (i.e. 'efforts', see 2.1.4, p.32) of these sub-tasks are met, allocating an appropriate part of the available total capacity to each. In other words, cognitive resources are thought to be governed by a central administrative process, even if it remains unclear how they are replenished. (Depending on the specific type of the translation task — Translation or one of the many types of Interpretation — these three elementary tasks may be supplemented by ancillary tasks, e.g. note-taking, or see further subdivisisons, e.g. of the comprehension task into (syntactic) parsing and (semantic) comprehension proper.)

This representation of the translation process is very schematic and leaves aside all considerations of vertical or horizontal processes. Notice, however, that these sub-tasks are understood as general features of all translations, whether carried out by professionals or untrained bilinguals. It is hence possible (at least in theory) to indicate the specific cognitive load from each task at any moment of a translation event, based on features of source, target, and their relation to each other. Figure 4.2 illustrates this for the Interpretation of sentence *(19)*:

(19) (t_0) Ladies and gentlemen (t_1) , (t_2) the International Association of Frozen Food Manufacturers (t_3) is happy to welcome (t_4) so many of you (t_5) in Paris (t_6) for this meeting (t_7)

Sentence *(19)* contains one informationally dense segment between t_2 and t_3 that is not familiar for the interpreter, while a second segment between t_3 and t_4 introduces a non-finite dependent clause. Figure 4.2 shows schematically how intake of the source continues (graph I, at t_3) while the comprehension of the semantically challenging segments requires additional effort (graph L). At t_4, the comprehended segment is committed to memory (graph M), while comprehension now turns to the structurally challenging segment. Continuing in this way,

Figure 4.2: *Effort requirements in the course of a translation*



Note: Schematic illustration of the effort requirements while interpreting sentence *(19)* (my elaboration of an example from Gile, 1997, p.201). The first four graphs shown above represent changes in the activation that is required to maintain processes (i.e. the effort, see 2.1.4) at times t_1–t_7 for parsing (**I**), comprehension (**L**), production (**P**), and memory (**M**). The fifth graph (**T**) indicates the sum of these requirements that must be handled by the coordinating control instance. Notice that parsing (**I**) is tacitly assumed as a sub-task of Interpreting and not discussed by Gile (1997), yet contained in his example that is cited here. Thus, the increase in effort requirements that is indicated in **I** at time t_2–t_4 signifies the occurrence of syntactically complex source input (see 19). In **L**, comprehension of the syntactically complex input is indicated at time t_3–t_5. **P** indicates that the interpreter is speaking at time t_1–t_2, and then again after t_6. (No parsing or comprehension effort is shown for the corresponding source segment at t_0–t_1 because it contains a predictable set phrase.) **M** indicates that comprehended intake is committed to memory beginning from t_4. The rising gradient at t_5–$t6$ is a function of the increased storage content, while the fall at t_6–$t7$ supposedly reflects the drop as committed units are released for production.

maximum processing load (i.e. a potential point for a breakdown) is achieved as the Interpreter begins to speak, at a segment that is not challenging in itself (discussion based on Gile, 1997, pp.200–201).

In this way, the Efforts model provides a tentative account for the observation that breakdowns in translation do not necessarily occur over presumably problematic segments of the source, but rather when all available resources are assigned but one of the sub-tasks would require still more. A second possible reason for a breakdown results from the central administration and distribution of available resources: although sufficient capacities are available, the capacities that have been allotted to any one of the sub-tasks may not be enough for the requirements at a given moment in time (Gile, 1997, p.206).

The two possibilities of breakdown in translation that have been outlined from the Efforts model provides two lessons for my explicit interest in language production. Firstly, it will be advisable in all research on translation to remain aware of the multiple sources of cognitive load. This is particularly true when a time factor is involved that caps the availability of activation over time. Secondly, the awareness of cognitive load should extend not only to its total amount, but also to the sub-tasks which may break down individually even if overall capacities appear available. More specific predictions or conclusions are difficult to draw, however, due to the lack of empirical work on the Efforts Model.

Word translation: Interpreters vs bilinguals

Particularly remarkable in the Efforts Model is the connection of activation and time. I have discussed how it accounts for breakdowns of the Interpreting process as results of the impossibility to carry out all required processing tasks in time: specifically in comprehension and production, this means that the activation of available items is not sufficient to select one that suits the requirements. This is remarkably similar to the principles of inconsistent processing that have been developed in 3.2.3. There, activation did not result in selection because of network features (insufficient integration of newly acquired items); here, activation does not result in selection because of its limited availability. There is, however, an important difference between these two instances of non-selection: in the first case, where an item is only weakly integrated, competitors with better connections will be selected instead; i.e. the output of the process will be different. In the second case, where the availabilty of activation itself is the problem, it will take longer for *any* item to accrue enough activation to be selected; i.e. the process itself is slowed down.

As pointed out by de Groot & Christoffels (2006, p.199), there are clear parallels between Gile's (1995; 1997) effort control instance in Translation and Interpreting research and attentional systems formulated in other fields of cognitive research (e.g. Gopher et al., 1989). The importance of a memory component in Interpreting is corroborated in work by Christoffels and her colleagues.

Christoffels, de Groot, & Kroll (2006) tested three different groups of natively monolingual speakers of L1 Dutch, L2 English, namely university students, English teachers, and professional interpreters. Experimental tasks involved tests of lexical retrieval (picture description, word translation) and of working memory (reading span, speaking span, word span). Their results showed that both groups of maximum proficiency participants, interpreters and language teachers, were faster than students on lexical retrieval tasks (with the exception of L1 picture naming). However, trained interpreters provided significantly better results on (working) memory tests than participants without interpreter background (Christoffels et al., 2006, p.339).

These results show that high performance on lexical retrieval is not unique to interpreters but a concomitant of proficiency. (It should be noted, however, that an earlier study by Christoffels et al., 2003, found that lexical retrieval could serve as a predictor for NT interpreting performance.) However, improved memory capacities appear as a characteristic feature of Interpreters, i.e. speakers who are trained for on-line translation and regularly exercise this skill. The implications of these improved capacities will not concern be of further concern in this thesis (see Christoffels, de Groot, & Kroll, 2006, for recent research on this issue).

4.3 Summary

This chapter has introduced a distinction between two strategies for translation tasks and shown how they informed theory development in the field of Translation and Interpreting research. I have shown some empirical studies that suggest cognitive correlates for them (Isham, 1994; Dam, 2001). Moreover, production resulting from what is presumably a form-based strategy of translation was found to have similar features as the cross-linguistic influences that have been discussed in previous chapters; research suggests that form-based translation is more characteristic of translation productions by untrained speakers.

In summary, models of the translation process point to changes in the accessibility of features as a direct cause of source language influences, and to restricted availability of activation under on-line conditions as a conducive factor. Whereas the latter may add a new aspect to the view of a non-homogeneously connected, shared-storage bilingual language production system that has been developed so far, the simple reference to accessibility as the mechanism of cross-linguistic influence cannot be satisfying any more in the light of recent developments in psycholinguistic research. While recent experimental work on translation has particularly focussed on lexical retrieval, my point of departure lies in syntax.

CHAPTER 5

Experiment 1: Grammatical Voice

This chapter develops an experimental method that tries to find evidence for the known phenomena of cross-linguistic priming in situations of source interference during translation, and puts it to a first practical test. Section 5.1 will consider implications of the research reported in Chapters 2–4, and develops general specifications for a psycholinguistic experiment to study structural phenomena in translations. Section 5.2 discusses the structures that will provide the material for the first experiment (grammatical voice in Dutch and English). The following section (5.3) outlines method, materials and participants in this experiment. Finally, results are presented, analysed and discussed in 5.4.

5.1 General considerations for an experimental paradigm

The research reported in Chapters 2–4 suggests a relation between source text interference in translations and the cross-linguistic phenomena that have been observed in psycholinguistic and SLA research. Considering the implications of findings from these three fields, this section is going to develop an experimental paradigm that allows closer scrutiny of the assumed connection. As I will show, this combination of research areas provides clear specifications in terms of eligible participants, experimental procedure, and suitable material. The resulting experimental paradigm is proposed as an alternative method to study the influence of syntactic cues on bilingual language production. Chapters 5–8 will apply this paradigm to constructions that are well covered in current research, and show the possibilities for specific contributions from translation experiments to the study of bilingual production.

5.1.1 Participants

In Chapter 4.1, I have described translation as a special type of language production, special either through its reliance on specific processes or through its specific use of processes. It is, however, available to all bilingual speakers, at least in the rudimentary form of Natural Translation. While trained translators presumably switch between meaning- and form-based approaches to translation (see 4.1.3), this thesis is concerned with widely applicable, more general features of bilingual production, and thus in the bias towards form-based translation that is evident in Natural Translation. Hence, the translation performance of untrained speakers is more relevant for my interests here than the more highly developed skills of professionals.

- Participants should not be professionally trained translators.

The participant group in a strictly controlled study of translation between two languages X and Y should not vary with regard to the status of both X and Y for each speaker. As shown in 3.2, it is not appropriate to generalize over 'all non-native speakers of language X'.L1 has been shown as an influential factor in L2 production, and cannot remain uncontrolled in an experimental situation. For completeness' sake, the points made by Grosjean (1998, pp.133–134) should be kept in mind, as well: native bilinguals cannot be integrated into one group with native monolinguals, nor even into one group with each other. For the purposes of this thesis, I draw a line at school age, grouping 'early bilinguals' together with natively bilingual speakers, and excluding both.

- All participants should be natively monolingual speakers of the same L1.

5.1.2 Procedure

The main concern of this thesis is features of bilingual production — specifically, the influence of syntactic cues on language production. In the field of Psycholinguistics, this research interest has been followed so far in particular with studies of syntactic priming. Thus, to set up an experiment that highlights this phenomenon in the context of translation, my starting point will be the configuration of structural priming experiments (see Bock, 1986b), more specifically in their cross-linguistic version (see Loebell & Bock, 2003). Characteristically, the semantic contents for a translation (i.e. the non-linguistic stimulus for a production in the target language) are directly retrieved from a source text in which they are embedded in the structure that might be transferred. This makes it possible to replace the double presentation of prime and stimulus in Loebell & Bock's (2003) priming experiment with the solitary presentation of a source sentence to constitute an elementary translation task.

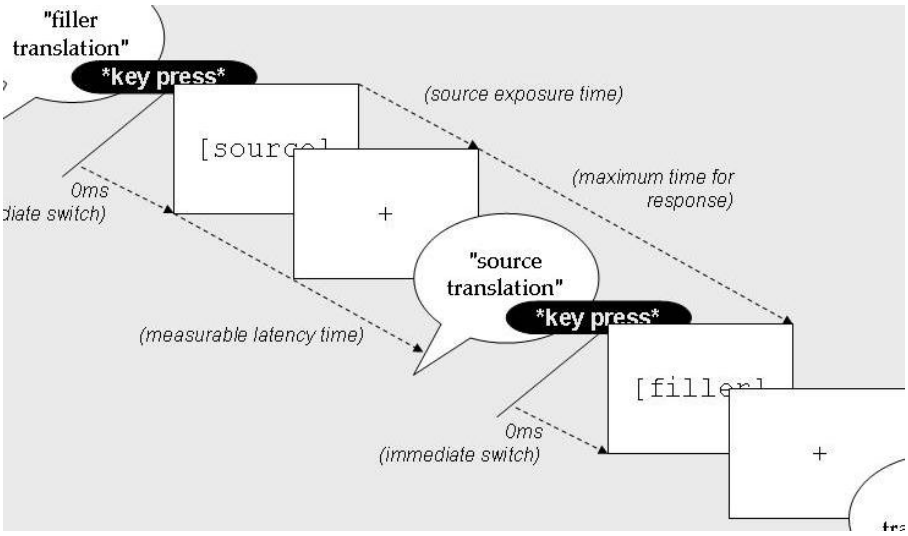
The resulting sequence is shown in Figure 5.1: a source construction is provided, the participant produces a translation, and calls up the following item (here, by pressing a key). Additional features of the procedure that are indicated in Figure 5.1 (mode of production, method and timing of source display) will be discussed below.

As pointed out variously in Chapters 2–4 (specifically in 2.2.3, 3.1, 4.1.4), evidence for structural influence between languages has been discovered in both speech and writing by research on Translation and Interpreting, Second Language Acquisition, and Psycholinguistics. Written production, however, takes longer to complete and offers more possibilities to reconsider structural choices. For purposes of determining the initial influences of automatic processing in translation, the first target translation that can be produced spontaneously, without unduly long consideration of the source, will be of particular interest. For this reason, the experimental procedure should discourage lengthy pre-processing.

- Target utterances should be produced in speech, not in writing.

Prosody has been found to affect processing (see Munro & Derwing, 1995). The use of written sources removes any possibility of such influences, and is con-

Figure 5.1: *Event sequence during experiment (schematic representation)*



clusively supported by recent conclusive evidence of priming from writing into speech (Cleland & Pickering, 2006; see 2.1.2). (The combination of written source material with an on-line translation task may appear unusual and atypical, but is known in the professional community as *sight translation* and has also attracted some research in recent years. For a comparison between Simultaneous Interpretation and Sight Translation, see Agrifoglio, 2004.)

- Source texts should be presented in writing.

Although the availability of context information may affect the performance of professional translators (see Chernov, 1994), little is known about the magnitude or the sources of the effect, rendering it hard to control. For this reason, it will preferably be removed from the experimental environment.

- Source texts should be presented in isolation, without context.

The decision to use written stimulus materials may conflict with the need to reduce the possibility of post-processing that has been catered for through the decision for spoken production. Seleskovitch (1976, p.95) and Gile (1997, p.204) suggest that prolonged availability of written stimuli may increase their structural influence, an assumption that has been confirmed by Agrifoglio (2004). Extended reading time may lead to a statistical ceiling effect; in the experiment that I am developing here, the source should optimally not be read more than once.

- Source text presentation should be kept as short as possible.

One technique for the presentation of written texts with little occasion for post-processing is Rapid Serial Visual Presentation (RSVP), where texts are shown as sequences of individual words in fast succession. A participant-paced version of RSVP has been used by Macizo & Bajo (2006) for the study of memory processes during translation, with good results. However, this application highlights also the relation between RSVP presentation and memory processes: while self-paced picture presentation requires additional attention to carry out, automatic RSVP distorts the use of memory resources. In brief words, every individual word receives equal attention and exposure time: but increased attention may lead to above-average perception of morphological features such as case endings, while an identical exposure time for open- and closed-class items may lead to a processing load valley, in which surplus activation can be employed to process structural features. For this reason, the technique is not suitable for the experiment that is set up.

- Source texts should be presented as complete sentences.

5.1.3 Measures

Evidence of cross-linguistic structural influences in the linguistic productions of bilinguals has been discovered in all three areas of research that inform this thesis, typically in terms of construction choice. As mentioned in 2.1.4, a number of structural priming studies (Smith & Wheeldon, 2001; Corley & Scheepers, 2002; Wheeldon & Smith, 2003) have retrieved on-line evidence of priming, by measuring the response latencies of participants' spontaneous first responses: facilitation from priming may be observed not only in the *outcome* of a syntactic choice, but also in its *time course*. (See 2.2.4: residual activation gives nodes an advantage for their subsequent selection.) As shown above, elicitation of spontaneous first responses is advantageous for a translation experiment, as well. It follows that it will be possible to employ response latency as a secondary measure of facilitation without major changes to the setup that has been developed so far. Response latency will be measured as the time between the onset of a source stimulus and the onset of the corresponding translation target response; this presumably reflects the time that is necessary for intake and comprehension of the L1 source and subsequent preparation of a speech plan in L2.

- Measure 1: response type
- Measure 2: response time

5.1.4 Materials

With regard to the materials that should be used for an experiment that elicits spontaneous first responses, Smith & Wheeldon (2001, p.128) point out that generation of conceptual structures may have an unfavourable effect on latency measures. Without further precautions, speakers will invest an unspecified (and unspecifiable) amount of effort into the creation or recognition of these structures. These effort fluctuations may reflect on the overall cognitive load that is incurred by the production process, and lead to unpredictable variations of latency data.

Arguably, however, this objection is of little relevance for translation: there, conceptual structures (and in particular the thematic roles of arguments) are provided by the source and may be re-applicable in the target — i.e. they do not need to be generated. Priming is commonly observed on constructions that differ on the level of syntactic surface structure, but involve presumably identical underlying argument structures. Thus, it is possible to assume that the incurred activation requirements ('cognitive loads') are identical across conditions; hence, it is possible to conclude that the generation of conceptual structures is not of any further concern.

Other features of language, however, may still affect the time course of activation during the process of translation — specifically, the retrieval of individual lemmas during comprehension and production. This relates closely to the psycholinguistic frequency effect, stating that the retrieval of low-frequency items requires more time than that of high-frequency items (for recent work on this topic, see Alario et al., 2002; Jurafsky, 2003). As mentioned in 4.2.1, professionals and researchers agree on the relevance of the phenomenon for the process of translation. Empirical support for this assumption comes from word translation experiments (e.g. de Groot, 1992; Jescheniak & Levelt, 1994; de Groot & Poot, 1997) where high-frequency items are commonly translated faster than low-frequency ones.

Hence, frequency should be taken into consideration when setting up materials for a translation experiment. In the following, I will first consider issues of lexical frequency, then syntactic frequency, and finally will propose a frequency-based method to reduce the likelihood of incrementality effects during production.

Lexical Frequency

Treating word frequency as a measure for the cognitive load that is connected with individual lexical items, it becomes possible to approach the creation of experimental materials systematically. Lexical items with comparable frequencies can be expected to require similar amounts of activation during comprehension. Thus, if two constructions in source materials for translation differ only in the surface order of two words with similar frequency, the processing differences for their comprehension are negligible. Of course, it is not possible to control for item frequencies in the lexicon of individual speakers; but two additional considerations offer still at least partial support for the desired effect: *a*) semantically ambiguous words may incur additional processing load as a choice between their meanings is made, and thus should be avoided; and *b*) the higher the frequency of a word in the source language, the more likely it is that speakers have some previous experience with it in a cross-linguistic context, enabling them to respond quickly.

- All words that are used in source materials should be semantically as unambiguous as possible, and should be selected from the same frequency range.

Syntactic frequency

It will be noticed that frequency is not only a feature of individual lexical items, but also of constructions (see Dick & Elman, 2001). This suggests that more frequent constructions may be processed faster, and that there might be inherent latency differences between source constructions — i.e. between the conditions of the experiment that I intend to develop. Syntactic frequency is more difficult to control than lexical frequency, due to problems with the exact definition of constructions and lexical and structural interdependences (see Dick & Elman, 2001, pp.8ff, for a discussion). Moreover, as shown in the discussion of the Interface Hypothesis in 3.2.1, the interface between syntax and semantics is an area where effects of cross-linguistic influence during acquisition may become particularly obvious. The frequency with which a specific construction occurs may be different between speaker groups (as defined in Section 5.1.1, above). For both these reasons, no attempt is made to control for construction frequency externally. Instead, a second task should be introduced into the experiment paradigm, with the explicit purpose to collect information about processing differences between variant constructions.

To this end, this experiment will employ a repeating task. Its general procedure is identical with that of the translation task, and differs only in the language of production. Although other methods, e.g. sentence recall, may be capable of providing insights of higher resolution, the main concern here is maximum comparability with data from the translation task — after all, its purpose is to control for comprehension difficulties or frequency effects that may arise from one of the involved constructions. The experiment setup so far has assumed that the syntactic structures in question are of identical or comparable complexity. If this condition is violated, latency times may correlate directly with construction complexity, as shown by F. Ferreira (1991).

It is *not* assumed that repeating and translation are essentially the same task. While both involve storing to memory and subsequent production, memory for repeating may be supported by the phonological loop (see Baddeley & Hitch, 1974). This may be reflected in a recent study by Macizo & Bajo (2006) that compared reading for repeating and reading for translation: they found differences between the two types of reading with lexically ambiguous items and under high memory load conditions (RSVP presentation) — both features that have been avoided in the construction of this experiment, reducing in this way the influence of the effect reported by Macizo & Bajo.

A trick of the verb

I have stated that the experiment that is developed in this section attempts to elicit the "spontaneous first translation" of source sentences. However, the discussion of incrementality in 2.1.4 (see p.33) may cast some doubt on the possibility of eliciting meaningful latency measures from translation tasks. If the overall process is strictly incremental, then time measurements can relate only to the translation complexity of the first segment that is produced, rather than to the utterance as a whole. This opinion is expressed explicitly by Smith & Wheeldon (2001, p.126), on the basis of earlier research (Schriefers et al., 1998; Smith & Wheeldon, 1999). Yet, as discussed above, other researchers (e.g. V. S. Ferreira, 1996) have been able to elicit meaningful time measurements to corroborate incrementality-based predictions where complexity was *not* located in the first segment of the utterance. Closer consideration of the findings that support Smith & Wheeldon's (2001) opinion shows, however, that incremental production is not so much a fact, but rather a tendency of language production, coming into particular effect in the production situation that they had created in their experiment. Hence, it may be possible to devise a method that reduces the likelihood of incremental production in the situation of a translation task.

In their earlier research, Smith & Wheeldon (1999, pp.238–241) had found evidence that, at speech onset, detailed grammatical encoding does not need to be completed for the sentence as a whole, but only for its first phrase. They point out that this finding does not imply evidence for strict serial incrementality: results still indicate clearly that some degree of "higher-level" structural processing of subsequent elements (a relative clause, in their experiment) may be carried out prior to onset nonetheless. Thus, their 1999 findings do not contradict those of V. S. Ferreira (1996): whereas Smith & Wheeldon show that speakers *do not have to* process the entire clause before onset, V. S. Ferreira shows what happens if speakers are *forced* to process the entire clause before onset.

The experiments of Schriefers, Teruel, & Meinshausen (1998) studied the role of the verb in grammatical advance planning through a series of picture-naming experiments. Their findings indicate that the verb is not automatically or obligatorily involved in the assignment of grammatical functions, and they suggest parallel existence of two different 'routes' for the processing of a speech plan (Schriefers et al., 1998, pp.628–629). Both routes involve the selection of a verb lemma and of an argument structure that accommodates additional conceptual information, but in different orders. Schriefers et al. hypothesise a distinction between *lexical guidance* and *conceptual guidance*. Under the **lexical guidance hypothesis**, the selection of a verb lemma will allow access to an appropriate and connected argument structure. Once this argument structure is available, conceptual information can be assigned to its slots. Under the **conceptual guidance hypothesis**, in turn, the available conceptual information leads to the selection of a suitable argument structure, which then leads to selection of one of the verbs that are associated with it.

Which one of these two routes is used in any individual instance of language production depends, according to Schriefers et al. (1998, p.630), on a number of factors. They mention explicitly three: *a*) the temporal order in which lemmas of the conceptual input become available, *b*) the reliability with which concepts are mapped onto functions, and *c*) previous processing of sentences with parallel structures. All other experiments discussed in this subsection have been concerned with priming, i.e. with the previous processing of syntactic structures, and attempted in various ways to keep the temporal order of the input constant across conditions. Similarly, the studies of V. S. Ferreira (1996) and Corley & Scheepers (2002) have approached the mapping of concepts onto functions through unchanged input order; the work of Smith & Wheeldon (1999), however, is explicitly targeted at the effects of conceptual complexity and changed input order. Thus, their experimental conditions result from manipulations of the conceptual setup, and contain not much linguistic material beyond the manipulated concepts — in particular, there is only one intransitive verb that follows after the manipulation in all instances. The approach focuses on changes in the available conceptual information but renders verb selection inconsequential. Unsurprisingly, their eventual claim about the impossibility of structural processing beyond the first phrase chimes in with the conceptual guidance hypothesis. This particular focus on conceptual guidance, however, is not detrimental to Smith & Wheeldon's (1999) finding of a decreased response latency after processing utterances with subjects of similar complexity.

For the experiment that is under development in this section, it follows that reliable on-line measurements of priming can be and have been achieved, although clear awareness of the psycholinguistic environment of production is required. The discussion above has shown that precautions need not take the shape of the restrictions that Smith & Wheeldon (2001) and Corley & Scheepers (2002) applied to their research — V. S. Ferreira (1996) was able to retrieve meaningful data from measurements that were not taken at the location of the phenomenon itself, through rigid control of intervening linguistic material. However, in tasks where linguistic material is not provided but needs to be generated (e.g. picture description, sentence completion), this level of control is difficult to achieve.

It has already been pointed out that translation tasks provide conceptual information for utterances-to-be-produced, rather than requiring participants to generate them, providing better control of the linguistic material that is employed. Considering the conclusions of Schriefers et al. (1998), however, the ready availability of conceptual features might also provide a cue for processing along the lines described by the *conceptual guidance hypothesis*, above. (This would lead speakers to follow an extreme pattern of form-based translation, translating each word of the source text individually, and in their sequence of occurrence, without concern for the larger syntactic structure.) In this case, however, the account of Smith & Wheeldon (2001) sets in, and all information from onset latencies could only be related meaningfully to the first phrase of a target utterance. To study syntactic production, it would be preferable if production processing could be biased towards the route described in the *lexical guidance hypothesis*.

Schriefers et al. (1998, p.629) observed lexical guidance when the utterances that their participants generated began with the verb, but not when they began with the syntactic subject — in other words, lexical guidance was only observed when the production context ensured that the verb was processed first. Schriefers et al. (1998, p.630) characterize the difference between these situations as depending on the "temporal order [of] becom[ing] available". A corresponding concept is encountered in the Gravitational Model of lexical access in translation (see 4.2.1): translation under time-pressure is described as relying strongly on highly accessible (i.e. frequent) items, which can be retrieved more quickly and with less cognitive effort (Gile, 1995, pp.223–4). Equating accessibility with frequency suggests that processing along the lines of lexical guidance can be induced by increasing the accessibility of the verb relative to the rest of the linguistic material. If processing affects highly accessible items first, and accessibility corresponds with frequency, then verbs will be processed before nouns if the relative frequency of the verbs is higher — i.e. if they are more accessible than other lexical items in the context. Hence, lexical guidance is generally expected to become used as a processing strategy in sentences where the verb is more frequent than the lexical items in the corresponding arguments. While the paradigm of verb-initial production that was employed by Schriefers et al. (1998) appears to have been more reliable as a method to eilicit processing under lexical-guidance, the method proposed above will allow me to avoid the formal restriction to verb-initial sentences.

- Hence, verbs in the material should be more frequent than nouns.

5.1.5 *Desiderata for a translation experiment*

Measures: As shown, there is reason to expect evidence of on-line facilitation from structural priming in translation utterances. A translation experiment may measure priming and facilitation through response type and response latency.

Procedure: The proposed experiment follows the general setup of priming experiments in the vein of Bock (1986b). Instead of prime presentation and picture description task, however, a single source sentence is presented in its entirety as the source text for a translation. Source sentences are presented only briefly, optimally only as long as is necessary to read them once. Participants produce spontaneous translations of the source in speech. To allow statistical control for effects of syntactic frequency, a repeating task is added that follows the same general protocol, and uses the same materials.

Participants: Participants in the experiment will be non-native speakers of one of the languages in the experiment, and (within each experimental group) natively monolingual speakers of the same L1.

Materials: Source materials for a translation experiment can be thoroughly controlled, and should be. Semantic ambiguities should be avoided, preference should be given to lexemes of high frequency. Verbs should be more frequent than nouns.

The remainder of this chapter will describe an experiment that is set up according to the above requirements, and present and analyse its results. The final discussion (in 5.4.3) will return to issues of the experimental setup once more.

5.2 Grammatical Voice in Dutch and English

As a linguistic topic for the first experiment, I choose grammatical voice in Dutch and English. In both languages, active constructions with the Agent in subject position provide the unmarked default (20a, 21a). As a (marked) alternative, passive constructions involve the Patient as their subject, a verb participle, and the Agent as a prepositional complement (or even not at all). In English, this alternative corresponds to exactly one syntactic construction, in which auxiliary and verb-participle are in medial position, possibly (but not necessarily) followed by the Agent in a prepositional phrase *(20b)*. Passive in Dutch can be encountered in a construction that shows identical word order *(21b)*. However, less rigid restrictions on word order in Dutch allow for an alternative configuration of passives, where the prepositional Agent follows directly after the auxiliary, and the participle is in final position *(21c)*.

(20a) A sheep hears the car.

(20b) The car is heard by a sheep.

(21a) Een schaap hoort de auto.

(21b) De auto wordt gehoord door een schaap.

(21c) De auto wordt door een schaap gehoord.

The examples in Cornelis' (1997) study of the Dutch passive acknowledge that participle-medial *(21b)* and participle-final *(21c)* variants exist, but do not discuss their differences in further detail. As in other languages, Dutch passives have frequently been contrasted with actives (see Cornelis, 1997, p.28); however, only very little research appears to have targeted the differences between the two passive structures.

Hence, it is not possible to indicate with any degree of confidence any differences in the use of the two Dutch passives. Native speakers may report anecdotally that participle-final passives are "more formal", but the claim cannot be substantiated. A raw frequency count in the *Corpus of Spoken Dutch* (Nederlandse

Taalunie, 2004) finds that participle-medial passives outnumber participle-final ones by 3:1, but even this ratio can only be considered as a very rough estimate.

The difference between active and passive, in its turn, is often analysed as a shift in relative topicality from Agent to Patient that is realized as a reassignment of the Subject function. This analysis is encountered for both Dutch (see Cornelis, 1997, p.16) and English (Quirk et al., 1985, p.1390; Huddleston & Pullum, 2002, pp.1444–1445).

To show the changes in syntactic relations, analyses of the underlying representations of 20a–21c are presented below. I use the corresponding tagset of Functional Grammar (Dik, 1997) which will be sufficient for the syntactic discussions in this thesis.[1]

20a-A: [*hear* (*sheep*)$_{\text{AGENTSUBJ}}$ (*car*)$_{\text{GOALOBJ}}$]
20b-A: [*hear* (*sheep*)$_{\text{AGENT}}$ (*car*)$_{\text{GOALSUBJ}}$]
21a-A: [*horen* (*schaap*)$_{\text{AGENTSUBJ}}$ (*auto*)$_{\text{GOALOBJ}}$]
21b-A: [*horen* (*schaap*)$_{\text{AGENT}}$ (*auto*)$_{\text{GOALSUBJ}}$]
21c-A: [*horen*$_{\text{FOCUS}}$ (*schaap*)$_{\text{AGENT}}$ (*auto*)$_{\text{GOALSUBJ}}$]

Notice that the analyses for English sentence types (20a, 20b) are identical — apart from the lexemes — with those for Dutch active and participle-medial passive (21a, 21b). Notice also that the analysis in (5.2) hinges on the Functional Grammar account that non-standard syntactic orders may be instantiations of a Focus marker (Dik, 1997, p.327).

Grammatical voice has been a topic of psycholinguistic research for a long time, in particular with respect to the assumed underlying representations of actives and passives and the corresponding response times (Tannenbaum & Williams, 1968; Wright, 1969; Perfetti & Goldman, 1975; Bock & Irwin, 1980). The contrast of active vs passive constructions was also one of the two structural features under inquiry in Bock's (1986b) first report on priming phenomena (see 2.1.2).

[1] The nuclear predication (here, identical with the clause) is delimited with square parentheses '[ ]'. Constituent terms of the clause are indicated with round parentheses '( )'. Notice that verbs are contained in the predication, but do not constitute terms. Every term is characterized by its semantic function in relation to a controlling verb or other term. This semantic function comes from a restricted set and is indicated in subscript small capitals. Terms may additionally be characterized by syntactic functions SUBJECT or OBJECT. The range of semantic functions that can or must be tagged with each syntactic function may differ between languages. OBJECT can never be assigned to an Agent. Terms may additionally be characterized by pragmatic functions FOCUS and TOPIC. There is no 'default' indication of pragmatic functions; if they bear no discernible influence to the structure of a sentence, they are not indicated.

Grammatical voice in English has also been frequently used in subsequent priming studies (Bock et al., 1992; Bock & Griffin, 2000; Bock et al., 2007). In Dutch, priming of passive structures was first reported by Hartsuiker & Kolk (1998), using a picture description task similar to Bock (1986b). With respect to the two passive constructions of Dutch, Hartsuiker & Kolk find evidence of specific priming: participle-medial passives are more likely to be produced after other participle-medial passives, and participle-final passives more after other participle-final passives. The most recent report of passive priming in Dutch comes from the monolingual experiment that is reported by Bernolet et al. (2006), discussed below in more detail with its cross-linguistic counterpart.

To investigate the possibility of cross-linguistic priming of grammatical voice, Loebell & Bock's (2003) study (see 2.2.3 for further details) attempted to prime actives and passives between English and German — in German, the word order equivalent of the Dutch alternative *(21c)* is obligatory for passives. Their experiments discovered no evidence of passive priming, and only weak active priming (this, however, in both language directions between L1 German and L2 English). According to Loebell & Bock (2003, p.807), the reason for the absence of the effect is the difference between the syntactic structures of passives in the two languages, effectively blocking any possibility for priming. (Notice that this account has found additional support in the recent work of Bernolet et al., 2007, reported in 2.2.3.) Another study of cross-linguistic structural priming, by Hartsuiker et al. (2004), provided evidence that it is essentially possible to prime grammatical voice across languages — in their case, from L1 Spanish into L2 English.

More recent experimental work on cross-linguistic structural priming by Bernolet et al. (2006) targeted the differences between grammatical voice in English and Dutch, as outlined above. They used a picture description paradigm in which participants received primes always in Dutch, but responded in L1 Dutch in one experiment, in L2 English in the other. Results show a priming effect for both types of passives, both monolingually in L1 (as in Hartsuiker & Kolk, 1998), and cross-linguistically from L1 to L2. The priming effect for English passives can be observed more clearly after participle-medial passives, but is present nevertheless after participle-final passives.

Table 5.1: *Experiment 1: Participant demographics*

		Range	
participants			24 (6M)
age (years)		18–35	(mean: 21.7)
learning age	(yrs since onset)	4–23	(mean: 9.9)
self-rating L2 (mean)	(1–7, 7=best)	3.8–6.6	(median: 5.25)
self-rating: L2 reading	(1–7, 7=best)	3–7	(median: 6)
self-rating: L2 listening	(1–7, 7=best)	3–7	(median: 6)
self-rating: L2 speaking	(1–7, 7=best)	3–7	(median: 5)
self-rating: L2 writing	(1–7, 7=best)	2–6	(median: 5)
recent use of L2	(1–7, 7=most)	1–7	(median: 4.5)

5.3 Experiment 1

In Experiment 1, speakers of L1 Dutch and L2 English repeated items in Dutch (L1-L1) or translated them from Dutch into English (L1-L2). Experimental conditions corresponded to three Dutch constructions for the expression of grammatical voice, i.e. actives, participle-medial passives, and participle-final passive. Only the first two constructions have direct equivalents in English.

5.3.1 *Participants*

24 participants were found in the University of Ghent community through self-enrolment on a dedicated internet page. Demographic details from a questionnaire (see Appendix F) that was filled in after the experimental session are listed in Table 5.1. Participants were paid for their contribution.

There was no explicit demand for participants to document their skill level in L2 English, apart from an explicit requirement to conduct all communication with the experimenter before the experimental session in English. This ensured a minimum level of proficiency. Table 5.1 indicates self-ratings of linguistic skills; the respective questionnaire items asked participants to judge their L2 skills on a scale from 1 (worst) to 7 (best). Scores for recent exposure came from a questionnaire item that asked participants to estimate the frequency with which they had used L2 actively during the three months before the experiment, ranging from "not at all" (scored 1) to "every day" (scored 7). (See Appendix F for the full questionnaire.)

All participants indicated their native language as Flemish Dutch or Dutch; all reported knowledge of 1–3 languages in addition to English, most frequently

French (all), German (17), and Spanish (5). Two participants reported extended previous exposure to English through stays of four weeks or more.

None of the participants had any degree of formal translator training; however, seven of them reported occasional translation activities in writing or speaking for educational or private purposes.

5.3.2 Materials

To create experimental materials, nouns from Tokowicz et al.'s (2002) translation norms for Dutch and English were used. Their list does not contain verbs, and an additional twelve transitive Dutch verbs (with transitive English translation equivalents) were selected from the 200 most frequent Dutch verbs (according to the *Corpus of Spoken Dutch*, Nederlandse Taalunie, 2004), following the specifications in 5.1. For details of measuring word frequency, see Appendix B, where the individual nouns and verbs that were used are listed in Table B.1.

Using these nouns and verbs, two master lists consisting of 48 items each were created, each master list using each of the twelve verbs four times. Each master list provided three lists of actual sentences so that each item occurred once in one of the three constructions (active, participle-medial passive, participle-final passive). Each list contained equal numbers of sentences in each construction. For each participant, one of the master lists provided a list of sentences for the repeating task, and the other a list of sentences for the translation task. Each list of sentences occurred equally often in each task. An example for an experimental item in the three conditions for trials has been given as (21a–21c) in 5.2, above; for ease of reference, a second one is listed with its master list entry as (22a–22d), below. Appendix C.1 lists all the sentences that were used as experimental stimuli.

(22a) Master list entry: TELL (LEADER)$_{\text{AGENT}}$ (PLAN)$_{\text{PATIENT}}$

(22b) Active: *De leider vertelt het plan.*

(22c) Passive, participle-medial: *Het plan wordt verteld door de leider.*

(22d) Passive, participle-final: *Het plan wordt door de leider verteld.*

Filler items were created as Dutch single lexemes (adjectives) or adjectival NPs (consisting of Determiner + Adjective + Noun). Like trial items, all nouns and adjectives were selected on the basis of the frequency provisions detailed in Appendix B. However, nouns from trial items were avoided in fillers. Examples of single lexeme and adjectival NP fillers are shown as *(23a)* and *(23b)*, respectively. A list of all filler items is given in Appendix D.1.

(23a) Single lexeme filler: *makkelijk*

(23b) Adjectival NP filler: *een rood gezicht*

Determinacy of nouns was controlled so that all agent nouns were determinate, and patient nouns were determinate and indeterminate in equal proportions.

Randomly created sentences that followed these specifications were proofread by three native speakers of Dutch to prevent excessively implausible semantics. All items that were flagged as implausible were removed or replaced.

5.3.3 *Procedure*

The experiment was conducted in a quiet, mildly-lit experimental room at the University of Ghent. Participants were seated with a headset at comfortable distance (50-80cm) from a computer screen that showed experimental items on one line, in a black monospace font on white background. A digital recording device was located between participant and screen. (See Appendix A for details of sound registering during the experiment.)

Participants were instructed orally that their task was to "repeat or translate" the items that appeared on the screen. Introductory screens to the experiment (see Appendix E.1) explained the general procedure in more detail, but did not specify the task any further. As far as the *process* of translation was concerned, instructions were held deliberately minimalistic. This was intended to direct participants' attention rather towards the more tangible *results* of the process, and allow uninhibited application of intuitive translation principles, i.e. Natural Translation. After reading the introductory screen, participants had a last occasion to ask questions about the experiment procedure and then started directly into the first block of the experiment.

The experiment consisted of two blocks of separate tasks: the translation task and the repeating task. Each block consisted of 108 items. Each item appeared at the centre of the screen for 850ms and was then replaced by a target cross. After exposure, participants had 9 seconds to respond to the item by translating or repeating. Following their response, they could press a key to continue with the next item. If the key had not been pressed after 8.5s, an acoustic signal would warn them that a new item was about to appear 0.5s later. (See also Figure 5.1 on page 97.)

Presentation of source sentences was carried out and logged with the E-prime v1.2 software. The selection of 850ms exposure time was a result of trial-and-error testing with several native speakers of Dutch during the development phase of the experiment.[2] Blocks consisted of one list of 48 trial items (all in random order, 16 per condition) and 60 fillers selected at random. All trials were separated by 1–2 fillers. The two task blocks followed each other in random order. All participants saw all items only once, one half in the repeating task, the other in the translation task.

After the experiment, participants filled in a questionnaire that attempted to elicit as much of their language biography as possible (see Appendix F), and were finally debriefed. Including the instructions, the actual experiment, the questionnaire and the debriefing, each session took about 50min.

During debriefing, various participants reported that they had developed strategies to cope with the challenge of reading the source in its entirety within the given time window. Predominantly, however, they reported concern about the experienced (in)accessibility of target language equivalents for individual words of the source text. While several of them had noticed that actives and passives posed more difficulties than other items, and might be of particular interest in the experiment, none suspected the translation of these very structures to be at the experiment's focus.

5.3.4 Predictions

There are three predictions for the outcome of Experiment 1:

Prediction 1: Repeating vs translation. Response latencies in the repeating task should be faster than in the translation task. This follows from horizontal models of translation (see 4.1.2): whereas repeating can be carried out on the basis of

[2]850ms were found sufficient for trial items, but proved more than enough for fillers. To reduce the perceptual salience of experimental items and create an impression of 'constant' time pressure during the experiment, exposure times for fillers were diminished. Thus, exposure time with trials items was 850ms, with NP fillers 650ms, with single word fillers 450ms. The total time available for responding was kept constant at 9000ms.

comprehension and production alone, translation needs to access a set of dedicated processes (which are available for *all* bilinguals, as shown in 4.1.3). Activation of these additional processes will draw upon available activation resources and lead to an overall deceleration of production (see also Gile, 1997). Comparable findings can be encountered in various places in the literature, e.g. in Beck (1997), who compared RTs for the formation of regular English past tenses by L1 and L2 speakers, and explicitly in Ruiz et al. (2008, p.495), although the main purpose of their research followed the lead of Macizo & Bajo (2006), discussed in 4.1.2.

Prediction 2: Response types. Dutch source sentences in the active voice should tend to be translated as English actives, and both types of Dutch passives should tend to be translated as English passive constructions. This prediction is *not* based on the simplistic assumption that grammatical voice in English "is the same" as in Dutch — an approach that is not tenable from a linguistic perspective (and see also the warnings against 'simple' assumptions in translation in Gile, 1994, p.48). Similarities notwithstanding, Cornelis (1997, pp.22, 25ff) points to a number of features of Dutch passives (possibility of impersonal passives, lower correlation of voice and argument order) that cannot be accounted for appropriately under an approach that is entirely based on English. Rather, support for this prediction can be found in all three fields of research that whave been discussed in Chapters 2–4. Accounts of syntactic priming (see 2.1.2) predict that previously processed structures may be facilitated for production — in the context of translation in general, and purposefully so in the setup of this experiment, the previously processed structure is the source. For an account from the angle of the Interface Hypothesis (see 3.2.1), it is relevant that both languages coordinate grammatical voice in an interface situation between syntax and pragmatics (see 5.2, above): for this reason, participants should select constructions for language production based on L1 criteria rather than L2 criteria — although these are not entirely the same (see Cornelis, above), all source sentences were proofread for plausibility, i.e. violations of L1 criteria had been systematically excluded (see 5.3.2). Finally, the participant selection for this experiment makes form-based translation a strong possibility: because no participant had formal translator training, they were forced to rely on Natural Translation to carry out the experimental task — which involves a high propensity for 'literal', form-based translation, as I have pointed out in 4.1.4, above.

Prediction 3: Response times. As discussed under Prediction 1, data from the repeating task should show shorter response latencies than data from the translation task. In addition, translation events where surface structures match in source and target should be carried out faster than those where they do not. This prediction follows from accounts of syntactic priming, as discussed under Prediction 2, above — evidence of facilitation is expected not only from the choice of target structures, but also from the rate at which they are delivered. More specifically, I predict faster translation of Dutch actives into English actives, and of Dutch participle-medial passives into English passives. This follows from the Integrated Model of language production (see 2.2.4): a construction that is syntactically identical in source and target language may retain traces of its activation during comprehension, and thus require less activation energy to be selected again in production. Lower activation requirements should lead to faster response latencies. Section 5.1.4 has discussed comparable findings and developed a method to observe latency effects in translation tasks. The processing of all non-matching instances of translation — in particular those where the source is a Dutch participle-final passive, which has no direct surface-structural match in the target language — will presumably need to access syntactic surface structures that have no residual previous activation. Thus, more activation energy needs to be aggregated to select a target structure, which leads to a higher response latency.

5.3.5 Scoring

All target productions were transcribed and rated for the employed construction as follows:

- Target responses were scored as actives, as passives (if they were in English, i.e. in the translation task), as participle-medial or participle-final passives (if they were in Dutch, i.e. in the repeating task), or as 'other' constructions.
- Productions in which an indefinite pronoun replaced one NP were considered acceptable; occurrences of several indefinite pronouns or of features that were judged as indicative of guessing led to classification of the response as 'other'.
- The data points that provided response times (RTs) for latency analysis were a subset of construction data where *a*) the construction was not categorized as 'other'; and *b*) no disfluencies or other technical problems were evident at the onset, as outlined in Appendix A.

5.3.6 Design and data analysis

Every participant responded to all experimental items, repeating one half and translating the other. Each item was seen only once by each participant. Each item was seen eight times in each of the three conditions, four times in each of the two tasks. Thus, every participant and every item contributed equally to all cells in the analysis. In each of the two possible task sequences, each list of source sentences occurred equally often in each of the two tasks.

Because only very little is known about the psycholinguistic contingencies of translation processes, a first step towards analysis was conduction of a linear regression to estimate whether other predictors than the experiment variables contributed to variance on the measures. This took the specific form of a 2-stage Least Squares method where t-values are calculated that reflect the likelihood for the predictor's regression coefficient (i.e. its contribution to total variance) being different from zero. Results tables (Appendix G) will only indicate the significance of these ts.

Analyses of variance were carried out on the numbers of acceptable responses and the reaction times in both tasks, the latter focussing on instances where the grammatical voice of the source was retained in the target utterance. Both analyses provide a 2×3 design with two tasks (repeating and translation) and three conditions (active, participle-medial passive, and participle-final passive). Both analyses were carried out twice: once with participants as the random factor, once with items (i.e. entries in master lists) as the random factor. Additional factors were applied in analyses by participants or by items according to the results of the Least Squares.

5.4 Results and Discussion

5.4.1 Results

Response Type. Table 5.2 shows that out of 1176 responses in the repeating task, 1119 (97%) were acceptable (i.e. not scored as 'other'). Of these, 34% were successful repetitions of active constructions, 34% of participle-medial passives, and 32% of participle-final passives. No restructurings were observed in the repeating task. English parallel structures to Dutch participle-final passives would qualify as 'other', but were never observed.

Table 5.2: *Experiment 1: Response Types*

task	production	Dutch stimulus active	passive p-medial	passive p-final	TOTAL
repeating	active	383	0	0	**383**
	p-m passive	0	380	0	**380**
	p-f passive	0	0	356	**356**
	other	1	4	28	**33**
translation	active	359	5	2	**366**
	passive	0	344	330	**674**
	other	25	35	52	**112**

Table 5.3: *Experiment 1: Mean Response Times [ms]*

task	gramm. voice	Dutch stimulus active	passive medial	passive final	passives (mean)	mean per task
repeating	retained	691	738	759	*748*	**728**
translation	retained	1465	1691	1798	*1743*	**1645**
MEAN		1039	1155	1218	*1186*	

Out of the 1040 (90%) acceptable translation responses, 34.5% translated actives, 33.6% participle-medial passives, and 31.9% participle-final passives. Only seven successful restructurings of Dutch passives as English actives were observed.

The low number of restructurings that were observed in the experiment will not allow a statistical analysis of voice changes (i.e. of structural priming). Hence, all restructurings are recategorized as 'other' productions, and excluded from further analysis.

Response times. The average response times (RTs) to the three experimental conditions in both tasks are shown in Table 5.3. As indicated in 5.3.5, above, RTs for some data points had to be excluded out of technical considerations, and they are not included in the average RTs shown in Table 5.3. In the repeating task, RTs had to be excluded for 4 actives, 10 participle-medial passives, and 9 participle-final passives; in the translation task, this concerned (respectively) 50, 56, and 55 data points.

RTs in the repeating task are always faster than RTs for translation. Similarly, mean RTs across passive conditions are always slower than those for the active condition; between the two types of passive, the participle-final passive always elicits higher RTs.

5.4.2 Analyses

Likelihood of responses

A first series of analyses was conducted to determine the likelihood of producing acceptable responses under experimental conditions could be influenced specifically by the constructions in which items appeared. For this purpose, the dependent variable had to be the proportion of acceptable responses out of all trials (see Table 5.2).

Thus, the proportions of acceptable responses per participant and per item were subjected to repeated measures Analyses of Variance with *source* as a three-level factor, and *task* as a two-level factor. Based on the findings shown in Table G.1, *verb frequency* was applied as a between-items factor in the corresponding analyses, while *sequence* (of experimental blocks) could be applied as a between-participant factor only in task-specific analyses.

Analyses find a significant effect from *task*, $F_1(1, 23) = 20.556$, $p < .001$, and $F_2(1, 91) = 28.107$, $p < .001$; reliable responses are more likely in the repeating task (estimate 97.1% per participant and per item) than in the translation task (estimates 90.3% per participant, 90.0% per item). There is also a main effect of *source* ($F_1(2, 46) = 17.339$, $p < .001$; $F_2(2, 182) = 14.777$, $p < .001$), but no interaction of task and source ($F_{1,2} < 1$).

Planned contrasts find that the likelihood to produce acceptable responses was higher after actives (96.6%/96.4%) than after passives in general ($F_1(1, 23) = 15.818, p < .01; F_2(1, 91) = 14.240, p < .001$). Additionally, responses to participle-medial passives were significantly more likely to be successful (94.9%/94.6%) than those to participle-final passives (89.6%/89.5%), with $F_1(1, 23) = 18.962$, $p < .001$, and $F_2(1, 91) = 15.236, p < .001$.

Between participants, the factor *sequence* had a small but significant influence on response reliability in the repeating task ($F(1, 22) = 4.480, p < .05$), indicating that response reliability was slightly lower in the first part of the experiment (96.0%) than in the second part (98.3%). However, *sequence* was not significant for response reliability in the translation task ($F(1, 22) = 2.282, p = .145$).

Between items, *verb frequency* was not significant on its own ($F(4, 91) = 1.771$, $p = .141$); however, it entered into a 3-way interaction with *task* and *source* ($F(8, 182) = 2.081$, $p < .05$) that suggested that the lower incidence of acceptable responses for translations of participle-final passives with low-frequency verbs was significant.

Response Latency

A second series of analyses was concerned with the influence of *task* and *source* on response latencies. The dependent variable here were the response latencies that had been found acceptable on phonological criteria (see Appendix A), did not represent an "other" construction, and — if from a translation — did not involve a change of grammatical voice (see Table 5.3).

Mean response times per participant and per item were subjected to repeated measures Analyses of Variance with *source* as a three-level factor, and *task* as a two-level factor. Based on the findings shown in Table G.2, *recent exposure* was applied as a between-participants factor in the corresponding analyses.

Analysis finds an effect of *task* ($F_1(1, 17) = 93.891$, $p < .001$; $F_2(1, 88) = 1067.71$, $p < .001$): responses were significantly faster in the repeating task than in the translation task. Another main effect is observed for *source* ($F_1(2, 34) = 22.438$, $p < .001$; $F_2(2, 176) = 22.507$, $p < .001$), and there is significant interaction between *task* and *source* ($F_1(2, 34) = 9.900$, $p < .001$; $F_2(2, 176) = 9.859$, $p < .001$).

Planned contrasts discover that, in the repeating task, actives were produced significantly faster than passives ($F_1(1, 17) = 5.701$, $p < .05$; $F_2(1, 95) = 5.396$, $p < .05$), but differences in latency were not significant where the repeating of participle-medial vs participle-final passives was concerned ($F_{1,2} < 1$). In the translation task, responses to active stimuli were again produced significantly faster than both types of passives ($F_1(1, 17) = 47.317$, $p < .001$; $F_2(1, 88) = 32.905$, $p < .001$). Here, however, planned contrasts found that responses to participle-medial passives were produced significantly faster than responses to participle-final passives ($F_1(1, 17) = 2.285$, $p = .149$; $F_2(1, 88) = 6.109$, $p < .05$). The latency difference for responses to the two types of passives approached significance even on the interaction of source and task was taken into account ($F_1(1, 17) = 1.636$, $p = .218$; $F_2(1, 88) = 3.821$, $p = .054$).

Between participants, *recent exposure* was not significant, $F_1(6, 17) = 1.157$, $p = .373$, and provided no significant interactions.

5.4.3 Discussion

The analysis of the likelihood to produce acceptable responses provides evidence that participants responded to the source sentences in similar ways, irrespective of the task they were in. Although the translation task made it more difficult overall to produce an acceptable construction, the absence of an interaction with *source* indicates that none of the source constructions was found more challenging to translate than the others. The weak effect of *sequence* suggests that data quality might be improved in subsequent experiments through introduction of a practice sequence prior to the experiment itself.

The analysis of response latencies shows that the repeating task is generally carried out faster than the translation task. In all instances, the mean latencies to produce actives were shorter than those for passives; differences between response latencies to the two passive sources were not found in the repeating task, but they were significant in the translation task.

In the following, findings from Experiment 1 are discussed in the order of the predictions in 5.3.4.

Repeating vs Translation. The finding that initiating the translation of a sentence takes generally more time than repeating it is in support of a horizontal model of translation. The increase in latency suggests that some additional and language-relevant (or even translation-specific) processing is taking place, in contradiction with the main architectural feature of vertical models of translation; see discussion in 4.1.2. This finding, however, cannot yet count as conclusive proof: the time difference between repeating in L1 and translation into L2 might still be due to generally higher response times if the selected (target) language is not the speaker's native language. The two main elements in a vertical architecture of translation are the systems of L1 and L2; no major other language-relevant processes are involved. Hence, all processing differences in such an architecture are due to differences in either L1 or L2; because L2 is generally less accessible than L1, a vertical architecture might account for the findings of Experiment 1 with generally longer production times in L2. (I will return to this issue in the discussion of Experiment 2, where latencies for translating from L2 are compared to latencies for repeating in L2.)

Response Types. The high degree of correlation for grammatical voice in source items and target productions during the translation task is entirely consistent with the expectation that untrained speakers should primarily follow a form-based translation strategy. The findings here indicate that a form-based approach to translation was widely prevalent in participants' translations in Experiment 1, in accord with expectations based on earlier studies of Natural Translation (see 4.1.4). Results suggest also that the participant group perceives strong pragmatic similarities between Dutch and English, as far as grammatical voice is concerned.

Response Times. Most importantly, the outcomes of Experiment 1 confirm the prediction that translation of Dutch participle-medial passives (structurally matched with the English passive target) should require less time than translation of (structurally non-matching) participle-final passives. In accordance with the mechanisms of language production and cross-linguistic influence that have been outlined in Chapter 2, this finding can be accounted for with the activation of syntactic patterns. To produce an English passive, it will be necessary to activate a syntactic frame that enumerates Aux-VPart-PP, in this order. In instances where the source is a Dutch participle-medial passive, a frame Aux-VPart-PP has just been activated in comprehension, and can be assumed to retain some residual activation, akin to the principles of syntactic priming. The fact that the semantics of all elements, and in particular those of the verb, are closely related or even identical, may support this effect further (the 'translation-equivalent boost'). However, in all production instances where the source is a Dutch participle-final passive, residual activation from comprehension is located at a frame Aux-PP-Vpart. Thus, the intended frame Aux-VPart-PP needs to aggregate more activation until it can be selected as (part of) the frame for a production that is acceptable by the standards of TL.

Notice that these results correspond closely with those of Bernolet et al. (2006), reported in 5.2 above. Their participants were less likely to produce English passives after Dutch participle-final passives, whereas participants in Experiment 1 took slightly longer to arrive at their English passive translations. While the experiment of Bernolet et al. (2006) describes the selection process in terms of its 'first past the post' outcomes, the latency observations of Experiment 1 provide additional insight into the activation requirements of the various candidate targets by indicating the length of selection processes.

To sum up, participants in Experiment 1 carried out a strictly controlled translation task. The constructions of the elicited translations corresponded in particular with predictions for form-based translation — the near-absence of structural variation within the elicited source-target pairs makes it hard to argue for priming or the Interface Hypothesis. However, response latencies correspond with predictions for on-line measures of priming. The observed variation in latency is not indicative of a change in grammatical construction, but only of a change in surface structure. This change can be described with equal plausibility as one in the 'literalness' of the translation, a change of the degree in which the target is based on the source. While participle-medial passives allow translation into normatively 'correct' English on a word-for-word basis, this is not possible for participle-final passives: here, translation with the same result requires a permutation of the surface structure, i.e. restructuring.

Any attempt to embed the observed phenomenon into the larger dichotomy of form-based vs meaning-based strategies would of course be unreasonable at this point. However, the notion of restructuring is integral to a considerable number of the constructions that have been studied in the context of priming: actives and passives can be converted into each other through a rearrangement (i.e. restructuring) of the order of syntactic functions; so can double object and prepositional object constructions; so can adjective and attributive NPs (Cleland & Pickering, 2003; Bernolet et al., 2007). In this sense, form-based translation (and the derived slightly-less-form-based translation, from now on 'non-form-based translation') offers an alternative perspective on the same range of phenomena. It underlines the necessity of clear categories for analysis of production outcomes, reducing in this way possible confounds from processes of sentence generation.

Taking into account current theories of bilingualism, Experiment 1 has combined translation and psycholinguistic theory, and has provided empirical measures of a phenomenon that relates to both syntactic priming and form-based translation. To my knowledge, this is the first occasion where an empirical effect of form-based translation has been observed on other than categorial or judgmental measures.

Apart from the evidence of priming in latency times, the strong identification of grammatical voice across the two languages in Experiment 1 could be a ceiling effect that is due to similar pragmatics for their use, or due to form-based translation, a combination of both, or even a ceiling effect for primed choice of grammatical voice. For sharper focus, the following experiment will look at a construction where pragmatic differences between source and target language are more clearly in evidence.

CHAPTER 6

Experiment 2: Dative Alternation

The previous chapter developed an experimental paradigm for the study of cross-linguistic influence in translation events, and tested specifically the resulting predictions for response latency. This was done using constructions with grammatical voice. In this chapter, I turn to another structural feature that has seen much research, the dative alternation (see 6.1). The choice of appropriate materials and participants is discussed in Section 6.2.

Experiment 1 found faster responses when source and target structures in translation were identical. It remains to be shown whether the choice of target structures depends on speakers' representation of the target language, or if it is a function of translation (see 5.3.4 and 5.4.3). For this purpose, Experiment 2 will compare translations in the same language direction by speakers of different L1s. General predictions for this experiment are outlined in Section 6.3. More detailed predictions for individual participant groups, however, are reported in the context of Sections 6.4 and 6.5, where results of the experiment runs for each group are presented and analysed separately. Section 6.6 will compare the two language-specific experiment runs to each other and discuss the results.

6.1 Ditransitives in English and German

The *dative alternation* is a well-known feature of English ditransitive verbs: their two objects (Theme and Recipient) may follow the verb in one of two possible orders. If the Theme (italicized in all examples) follows the Recipient *(24a)*, both objects are realized as as simple noun phrases; this is known as the double object construction (DO). If it is the Recipient that follows the Theme *(24b)*, only the Theme is kept as a simple noun phrase; the Recipient is embedded in a prepositional phrase. Correspondingly, this is known as the prepositional object construction (PO). (In all examples in this section, bold font indicates a morphological element that is not contained in a DO or dative construction, e.g. prepositions.)

(24a) **DO:** The uncle sells the pope *the bicycle*.

(24b) **PO:** The uncle sells *the bicycle* **to** the pope.

Researchers agree widely that the dative alternation fulfils a semantic-pragmatic function — further specifications have suggested a role in information structure (Quirk et al., 1985, p.1396; Levin, 2006, p.11), clarification of case semantics (Givón, 1993a, p.217), or the alignment of syntax and semantics (Huddleston & Pullum, 2002, p.248). Details, however, depend strongly on authors' approaches to English grammar in general, and in particular on their account for verbs like *to donate* which do *not* permit DO constructions (see Quirk et al., 1985, pp.1210–1211; Levin, 1993, pp.45–48).[1] For the purposes of this thesis, it will not be necessary to discuss possible accounts of the dative alternation in further detail: here, it is sufficient to know that the dative alternation has semantic-pragmatic causes — in other words, it belongs to 'interface syntax' in the sense of the Interface Hypothesis (see 3.2.1).

I will, however, follow the detailed distinction drawn by Levin (1993, p.49) between verbs that show dative alternation proper (using the preposition *to* in POs) and those with benefactive alternation (which use the preposition *for*). The benefactive alternation is frequently encountered with verbs that are commonly understood as monotransitives (e.g., "the student bakes his friends a pizza" from "the student bakes a pizza (*for* his friends)", "the manager bought the rockstar some cocaine" from "the manager bought some cocaine (*for* the rockstar)"). In other words, while indication of a recipient is obligatory with verb that show dative alternation, indication of a beneficiary is not equally necessary in the benefactive alternation. While dative-alternating verbs (in the active voice) are connected to two syntactic frames for ditransitive verbs, namely DO and PO,

[1] Givón (1993a) and Huddleston & Pullum (2002), for example, propose opposing views: While Givón (1993b, p.121; 1993a, p.216) describes DO constructions as the result of a promotion of a PO's recipient to direct object status, Huddleston & Pullum (2002, p.248) follow a definition of 'object' that makes it impossible to view POs as ditransitive constructions, and they treat them rather as monotransitives with prepositional complements.

benefactive-alternating verbs are also connected with a monotransitive representation, without violation of surface acceptability (e.g., "the man reads a story", "the manager bought some cocaine").

The dative alternation has been used to investigate syntactic priming in a considerable number of psycholinguistic studies (Bock, 1986b; Bock & Loebell, 1990; Pickering & Branigan, 1998; Potter & Lombardi, 1998; Bock & Griffin, 2000; Branigan et al., 2000; Corley & Scheepers, 2002; Chang et al., 2003; Branigan et al., 2006; Bock et al., 2007); it has even been suggested that the dative alternation might be more reliable as a vehicle of priming than the transitive alternation of active/passive (see Bock & Griffin, 2000, pp.183f, 187). In recent years, evidence has shown that it is possible to prime the production of ditransitive constructions in L2 English with priming sentences in various L1s where comparable constructions are available — e.g. Dutch (Salamoura & Williams, 2006; Schoonbaert et al., 2007), German (Loebell & Bock, 2003), Greek (Salamoura & Williams, 2007), Korean (Shin & Christianson, 2007), or Swedish (Kantola & van Gompel, submitted). Recent research by McDonough (2006) reports that speakers of L2 English can only be primed for PO constructions. These results, however, come from speakers from a variety of L1 backgrounds, with a bias towards L1 Chinese (McDonough, 2006, pp.187, 195). The research reported in Chapter 3 has shown that different L1 groups may systematically show different responses to the same type of L2 construction; thus, McDonough's (2006) generalization of her results must be considered as problematic.

Discussing the two constructions of the dative alternation, a recent paper by Levin (2006) points out that the first object in a PO can be compared to the object of a monotransitive verb, while this is not possible for the first object of a DO. Rather, Levin argues, the first argument of a DO should be compared to a dative NP in languages with dative case marking, such as German. Her theoretical claim may provide support for the cross-linguistic study of priming phenomena between English and German. Following Levin's (2006) claim, the remainder of this section will discuss the two constructions of German that correspond with those of the English dative alternation.

Levin (2006) likens the English DO to the German dative construction, which is the default syntactic environment for ditransitive verbs in German. As shown in *(25a)*, it contains no preposition, and its Theme follows the Recipient (see Kunkel-Razum & Münzberg, 2006, p.400). A small number of verbs, however, allows prepositional constructions where the Recipient is embedded in a prepositional phrase and follows after the Theme *(25b)*.[2]

(25a) **dative:** Der Onkel verkauft dem Papst *das Fahrrad*.

(25b) **prepositional:** Der Onkel verkauft *das Fahrrad* **an** den Papst.
"The uncle sells the pope the bike/the bike to the pope"

Importantly, argument structure in German is indicated not through syntactic position alone, but also through case marking: whereas the Theme always carries the accusative case, the recipient is marked with the dative case in a dative construction, and with the case that is appropriate to the preposition in a prepositional construction. Case, in its turn, is a strong predictor for the position of a complement in relation to the finite verb or auxiliary: by default, accusative objects are closer to the finite verb than prepositional constructions, while dative objects are closer to the verb than both Kunkel-Razum & Münzberg (2006, pp.882–3). (A more detailed discussion of word order with German ditransitive verbs will follow in Chapter 7.)

In the study of German, sentences such as *(25a)* and *(25b)* are not commonly described as alternating. Here, prepositional constructions are more commonly discussed as a possible result of an alternation between prefix and particle verbs (Kunkel-Razum & Münzberg, 2006, pp.698–714). This alternation is a frequent feature of German ditransitive verbs (see Olsen, 1995) and involves the presence and location of morphosyntactic markers on the verb itself or in its construction. This leads to the existence of — lexically apparently distinct — pairs of verbs, e.g. *entnehmen (X+dat. Y+acc.) /nehmen (Y aus X)* 'take Y out of X' (see example below), or *zuwerfen (X+dat. Y+acc.) / werfen (Y zu X)* 'throw Y towards X'.

(26a) Sie nimmt *die Schokoladenbonbons* **aus** der Dose.

(26b) Sie **ent**nimmt der Dose *die Schokoladenbonbons*.
'She takes the chocolates from the tin.'

[2] A word on terminology: I will refer to the two ditransitive constructions of English, shown in *(24a)* and *(24b)*, with the abbreviations 'DO' and 'PO' *only*. The two ditransitive constructions of German shown in *(25a)* and *(25b)* will be referred to as 'dative' and 'prepositional' *only*, supplemented with the specification 'construction' wherever necessary. All other uses of the terms 'dative' and 'prepositional' will be avoided.

A difference in the semantics of aspect or *aktionsart* between the two resulting forms of the root verb is variously seen as either the cause or the result of this morphosyntactic alternation. Arguing that the phenomenon should be discussed rather in terms of a productive derivation than in terms of a lexical distinction, Olsen (1995, p.76) reinstates an argument that its results should be seen as referring to *one* lexical entry, not two separate ones. In light of these semantic differences, the translation equivalents for these verb pairs may be far from unambiguous. For the time being, it appears apprpriate to avoid verbs from the German prefix-particle alternation in priming experiments.

There are not many monolingual studies of ditransitive priming in German; apart from two studies that have been more concerned with verbal valency structures (Scheepers & Corley, 2000; Melinger & Dobel, 2005), it has been used in a pilot study of Loebell & Bock (2003, pp.807–8) that employed the same experimental paradigm as Bock (1986b). There, dative priming in German is found to be similar to the findings for English in the earlier study. However, none of the discovered effects reached significance, probably due to the smaller number of participants in the pilot study. In addition to indications of a priming effect, the numbers reported by Loebell & Bock (2003, p.808) also show a strong preference for dative responses in German. (A similar observation is made by Melinger & Dobel, 2005, pp.B15–B16.)

The same bias for datives over prepositional constructions in German is encountered in Loebell & Bock's (2003) main study of cross-linguistic priming with speakers of L1 German and L2 English. Participants showed a strong overall tendency to use dative constructions when responding in German following an English prime. The authors suggest that this may be due to the more restrictive use of prepositional constructions in German. Interestingly, the same participants show the inverse bias when responding in English after a German prime; i.e. they are overall more likely to produce English PO constructions, although a cross-linguistic structural priming effect is still observed. Loebell & Bock make no attempt to account for this reverse effect.

6.2 Experiment 2: Practical Issues

In Experiment 2, speakers of L1 German and L2 English and of L1 English and L2 German repeated items in German or translated them from German into English. Experimental conditions corresponded to two possible constructions with

German ditransitive verbs, the (canonical) dative construction and the prepositional construction. Expected target constructions in the translation task were English DO and PO. This section describes the materials that were created and general alterations to the experimental environment, and outlines the principles of data processing that were applied.

6.2.1 Participants

Participants for Experiment 2 were found through posters and electronic advertising in the University of Edinburgh community and in the wider community of Germans and German speakers living in Edinburgh, and were paid to participate. Demographic information for, and a more detailed discussion of, each group is contained in the participants sections for each of the two experiment runs (Experiment 2a with L1 German in 6.4.1, Experiment 2b with L1 English in 6.5.1).

To retrieve information about participants beyond biographical data and self-judgements, language tests were applied to elicit an additional measure. Simple multiple-choice placement tests for orientation purposes were extracted from Transparent Language (2006) for English and German, to provide a rough estimate of participants' overall skills in these L2s. Tests were applied in written form.

6.2.2 Materials

The criteria laid out in 5.1.4 were also applied to the creation of items for Experiment 2. The selection of source verbs was restricted by requirements that they *a*) should allow the creation of grammatical source sentences (i.e. permit both a dative and a prepositional construction in German without a change in semantics); and *b*) should not allow monotransitive constructions — i.e., they should instantiate not the benefactive alternation, but the dative alternation (see discussion in Section 6.1, above; similarly, see the insistence on ditransitive predicates in Scheepers & Corley, 2000, p.437).

Based on a list of the 200 most frequent German verbs in Wängler (1963), application of these criteria led to selection of the verbs *liefern* "to deliver", *melden* "to report", *schicken* "to send", *senden* "to send [in formal way]", *übergeben* "to hand over", *verkaufen* "to sell", *vermieten* "to rent (out)", and *verraten*, "to tell [secretly; to betray]". (See also Table B.2 in Appendix B).

It will be noticed that the provisional translations that I have given for some of these verbs belong to the restricted group of English verbs that do not take DO constructions, which might be seen a potential skewing factor for translations in the experiment. However, the actual choice of verbs in translations is still up to participants; unrestricted higher-frequency alternatives (e.g., "to bring" and "to tell") are readily available; moreover, selection of structurally restricted alternatives for other verbs is equally possible (e.g. "to reveal" for *verraten*, or "to entrust" for *übergeben*). Finally, as observed on passive translations in Experiment 1, facilitation of response latencies can be observed even if there are no syntactic alternatives available. For these reasons, the existence of translation equivalents that support both DO and PO structures is not introduced as an additional requirement. Only 19 German verbs could be found that fulfilled the experimental requirements; of these, three had to be excluded for using different prepositions; of the remainder, the eight more frequent ones were selected.

Thus, two master lists were created, consisting of 32 items each, with each verb occurring four times in each master list. Each master list provided two lists of actual sentences so that each verb occurred twice in each condition (dative or prepositional construction) in each list. As before, each master list provided the trial items for one of the two tasks that each participant carried out, so that every participant saw every item exactly once. Each list occurred equally often in each task. Appendix C.2 lists the sentences that were used as experimental stimuli.

Notice that due to the restricted choice of verbs and their low overall frequency, it was not always possible to maintain a clear frequency difference between verbs and nouns, as recommended in 5.1.4. Based on the available frequency data, the verb had at least double the frequency of the first noun (the agent) in 39 out of 64 items; in another 16, it was of roughly the same frequency; and in 9 instances, a noun had to be selected that was more frequent than the verb. Hence, this maxim could only be applied as tendency in the creation of materials for Experiment 2, not as a principle.

Filler items were created as German adjectival NPs (consisting of Determiner + Adjective + Noun), or as long or short intransitive sentences (respectively with or without local or temporal complements). The frequency of nouns, verbs and adjectives was comparable to that of verbs and nouns in experimental items, but no segment from fillers was repeated in trials. Fillers in Experiment 2 are listed in Table D.2 in Appendix D.

As in Experiment 1, additional noun features were considered or kept under control. These are:

- *determinacy*: all NPs in Experiment 2 were determinate (there are additional acceptability restrictions for source constructions with indeterminate objects)
- *animacy*: all Agents and Recipients were human, Themes were not; each master list contained only two items with Themes that were animate but not human
- *grammatical gender*: Agents occurred in all three grammatical genders of German; Recipients and Themes were restricted to masculine and neuter genders. Articles for these genders allow unambiguous resolution of case assignment in the experimental constructions (article *dem* in dative case, *den/das* in accusative case or after the relevant prepositions)

6.2.3 Procedure

To minimize background noise in recordings, the sessions for this experiment were carried out in the recording studio of the Department of Linguistics and English Language at the University of Edinburgh. Participants were seated in a soundproof booth with a computer screen, a keyboard, and a pair of loudspeakers, all connected to the computer that carried out the experiment script. A microphone was connected to a separate computer for sound recording. As before, loudspeakers produced a low beep 500ms before a new source item was displayed by the program script (i.e. if participants had not called up the new item themselves). Selecting their own convenient viewing position, participants' distance from the screen (and the microphone) was 50-100cm. As in Experiment 1, participants would first see the source item for a restricted time, then have a restricted time window to produce a response (translation or repetition), then see the next item either after expiry of the production window or after pressing a key (see Figure 5.1 in Chapter 5.1). The two tasks followed each other again in random order across participants, and trials in each task occurred again in random order, interspersed with 1–2 fillers. Based on pilot tests, exposure and production times for Experiment 2 were set to 1400ms and 12000ms, respectively.

As before, participants were merely instructed to "repeat or translate" so that intuitive strategies of Natural Translation could be elicited. Instructions in introductory screens (see Appendix E.2) avoided processing cues, as before. Along with the explanation that the experiment was concerned with spontaneous outcomes of translation, participants were explicitly encouraged to "use the first word that would cross their mind". This instruction was intended to add to their focus on aspects of meaning on the level of the word, distracting them even further from structural processes. A practice session of 22 items (listed in Appendix D.2) preceded the actual experiment. This allowed not only fine adjustment of the recording equipment, but was also intended to reduce the practice effect that had been observed between first and second task in Experiment 1. No items occurred during the practice session that contained one of the critical constructions. The experimenter left the booth for the actual experiment to supervise the recording. The script left a break of unspecified length for self-paced recuperation between tasks. From the beginning of the first task to the end of the second, recording sessions lasted 8-17 minutes.

After the experiment, participants carried out an unspecific test of their L2 skills as described above (6.2.1), and provided, as before, information about their language biography through a questionnaire (Appendix F). Experimental sessions comprised, in this order, the experiment proper, the L2 test, the background questionnaire, and the final debriefing. In total, they lasted 35–75 minutes.

6.2.4 *Scoring*

Experiment sessions were recorded, transcribed, and each trial response was categorized for the structure that it contained. For the repeating task, all utterances that did not correspond to one of the source constructions were tagged as type "other". In the translation task, items that could not be clearly identified as representing a DO or a PO were tagged as type "other".

To determine response times, the recordings were again processed as described in Appendix A, with an added procedure to reduce data losses, outlined in Table A.2.

Specific note was taken of the verbs that were used in target productions. As pointed out in 6.2.2, utterances with non-alternating verbs (following Levin, 1993, pp.46–47) might distort response type data, and were excluded from analyses of construction choice (but not of latency).

It will be observed that this exclusion of target verbs may lead to a severe bias in data, if individual source verbs have elicited a large number of non-alternating responses. For this reason, an additional ruling was introduced that items should be excluded if more than 25% of their acceptable responses had to be excluded solely on grounds of containing an alternating verb. Like non-alternating responses, items are only excluded from analyses of construction data.

6.2.5 *Design and data analysis*

In both experiments, each participant responded to all experimental items, repeating one half and translating the other in separate tasks. Each item was seen only once by each participant. Each item was seen eight times in each of the two conditions, four times in each of the two tasks. Thus, every participant and every item contributed equally to all cells in the analysis. In each of the two possible task sequences, each list of source sentences occurred equally often in each task.

As in Experiment 1 (see 5.3.6), a first approach to experimental data is taken through a 2-stage Least Square linear regression, estimating the contribution of other predictors to variance of analysed measures.

A first analysis considered the question whether the different amounts of acceptable responses to the two *source* constructions indicated specific problems with the processing of either, in general or in one specific task. This was carried out as a repeated measures Analysis of Variance on all data provided, using the proportion of acceptable responses as a measure. Two sets of analyses were carried out, treating participants as the random factor in one, items in the other. The analysis followed a 2×2 design, using *task* (repeating vs translation) and *source* (dative vs prepositional) as factors both within participants and within items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

The second step of analysis was concerned with the distribution of *target* constructions in participants' productions. The repeating task, almost by definition, can be expected to provide occurrences close to 100% for the *target* that corresponds to the *source*, and will not be included in the analysis. Thus, the analysis is a repeated measures Analysis of Variance, using as its measure the proportion of PO productions per source construction among all acceptable responses in the translation task only. As before, two sets of analyses were carried out, treating participants as the random factor in one, items in the other. Analyses treated *source* as a 2-way factor both within participants and within items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

Because *target* construction (DO vs PO) is a dependent variable itself (and thus cannot be assumed to be distributed normally), latency data — presumably depending on processing times for *source* and *target* — cannot be subjected to an Analysis of Variance. Instead, I apply the analysis technique of Linear Mixed Effects modelling, as described by Baayen (2008) and applied e.g. in Jones et al. (2008).[3] Models will treat response time (*RT*) as the dependent variable. Fixed effects are calculated using the three 2-way factors of *task*, *source*, and *target*, with random effects from participants and items. One stage of modelling attempted to include the predictors found from Linear Regressions into the random effects for participants and items. Predictors that were not found contributing to the model were dropped.

Finally, application of a Linear Mixed Effects model led to another problem: the underlying assumption of a 2×2×2-model (*task*×*source*×*target*) is not appropriate; two of the resulting eight data cells are systematically empty due to the particular characteristics of the repeating task. To resolve this problem, a new 3-way factor *event* is created by collapsing *task* and *target*. I argue that this approach is appropriate because *source* is entirely identical across both tasks, whereas the values of *target* differ systematically, depending on *task*. The resulting new factor *event* has three levels: *a*) repeated argument order in repeating task, *b*) repeated argument order in translation task (i.e. primed translation), and *c*) changed argument order in translation task (i.e. non-primed translation). Notice that primed events for both types of *source* are collapsed into one level of *event*, and will be distinguishable where necessary through their interaction with *source*.

Because the factor *event* is applied only *post hoc*, and is not integral to the experiment, I will follow a conservative step-by-step approach similar to that outlined above for construction data. Thus, first only latency data from the repeating task is analysed, using only *source* as a fixed effect. Then, only latency data from the translation task is analysed, using *source*, *target*, and their interaction as fixed effects (in a 2×2 design). Only then, data from both tasks together is analysed, using *source*, *event*, and their interaction as fixed effects (in a 2×3 design). The dependent variable *RT* is entered into the analysis not directly,

[3] All Linear Mixed Effects modeling reported in this thesis was carried out using the software package R, version 2.5.1 (R Development Core Team, 2007).

but in its loglinearized form, following the recommendations of Baayen (2008, pp.30–31).

Like Analyses of Variance, Linear Mixed Effects Models indicate effects on dependent variables from experimental manipulations. Known random factors (in the experiments reported here, participants and items) are taken into account and partialled out of the overall variance; then, the contribution of the dependent ('fixed') factors to overall variance is calculated. To indicate the effect sizes in any one model, one effect must be selected as a comparison for the others (the 'intercept'). For the models that are presented in this thesis, I choose translations of datives into POs as the comparison effect — priming predicts no effects for these events. (For Linear Mixed Effects Models of the repeating task, the comparison are repetitions of datives.) This particular intercept is chosen partially with a view on the translation data, where the majority of translations are PO constructions, partially with a view on continuity with later experiments, in which datives are paired with other constructions. In other words, this combinations of factors can provide an effect-free and stable (because of group size) backdrop for more interesting combinations.

The general results of Linear Mixed Effects Models will be reported in this thesis in the form of figures that show the relative effect size for all combinations of the variables that are predicted as having an effect on response latency (i.e. *source* and *target* resp. *event*, where no larger comparisons between experiments are made). The significance of the calculated effects will be indicated in figures by asterisks, in the main text through indication of a t-statistic and a p_{mc}-value. t is calculated from the model and corresponds to the outcome of a t-test. However, calculation methods for the degrees of freedom for a t from a Linear Mixed Effects model are still under development (Baayen, 2008, pp.247–248). Markov Chain Monte Carlo sampling is a recommended alternative method of validation, and will also be used in this thesis (with $n = 50,000$ simulation runs). It provides a p_{mc}-value that indicates the likelihood with which simulated data points may take a value that exceeds the effect size estimated by t. Figures will represent the tested effect sizes from simulations rather than the calculated ones from the model.

Factors that were found as additional predictors of response latency through Linear Regression were generally kept out of the main model and served to improve the data fit of the random effects, wherever applicable. Although not directly accessible for meaningful further analysis, their presence may be of relevance, and their indication is an integral part of the results of a Linear Mixed Effects model.

Because the reaction times in each participant's data can be expected to show traces of individual characteristics at the time of participation, a last observation will have to concern the possibility of habituation effects in these data. The need to switch constantly back and forth between L1 and L2 may be experienced by some speakers as a cognitive strain that slows down their reactions as the experiment proceeds. Others may find this particular bilingual mode to be less of a challenge and 'warm to the task' — i.e. their reaction will speed up. In consequence, the average RTs from these two groups can be expected to diverge more and more as the experiment progresses.

As pointed out by Baayen (2008, p.276), data that contains this type of progressive task effect may lead to distorted analysis results. This can be remedied most easily if the variable in question is 'centered' (i.e. recoded to have zero as its centrepoint rather than at its left boundary). If subsequent analyses show a significant effect of the random factor *trial* nevertheless, this will indicate that habituation effects are influenced by some characteristic of task or participants.

6.3 Predictions

General expectations for this experiment concern — as before — *RT* differences between tasks in general, *target* productions in response to *source* constructions, and *RT* for different types of translation events.

Task differences: Both participant groups are expected to show shorter response latencies in the repeating task of Experiment 2. The expectation is based on the assumption of additional instances of processing that are involved in translation. Findings from L1→L2 translations in Experiment 1 could not be entirely conclusive and allowed for an alternative account through generally increased response latencies in non-native languages. Such an account would predict longer latencies for repeating in L2 than for translations L2→L1 — i.e., the overall time requirements in the two tasks should be different between the two participant groups (see Prediction 1 in 5.3.4 and the discussion of pertaining results in 5.4.3). If, on the other hand, there is no significant difference between L1 groups with respect to RT differences between the two tasks, accounts of translation skill as a function of language proficiency can be conclusively excluded.

Response Types: In Experiment 1, participants showed only marginal alternation between the active and passive constructions. At this point, it is not clear whether a similar lack of variation can be expected in Experiment 2 — if so, this would provide evidence of a very strong preference for form-based translation in untrained translators. If not, however, then the findings from priming experiments (see 2.1.2) predict that previous comprehension should facilitate features for their use in the following production. Specifically in the translation task, this would mean that the structural intake of a source primes structural features of the target production. Hence, if there is variation in target productions, DO targets should occur more frequently after dative sources, and PO targets more frequently after prepositional sources. As shown in 4.1.4, this effect is also suggested by observations in Translation and Interpreting research, where the effect is often described as form-based translation (Barik, 1971; Lörscher, 2005; Mauranen, 2006). If the produced constructions vary, different performance patterns from the two groups may be expected, following from the Interface Hypothesis — the use of dative and prepositional constructions in German, and of DO and PO in English, is conditioned by semantic and/or pragmatic features, which cannot be acquired by non-native speakers to their full extent (see 3.2.1). Expectations for each group will be discussed in more detail in the introductory paragraphs for the individual experiments (6.4, 6.5).

Response Times: As in Experiment 1, shorter response latencies should be evident for facilitated productions than for unfacilitated ones. This means that faster reaction times should be measured in instances where a dative is translated as a DO or a prepositional construction as a PO, than when a dative is rendered as a PO or a prepositional construction as a DO. The reasoning for this prediction is the same as in the previous experiment (see 5.3.4).

6.4 Experiment 2a: L1 German

In this part of Experiment 2, native speakers of German will repeat (L1-L1) or translate (L1-L2) German dative and prepositional constructions.

The findings from cross-linguistic research with L1 German speakers that have been reported in section 6.1 allow some clear expectations for outcomes of the translation task in this part of the experiment — not clear, however, is whether and how the various factors will interact that may be applicable.

Loebell & Bock (2003) discovered in their main and pilot studies that speakers of L1 German showed a strong preference for dative constructions in subsequent picture descriptions in German, irrespective of whether they had been primed with German dative and prepositional constructions (in the monolingual pilot study) or with English DOs and POs (in their main study). Similar results in a monolingual task were found by Melinger & Dobel (2005). Both teams of authors point out that the dative appears to be the preferred construction in German (see Loebell & Bock, 2003, p.807; Melinger & Dobel, 2005, p.B16). If this is correct, then some reflection of this preference may be expected in the experiment, either in the shape of higher response rates or overall lower response latencies after dative sources (or both).[4]

On the other hand, Loebell & Bock's (2003) L1→L2 priming experiment showed a strong preference among L1 German speakers for PO constructions in English. At this point, no psycholinguistically conclusive account for this inverse effect has been offered; however, as participants are free to select the target constructions of their translations, this may predict a higher incidence of PO targets, and possibly also of lower overall response latencies for these constructions. This prediction appears also plausible in the light of McDonough's (2006) findings according to which only POs can be primed in L2 English (however, see 6.1 for theoretical reservations).

Hence, if L1 German speakers are biased towards datives and POs, then the combination of these two constructions, i.e. translation of (German) dative sources into (English) PO targets, might be particularly facilitated. However, this expectation would contradicts the predictions for Response Times under an account of primed production. Opposed to that, general expectations for priming in translation predict lower RTs in instances of structural priming, i.e. when German datives are translated into English DOs, or German prepositional constructions into English POs. Instances where datives are translated into POs should be clearly slower.

[4]The corpus studies of Keller (2001) or Kempen & Harbusch (2004) are not directly relevant to the discussion here; they are concerned only with the ordering of direct and indirect object clauses, but do not cover prepositional objects.

Table 6.1: *Experiment 2a: Participant demographics*

	Range	
participants		16 (2M)
age (years)	19–41	(mean: 26.1)
years learning English	7–30	(mean: 16.0)
self-rating (1–7, 7=best)	3.5–7	(median: 5.4)
self-rating: L2 reading (1–7, 7=best)	2–7	(median: 6)
self-rating: L2 listening (1–7, 7=best)	4–7	(median: 6)
self-rating: L2 speaking (1–7, 7=best)	2–7	(median: 6)
self-rating: L2 writing (1–7, 7=best)	4–7	(median: 6)
recent use (1–7, 7=most)	6–7	(median: 7)
time of residence (months)	2–200	(median: 18)
test results (percentages)	76–100	(mean: 89.3)

6.4.1 Participants

Natively monolingual speakers of L1 German with L2 English were found as participants for Experiment 2a as described in 6.2.1, above. No participant had any formal training as a translator or interpreter. Table 6.1 lists biographic details and self-judgements elicited from the post-experimental questionnaire, and also percentage results of language tests (see 6.2.1).

All participants reported knowledge of 1–3 additional languages, most commonly French (15) and Spanish (5). Twelve of them reported occasional translation activities for personal or professional needs.

As in Experiment 1, some participants of Experiment 2a reported in debriefing sessions that they had developed reading strategies to cope, and many had noticed that "the long sentences" appeared to be of particular interest. Several participants noticed the alternation between prepositional and default dative constructions in the sources, and were not surprised to hear that the experiment focussed on these. One participant pointed out that he had consciously used only PO target constructions, i.e. applied a conscious translation strategy. For purposes of the analysis, data from this speaker was replaced with data from another speaker who had applied no structural strategy.

6.4.2 Results

Table 6.2 shows the response type counts for all productions after application of the exclusion criteria that were outlined in 6.3. With respect to the issue of verbs with set constructions mentioned in 6.2.4, four non-alternating verbs

Table 6.2: *Experiment 2a: Response types*

task	construction produced	German source dative	German source prepositional	TOTAL
repeating	dative	215	0	**215**
	prepositional	0	211	**211**
	other	9	13	**22**
translation	DO	48	4	**52**
	PO	117	168	**285**
	other	59	52	**111**

(according to Levin, 1993, pp.46–47) are encountered in 47 translation responses to Experiment 2a and must be excluded from construction analyses (11.5% of all acceptable responses). These are: "to announce" (in 2 translations of *melden*), "to deliver" (in 37 translations of *liefern*, 2 of *übergeben*, 1 of *verraten*), "to report" (in 4 translations of *melden*), and "to reveal" (in 1 translation of *verraten*). The verb "to deliver" was twice encountered in DO constructions, but was excluded in all instances nevertheless. Thus, nearly 60% of all acceptable translations of the verb *liefern* involve a non-alternating verb; all items using this verb are excluded from construction analysis, as ruled above (see 6.2.4).

As a side observation, 11 responses in this experiment corresponded undisputably to acceptable constructions in the respective task morphologically, but had to be scored as 'other' because their constructions differed from the patterns shown in (24a–25b). Thus, the produced argument order of a prepositional construction was repeated as a dative with inverted argument order *"Der Schreiber liefert* ***die Frucht*** *dem Fuchs"* ('The writer brings **the fruit** the fox (dat.)'); another dative construction was translated as: "*the writer is sending to the boy the blanket*". This kind of changes in argument orders involved 1 dative repetition of a dative source, 5 dative repetitions of prepositional sources, 1 DO translation of a prepositional source, and 4 PO translations of dative sources.

Response Type. As shown in Table 6.2, 426 (95.1%) of the responses in the repeating task were acceptable, and only 4.9% rated as 'other'. 50.5% of all acceptable repetitions involved a dative construction (see 25a), and 49.5% a prepositional construction (see 25b).

Out of 337 (75.2%) acceptable translation responses, 49.0% translated a dative (36.8% of all), and 51.0% translated a prepositional construction (38.4% of all). A strong overall preference for English PO constructions is discernible — they

Table 6.3: *Experiment 2a: Mean Response Times [ms]*

task	construction produced	German source dative	German source prepositional	mean
repeating	dative	1031	n.a.	1031
	prepositional	n.a.	1050	1050
	mean	1031	1050	
translation	DO	2472	2517	2476
	PO	2787	2617	2687
	mean	2698	2615	

Note: *n.a.* identifies systematically unrepresentative response cells in the repeating task.

are encountered in 63.6% of all translation responses, while only 11.6% are DOs. (24.8% are "other" constructions.) At that, DO targets occur predominantly after dative sources (92.3%), while PO targets are more frequent after sources with prepositional constructions (58.9%).

Response times. Table 6.3 shows the mean response times (RTs) to the experimental conditions in both tasks. As before, a number of data points had to be excluded out of technical considerations. These are not included in the mean RTs shown in Table 6.3. In the repeating task, this concerned 3 dative responses and 5 prepositional responses; in the translation task, 10 translations of datives into DOs and 18 into POs had to be excluded, and also 28 translations of prepositional constructions as POs.

6.4.3 Analysis

The following analyses were carried out according to the principles presented in 6.2.5.

Likelihood of responses

An overview of the significance of participant- and item-specific predictors is given in Table G.3 in Appendix G.

Considering the likelihood of acceptable responses under experimental conditions, repeated measures Analysis of Variance finds a significant effect from *task* ($F_1(1, 14) = 34.006, p < .001; F_2(1, 50) = 16.573, p < .001$), but not *source* ($F_1(1, 4) < 1; F_2(1, 57) < 1$). There is no interaction between *task* and *source*, either ($F_1(1, 14) =$

2.364, $p = .146$; $F(1, 57) < 1$). Thus, most importantly, successful responses were significantly more likely in the repeating task, at estimated 95.6% by participants and 94.0% by items, than in the translation task (by participants, 76.1%; by items, 77.2%).

Between participants, the degree of *recent immersion* in the L2 environment was no significant predictor of their overall ability to respond ($F(1, 14) = 1.221$, $p = .288$).

Between items, the *frequency of the verb* had a weak influence on whether or not an acceptable response ensued ($F(3, 50) = 3.901$, $p < .05$). This effect varied between tasks ($F(3, 50) = 4.211$, $p < .01$): while all verbs provided 91.7%–95.2% acceptable responses in the repeating task, only the two low-frequency verbs achieved estimates of more then 80% acceptable responses during the translation task. The five more-frequent verbs provided only an average 65.5%. The *frequency of first noun* did not have any significant effect ($F(2, 50) = 2.347$, $p = .106$), but was found to interact with *task* ($F(2, 50) = 3.584$, $p < .05$). While acceptable responses in the repeating task dropped from an estimated 88.2% after more frequent nouns to 82.7% after less frequent ones, rates in the translation task dropped from 91.6% to 74.5%.

Construction

An overview of the significance of participant- and item-specific predictors is given in Table G.3 in Appendix G.

The data reported in Table 6.2 gives the impression of a strong overall preference for PO constructions in the translation task. However, a repeated measures Analysis of Variance of *target* productions indicates that there is still a main effect of *source* ($F_1(1, 15) = 14.128$, $p < .01$; $F_2(1, 49) = 25.182$, $p < .001$). Thus, POs will occur as translations of dative constructions in an estimated 70.6%/72.3% of all acceptable responses, but at 97.8%/97.5% in response to a source that is a prepositional construction.

No participant-specific factor was found relevant for this analysis. **Between items**, the *frequency of verbs* was found to have but a marginal effect on construction choice ($F(3, 49) = 2.789$, $p = .050$): POs were most likely after the two least frequent verbs (95.3%), but least likely after after the three second most frequent verbs.

Latency

Before carrying out a more detailed analysis through Linear Mixed Effects modeling, a repeated measures Analysis of Variance was carried out on loglinearized latency times for possible evidence of differences in latency due to characteristics of the source constructions. Two analyses were carried out, respectively treating participants and items as random factors. Both analyses used a 2×2 design and used *task* (repeating vs translation) and *source* (dative vs prepositional) as factors both within participants and within items.

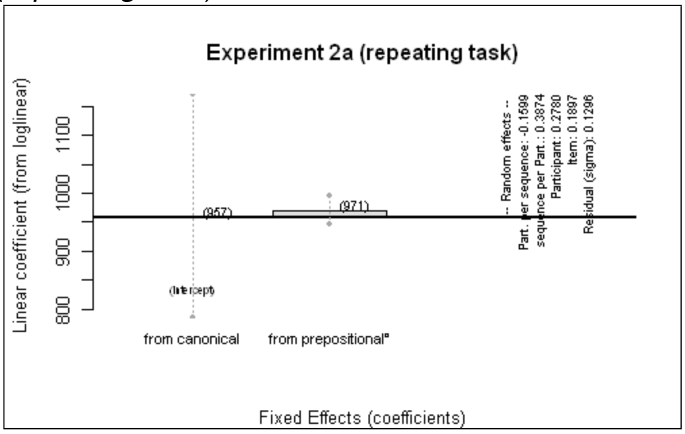
This found a significant effect of *task* ($F_1(1, 15) = 110.926$, $p < .001$; $F_2(1, 56) = 1225.726$, $p < .001$), but not of *source* ($F_{1,2} < 1$). Nor was there evidence of any significant interaction between the two factors ($F_{1,2} < 1$), which allowed to exclude even task-specific latency effects from *source* constructions.

In the repeating task, an analysis of latency data through Linear Mixed effects found that no effect from *source* had been observed ($t = 1.48$, $p_{mc} = .139$, as shown in Figure 6.1.

Analysing data from the translation task of Experiment 2a (see Figure 6.2), the analysis finds that instances where a dative was translated as a PO were not significantly different from those where a prepositional construction was rendered as a PO ($t = -0.65$, $p_{mc} = .515$, or a dative as DO ($t = -0.52$, $p_{mc} = .602$. Translations of prepositional constructions as DOs are not significantly different from what is expected on the basis of translations of prepositional constructions or into DOs alone ($t = 0.68$, $p_{mc} = .498$.

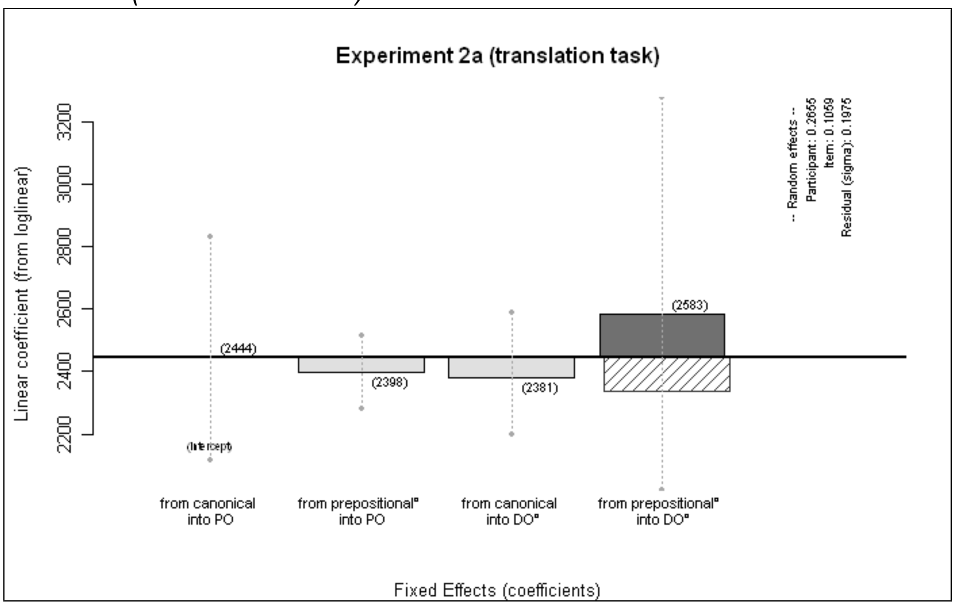
Considering latency data from Experiment 2a as a whole (see Figure 6.3), analysis discovers no significant differences between the two types of translations into unprimed structures ($t = 0.36$, $p_{mc} = .716$. There is no significant difference between the translations of datives into primed or unprimed constructions ($t = -0.05$, $p_{mc} = .963$. The effect of primed translations of prepositional constructions is not significantly different from what can be expected on the basis of their components ($t = -0.43$, $p_{mc} = .668$. The repeating of datives was significantly faster ($t = -10.24$, $p_{mc} < .0001$), while the repeating of prepositional constructions was not significantly different from what could be expected on the basis of its components ($t = -0.15$, $p_{mc} = .883$.

Figure 6.1: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2a (repeating task)*



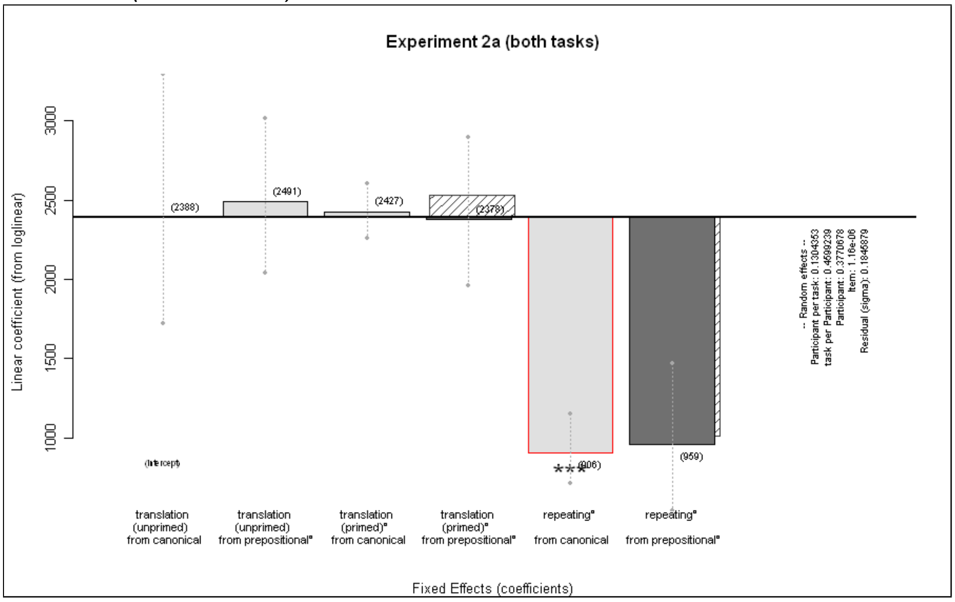
Note: The estimate for one level (canonical dative construction) of the fixed effect condition *source* in the repeating task is compared to the other (prepositional construction). Predicted values, representing response latencies in milliseconds, are provided in parentheses. Error bars denote 95% confidence intervals, and are derived from Markov Chain Monte Carlo simulations (see 6.2.5). Variance for random effects and the model's residual variance are indicated on the right.

Figure 6.2: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2a (translation task)*



Note: The comparison effect (see 6.2.5) in this Figure is the translation of canonical dative sources into PO targets. The effects of two fixed effects conditions (*source* and *target*) are shown in relation to it. Each column represents one combination of the factors' possible values and is labeled for all relevant factors. "°" indicates factors that are different from the comparison effect and contribute to the column's height. Where more than one factor differs from the comparison, the relevant contrast is indicated by a striped outline "ghost bar" that shows the sum of the involved fixed effects without interaction, while the solid bar includes the interaction. Notice that, in these cases, it is the 'ghost bar' that indicates the relevant contrast for the effect's confidence intervals. Thus, the present graph shows, from left to right, the comparison effect, the relative effect of *source*, the relative effect of *target*, and the interaction of *source* and *target*. In all other respects, see note for Figure 6.1.

Figure 6.3: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2a (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. In all other respects, see notes for Figure 6.1 and Figure 6.2.

Finally, the Linear Mixed Effects models of response latencies in Experiment 2a show no significant effect of *trial* as a random factor: no habituation effects are in evidence for this group of participants.

6.4.4 Discussion

The repeating task of Experiment 2a provides no evidence — neither in terms of production nor of latency — of the processing differences among speakers of L1 German between dative vs prepositional constructions that had been expected on the basis of the reports of Loebell & Bock (2003) and Melinger & Dobel (2005). Their work, however, required speakers to generate conceptual structures for utterances; Experiment 2a did not. Hence, I conclude that the reported preference for datives is related rather to processes of conceptual processing than of language production.

In the translation task, a preference for POs in L2 English in speakers of L1 German is in clear evidence (by more than 5:1) from the selection of target constructions during the translation task, similar to the findings of Loebell & Bock (2003). Unlike German datives, a bias towards English POs appears to be a clear feature in the language production of speakers of L1 German. In agreement with this is also the finding of structural priming — despite the general bias towards English PO, translations into PO targets are more frequent after German prepositional source constructions, while DO targets are more likely to occur after dative sources.

Having observed structural priming in translation, it is time to consider form-based translation as an alternative account of the production that has been observed. From this perspective, the data collected in Experiment 2a is remarkable because it appears to indicate different susceptibility to form-based translation for the two source constructions. A plausible explanation may involve the preference for the dative construction that had been reported in monolingual studies: being 'preferred', datives may be easier to process on the intake, thus leaving more resources available that allow retrieval of the non-parallel PO structure for translation. Notice, however, that an account that is based on the assumption that form-based is a strategy of translation that is characteristic for untrained translators cannot explain satisfactorily why it was possible to observe a phenomenon of effort economy so reliably with *untrained* translators. It might be possible to argue that my findings still indicate a high degree of form-based translation, and predict that the effect should be significantly weaker in professional translators. However, the absence of an effect from *source* in the repeating task, and the fact that the dative preference had been observed in tasks of language *production*, provide the most serious cognitive arguments against a form-based account of phenomena that appear to show priming in translation. For the time being, I leave the issue unresolved, and return to it in the following chapter.

A remarkable feature of the results from Experiment 2a is the absence of measurable effects from latency data (apart from the faster production of repeating responses, in comparison to the translation task). With only construction choice available as a measure of priming, however, further evaluation of McDonough's (2006) claim that L2 speakers of English can only be primed for POs is not possible at this point. The underspecification of the retrieved latency data with respect to the experimental conditions may have several reasons:

- As shown in Table 6.2, the strong preference for PO translations makes DO translations relatively scarce. Adding the priming effect, one cell of the results table (and also of the latencies in Table 6.3) is filled by only four data points. This has no influence on the reliability of Linear Mixed Effects models, but leads to a further spread of confidence intervals, making it less likely to discover existing effects.

- Analyses of response likelihood and construction discover a weak effect of *frequency of the verb*. In particular in view of the irregular pattern of PO translations across verb frequency bands (see discussion under construction analysis), it appears possible that the verbs that were used had triggered some item-specific lexical effects that led to their processing through conceptual rather than lexical guidance (see p.99).
- Lastly, analyses of response likelihood have suggested that the *frequency of the first noun* has had some influence in the outcome of this experiment. This is particularly worrying because it hints at conceptual guidance (see 5.1.4) during the process of translation — i.e. participants may have processed argument structures first, before verbs. This is a concern, because the response latencies that result from incremental processing under conceptual guidance are likely to reflect more clearly the processing time for the first noun phrase only, rather than the sentence as a whole. This suggests that a more relaxed approach on frequency, as it had to be taken in this experiment (see 6.2.2), should be avoided if latency data is to be evaluated.

With respect to the general predictions for Experiment 2 (see 6.3), it is possible to observe even at this point that responses in Experiment 2a, different from those in Experiment 1, show some variation in construction choice — a prerequisite for predictions concerning changes of the type that the Interface Hypothesis is concerned with. Thus, a different pattern of construction choice is now expected from Experiment 2b. (A detailed comparison and discussion of the results of Experiments 2a and 2b will follow in 6.6.) The results of Experiment 2b may also help to further explore various issues surrounding latency measures.

6.5 Experiment 2b: L1 English

In this part of Experiment 2, native speakers of English repeated (L2-L2) or translated (L2-L1) German dative and prepositional constructions. Hence, translations were carried out in the commonly preferred working direction of professional translators, as discussed in Section 4.1.5). There, I have also pointed out possible connections of directionality with the findings of Schoonbaert, Hartsuiker, & Pickering (2007), indicating absence of a 'translation-equivalent boost' in priming from L2 to L1, even though a priming effect is still observed. For Experiment 2b, this could predict a weaker priming effect; however, weaker

Table 6.4: *Experiment 2b: Participant demographics*

	Range	
participants		16 (6M)
age (years)	18–33	(mean: 22.7)
learning age (yrs since onset)	1–21	(mean: 10.5)
self-rating (7=best)	3.75–7	(median: 5.1)
self-rating: L2 reading (1–7, 7=best)	4–7	(median: 5.5)
self-rating: L2 listening (1–7, 7=best)	3–7	(median: 6)
self-rating: L2 speaking (1–7, 7=best)	4–7	(median: 5)
self-rating: L2 writing (1–7, 7=best)	2–7	(median: 4)
recent exposure (7=most)	1–7	(median: 5.5)
time of residence (months)	2–192	(median: 12)
test results (percentage)	62–99	(mean: 86.5)

priming should be discernible only in relation to other experiments that study the same priming phenomenon — here, in subsequent comparison with results from Experiment 2a. Apart from that, there are no other known influences or preferences for production comparable to what was observed in Experiment 2a. Thus, target productions in Experiment 2b were expected to show no particular bias towards either target construction, but still an effect of priming (or form-based translation) that leads to a preference for responses in which the target construction's argument order matches that of the source. Following the observations in Experiment 2a, I consider latency effects in Experiment 2b to be mostly of exploratory value.

6.5.1 Participants

Paid participants for Experiment 2b were found in the same fashion and from the same population as those of Experiment 2a (see 6.2.1). All were natively monolingual speakers of L1 English with L2 German without formal training as translators or interpreters. Considering that all participants in Experiment 2a were resident in the country of their L2 at the time of the experiment, a minimum requirement was introduced for participants in Experiment 2b to have at least one month experience of living in a German-speaking environment. Biographic details were elicited as before and are listed in Table 6.4.

All participants reported knowledge of 1–5 additional languages, most commonly French (12), Spanish (5), and Russian (3). Twelve participants reported occasional translation activities, mostly for educational reasons, but also occasional personal purposes. One of these had also carried out a paid translation job solely on the basis of his qualification as a bilingual.

Being non-native speakers of the source language, participants in Experiment 2b reported a greater challenge from the requirement to read the source texts within the given time window than participants in previous experiments. While "the long sentences" were commonly pinpointed as being particularly problematic, no particular concern with the constructions involved was reported.

6.5.2 Results

Table 6.5 shows the result counts for all productions after filtering through the exclusion criteria outlined in 6.3. Five verbs that are indicated as non-alternating by Levin (1993, pp.46–47) are encountered in 38 translation responses to Experiment 2b (12.9% of all successful ones); they are: "to announce" (in 3 translations of *melden*), "to deliver" (in 22 translations of *liefern*), "to explain" (in 1 translation of *übergeben*), "to report" (in 4 translations of *melden*), and "to reveal" (in 2 translations of *melden*, and 6 of *verraten*). Contrary to the regularities reported by Levin (1993), data provides one instance where "to deliver" is found in a DO construction. Nevertheless, all responses that used one of the above verbs were coded as 'other' and excluded from analysis. By the ruling that has been set in 6.2.4, these numbers require exclusion of all items that involve the verbs *liefern* and *melden*.

As a side observation, 24 responses in this experiment corresponded morphologically to acceptable constructions in the respective task, but used argument orders different from those shown in (24a–25b). (See also 6.4.2, with examples.) This involved 1 dative repetition of a dative source, 1 prepositional repetition of a dative source, 10 dative repetitions of prepositional sources, 4 DO translations of dative sources, 4 DO translations of prepositional sources, and 5 PO translations of dative sources. All of these were excluded from analysis.

Response Type. As shown in Table 6.5, 221 (57.6%) of the responses in the repeating task were acceptable. Of these, 50.7% were successful repetitions of dative constructions, and 49.3% of prepositional constructions.

Of 211 (54.9%) acceptable translation productions, 51.7% responded to datives (28.4% of all), and 48.3% to prepositional constructions (26.6% of all). Again, a

Table 6.5: *Experiment 2b: Response Types*

task	construction produced	German source dative	German source prepositional	TOTAL
repeating	dative	112	0	**112**
	prepositional	0	109	**109**
	other	80	83	**163**
translation	DO	45	5	**50**
	PO	64	97	**161**
	other	83	90	**173**

Table 6.6: *Experiment 2b: Mean Response Times [ms]*

task	construction produced	German source dative	German source prepositional	mean
repeating	dative	1290	n.a.	1290
	prepositional	n.a.	1255	1255
	mean	1290	1255	
translation	DO	2999	3200	3027
	PO	3300	3029	3134
	mean	3161	3043	

Note: *n.a.* identifies systematically unrepresentative response cells in the repeating task.

production bias for English PO constructions is discernible — here, they make up 76.3% of all translation targets, while 23.7% are DOs. 90.0% of all DO targets occur after sources with a dative construction, while 60.2% of PO targets followed a source with a prepositional construction.

Response times. Table 6.6 shows the mean response times (RTs) to the experimental conditions in both tasks. As in previous experiments, a number of data points had to be excluded for technical reasons (impossibility to specify onset time, see Appendix A). These are not included in the mean RTs shown in Table 6.6. In the repeating task, this concerned 6 dative constructions and 4 prepositional constructions; in the translation task, 16 translations of datives into DOs and 24 into POs had to be excluded, moreover 2 translations of prepositional constructions into DOs and 36 into POs.

6.5.3 *Analysis*

The following analyses were carried out according to the principles presented in 6.2.5.

Likelihood of responses

An overview of the significance of participant- and item-specific predictors is given in Table G.6 in Appendix G.

Analysis of variance finds no effect from *task* on the likelihood to produce an acceptable response ($F_1(1, 11) < 1$, $F_2(1, 31) < 1$), nor from *source* ($F_1(1, 3) < 1$; $F(1, 20) < 1$), nor any interaction between the two.

Between participants, the *sequence* of tasks had only a marginal influence on the overall likelihood of acceptable responses ($F(1, 3) = 6.378$, $p = .086$). *Test results* could serve as weak predictors of performance ($F(11, 3) = 8.892$, $p < .05$) — the higher participants' test scores, the more acceptable responses they produced. This is not specific to either task ($F(, 11) < 13$).

Between items, *frequency of the verb* did not have a significant influence on whether or not an appropriate response ensued, $F(3, 20) < 1$. The *sequence* of tasks was indicated by Least Squares as a possible predictor for likelihood of acceptable responses per item and had to be calculated **within items**; its contribution to the likelihood of acceptable responses, however, was only marginal $F(1, 20) = 3.935$, $p = .061$.

Construction

An overview of the significance of participant- and item-specific predictors is given in Table G.6 in Appendix G.

While POs are still more frequent than DOs, repeated measures Analysis of Variance discovers a significant main effect of *source* ($F_1(1, 4) = 73.349$, $p < .01$; $F_2(1, 37) = 13.409$, $p < .001$). Thus, POs were produced as translations of dative constructions less frequently (estimated by participants, 48.4%; by items, 68.2%) than as translations of prepositional constructions (96.3%/96.7%).

Between participants, *test results* could not serve as a reliable predictor of construction choice ($F(11, 4) < 1$).

Between items, *frequency of first noun* is found as a weakly significant factor for the choice of target construction ($F(2, 37) = 4.008$, $p < .05$). 17 items with the most frequent first nouns are followed by POs in 70.8% of successful responses; 19 items in which the first noun is only half as frequent as the most frequent ones are followed by POs at 76.5%, and 4 items where the first noun is only quarter as frequent are followed by POs at 100%.

Latency

Before carrying out a more detailed analysis through Linear Mixed Effects modeling, a repeated measures Analysis of Variance was carried out on loglinearized latency times for possible evidence of differences in latency due to characteristics of the source constructions. Two analyses were carried out, respectively treating participants and items as random factors. Both analyses used a 2×2 design and used *task* (repeating vs translation) and *source* (dative vs prepositional) as factors both within participants and within items.

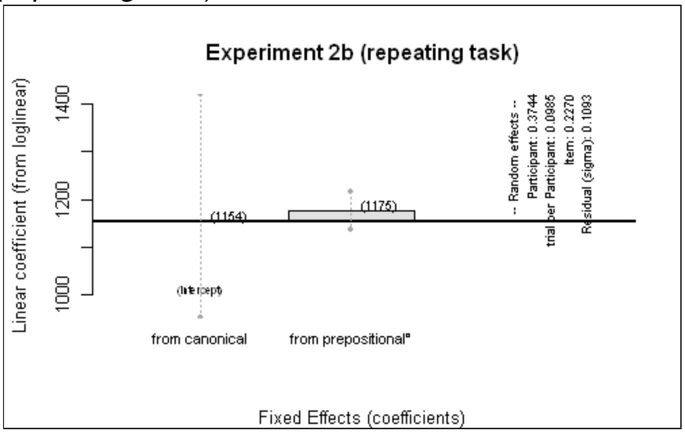
This found a significant effect of *task* ($F_1(1,14) = 30.891$, $p < .001$; $F_2(1,37) = 464.895$, $p < .001$), but not of *source* ($F_{1,2} < 1$). Nor was there evidence of any significant interaction between the two factors ($F_1(1,14) = 1.153$, $p = .301$; $F(2,1) <$ 137), which allowed to exclude even task-specific latency effects from *source* constructions.

In the repeating task, analysis of latency data through Linear Mixed effects found no effect from *source* ($t = 1.22$, $p_{mc} = n.s.$), as shown in Figure 6.4. Remarkably, however, this model contains *trial* as a factor on the random effect of participants; participants' response latencies varied regularly across the time course of the experiment.

Analysing data from the translation task of Experiment 2b (see Figure 6.5), the analysis finds that instances where a dative was translated as a PO were not significantly different from those where a prepositional construction was rendered as a PO ($t = -0.36$, $p_{mc} = n.s.$), or a dative as DO ($t = 0.40$, $p_{mc} = n.s.$). Translations of prepositional constructions as DOs are not significantly different from what is expected on the basis of translations of prepositional constructions or into DOs alone ($t = 0.43$, $p_{mc} = n.s.$).

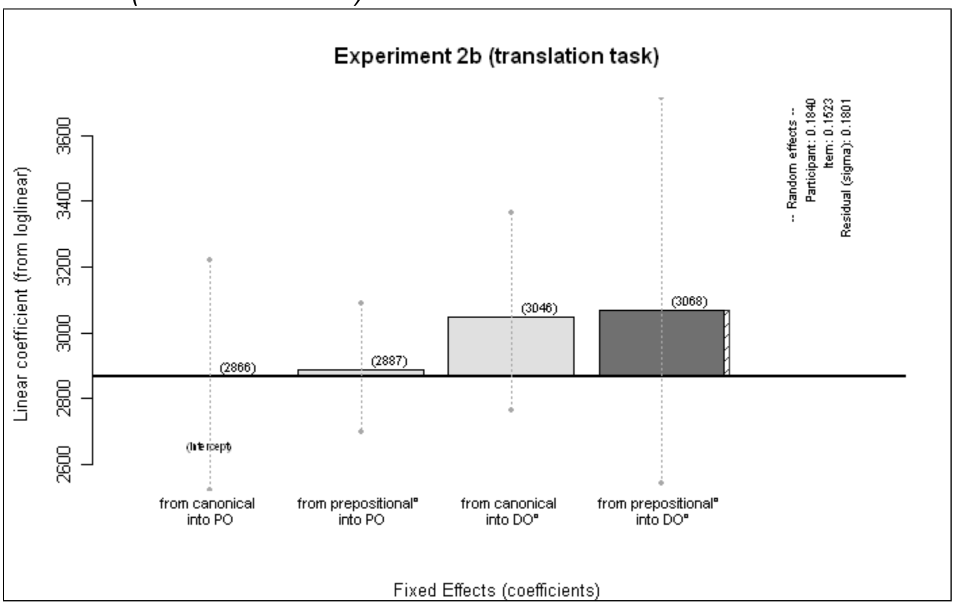
Considering latency data from Experiment 2b as a whole (see Figure 6.6), analysis discovers no significant differences between the two types of translations into unprimed structures ($t = 1.00$, $p_{mc} = n.s.$). There is no significant difference between the translations of datives into primed or unprimed constructions ($t = 0.11$, $p_{mc} = n.s.$). The effect of primed translations of prepositional constructions

Figure 6.4: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2b (repeating task)*



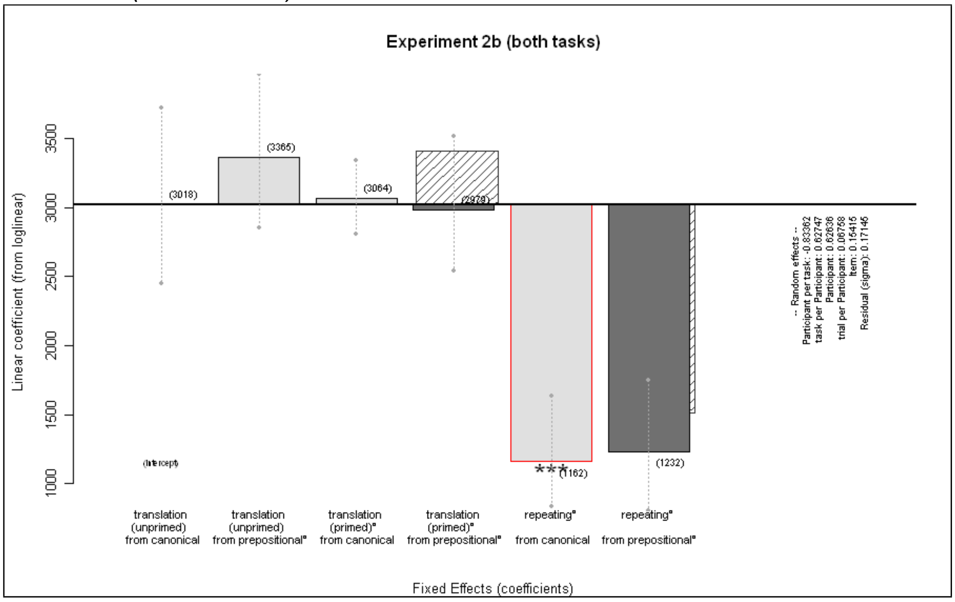
Note: *Trial* is present as a factor over the random effect of participants. In all other respects, see notes for Figure 6.1 and Figure 6.2.

Figure 6.5: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2b (translation task)*



Note: See notes for Figure 6.1 and Figure 6.2.

Figure 6.6: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 2b (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. *Trial* is present as a factor over the random effect of participants. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. In all other respects, see notes for Figure 6.1 and Figure 6.2.

is not significantly different from what can be expected on the basis of their components ($t = -1.33$, $p_{mc} = n.s.$). The repeating of datives was significantly faster ($t = -5.90$, $p_{mc} < .0001$), suggesting that their structure was more accessible for participants, while the repeating of prepositional constructions was not significantly different from what could be expected on the basis of its components ($t = -0.76$, $p_{mc} = n.s.$). Like the repeating task (but not the translation task), the combined model was improved through inclusion of *trial* as a random factor over participants.

The Linear Mixed Effects model of response latencies in Experiment 2b shows an influence from *trial* that can be traced back to the repeating task, where a significant random effect of 0.09822 points on the logarithmic scale is encountered between trials. The restriction of this effect to the repeating task suggests that it is most likely related to the task aspect of L2 production — if L2 comprehension were involved, the effect should have been observable in both tasks. A more detailed discussion of this effect, however, would require further dedicated experimentation and is beyond the scope of this thesis.

6.5.4 Discussion

Neither production data nor response latencies from the repeating task in Experiment 2b provide evidence of any processing advantages for German dative or prepositional constructions in speakers of L2 German, L1 English.

In the translation task, PO productions outnumber DOs in the productions of L1 English speakers by 3:1. Still, priming is in clear evidence: DOs occur more often as translation for datives than for prepositional constructions, which are preferably translated into POs.

As expected from Experiment 2a, latency data shows no effect of the experimental main manipulation. It shows, however, that all productions in this L2→L1 translation task take significantly longer than productions in the repeating task — in parallel with the L1→L2 translations of Experiments 1 and 2a. This finding makes it impossible to argue that the time difference between repeating and translation in these experiments might have been due to L2 proficiency, as it might have been claimed in defence of a vertical model of translation (see 4.1.2, 5.4.3). If there is an influence of L2 proficiency, it is most likely to be at the level of successful comprehension, as shown by the observation that *test results* may serve as a predictor of structurally acceptable responses irrespective of task. Hence, it is warranted to conclude that repeating takes less time to process than translation, whether in L1 or in L2.

The impossibility to find effects in the latency data from Experiment 2b is only partially comparable to the similar phenomenon in Experiment 2a. The bias towards PO translations that was observed in both experiments has provided only very little data for unprimed DO productions. In Experiment 2b, this was further aggravated by the generally lower success ratio of responses — in both tasks, participants perform only at about 55%. However, there is no evidence from Experiment 2b that would suggest that lexically or conceptually guided processing are an issue in the translations from L2. The effect of *frequency of first noun* on construction choice might be explained as evidence of easier access to PO construction under high processing load, but requires targeted research.

6.6 Experiment 2: Comprehensive Analysis and Discussion

In summary, Experiment 2a and 2b have provided evidence for primed choice of target constructions during translation, although some problems have become obvious. A combined analysis of the data from both experiments will allow a more detailed discussion with respect to language-specific issues.

6.6.1 Analysis

Similar analyses as before are calculated for the combined dataset from Experiments 2a and 2b, including now *L1* as a factor between participants and within item.

Restrictions of the dataset due to occurrence of non-alternating verbs in target productions are combined from both datasets. Thus, no items are included that involve source verbs *liefern* or *melden*. Due to the heterogeneity of the two participant groups, information that is specific to participants or items can not be taken into account.

In view of the problematic situation for latency data with respect to Item influences, comparison of latency data from Experiments 2a and 2b can not be expected to provide major insights. No latency analyses for the combined experiments are presented in the following.

Likelihood of responses

The repeated measures Analysis of Variance for the likelihood of acceptable responses shows a significant effect of participants' *L1* ($F_1(1, 30) = 26.678$, $p < .001$; $F_2(1, 47) = 208.898$, $p < .001$): speakers of L1 German produce acceptable response at estimated 88.4% of the time (by participants and by items), but speakers of L1 English only at 56.3%.

There is also a continued effect of *task* on speakers' production ($F_1(1, 30) = 5.332$, $p < .05$; $F_2(1, 47) = 8.686$, $p < .01$): while the repeating task provides an average 76.3% acceptable responses, this drops to 68.4% in the translation task. There is some suggestion of an interaction of this effect with *L1* ($F_1(1, 30) = 2.409$, $p = .131$; $F_2(1, 47) = 8.149$, $p < .01$). While speakers of L1 German provided an estimated 95.1% acceptable responses in the repeating task and 81.8% in translation, speakers of L1 English provided 57.6% acceptable responses when repeating and 54.9% when translating.

Comparison between the two experiments found no effect from *source* on the overall acceptability of participants' responses ($F_{1,2} < 1$), nor any interaction with *task* or *L1*.

Construction

Analysis of Variance finds significant differences between *L1* groups ($F_1(1, 30) = 11.900$, $p < .01$; $F_2(1, 39) = 4.471$, $p < .05$). Thus, speakers of L1 German were more likely (by participants, 69.8%; by items, 84.7%) to produce a PO construction during the translation task than speakers of L1 English (41.9%/76.5%).

There was also a main effect of *source* ($F_1(1, 30) = 27.526$, $p < .001$; $F_2(1, 39) = 50.406$, $p < .001$), indicating that participants were generally less likely to produce POs in translation of a dative (45.8%/64.7%) than when translating a prepositional construction (65.9%/96.5%). There was, however, no interaction of *source* and *L1* ($F_1(1, 30) < 1$; $F_2(1, 39) = 3.768$, $p = .060$).

6.6.2 Discussion

Comparison shows that L1 German speakers have been more likely to provide responses that were acceptable within the framework of this experiment than L2 speakers. Notice that the performance drop from the repeating task is steeper for translations into L2 English than for translations into L1 English. Considering that German was used as the source language, the overall difference between the groups' response likelihoods appears to be due to the native/non-native status of the source language, while their differences in task performance are due to the native/non-native status of the target language.

The presence of *source* as a factor in the analysis of combined construction choice data from translation tasks indicates that both groups experience construction priming, notwithstanding the stronger preference for PO targets that is encountered in native speakers of German. Apart from that, the absence of an interaction between *source* and *L1* suggests that there are no qualitative differences in the priming effects that are experienced by the two groups, a finding that appears to be in clear contradiction to the language-specific predictions of the "translation-equivalent boost" (2.2.3). There can be little doubt that participants did select translation-equivalent verbs in the translation task; yet Experiment 2 has provided no evidence of the 'translation-equivalent boost' of priming that Schoonbaert et al. (2007) had observed (see p.43 in 2.2.4).

However, this finding should be approached with considerable caution. The main criterion for the selection of verbs for the items of this experiments had to be their availability; the specific features of English and German and considerations of translatability left little room for the creation of a better balance. I have also pointed out that frequency of the first noun was found to be a prominent factor in the analysis. For this reason, I avoid further conclusions at this point.

To conclude this chapter, I sum up and discuss the results of Experiment 2 with respect to the predictions that were made in 6.3.

Task differences. As in Experiment 1, repeating in Experiment 2a was carried out in L1 while translations were carried out L1→L2. The latency ratios for the two tasks were comparable between the experiments (repeating faster than translation). In Experiment 2b, repeating was carried out in L2 while translations were carried out L1→L2. However, the ratio between task latencies remains unchanged. It follows that translation is always slower than repeating, irrespective of language direction. This provides still more evidence against strictly vertical models of translation (see 4.1.2, 5.4.3). The observation that translation requires always more processing time than repeating suggests rather that, during translation, additional cognitive processes are carried out that are not involved in monolingual production (or at least less extensive in use).

Response Types. Separately and conjointly, the two sub-experiments of Experiment 2 find evidence for priming as a factor in the choice of constructions during production, in both directions of translation. At that, the two speaker groups show different preferences for the two available target constructions, i.e. different overall patterns of responses as predicted by the Interface Hypothesis. However, these results are not sufficient to provide evidence of (or against) the 'translation-equivalent boost' that has been reported under the framework of the Integrated Model of bilingual production.

The finding of priming is remarkable also from the perspective of Translation & Interpreting studies — primed target productions can also be described as clear instances of form-based translation: the structural match between sources and primed target structures cannot be increased within the range of the target language. It follows that this same match *can* be improved between sources and non-primed targets. Thus, non-primed translations are less form-based, and slightly more meaning-based.

Response Latencies. As discussed above, latency data retrieved during Experiment 2 was not reliable, and at least partially confounded by conceptually-guided processing. Experiment 3 will attempt to remedy this flaw, and return to the issue of form-based translation and priming.

Chapter 7

Experiment 3: Shifted datives in German

Evidence from Experiment 2 supports the assumption that priming phenomena play a role in translations by untrained speakers, whether into or out of L1. Still, several serious issues with its results have been discovered:

- Firstly, there is some concern about the influence of materials. Although the experiment was set up to access latency data as an on-line measure of processing, the retrieved reaction time measures were found to be unsatisfactory. Additional analyses suggest that this may have been a consequence of characteristics of the source sentences.
- Secondly, there is reason for concern about the materials themselves: the number of German ditransitive verbs that show exactly the same type of structural alternation between constructions with and without prepositions as their English translation equivalents is rather small (see 6.2.2.) For this reason, it had not been not possible to take further structural features of the verbs into account.
- Thirdly, and most importantly, serious reservations about the experimental manipulation are in order. The alternation between the possible target constructions of Experiment 2 is known as the dative alternation in English. Grammatical descriptions of German, however, provide no support for the assumption of a comparable, structurally defined alternation between the corresponding German dative and prepositional constructions (see Levin, 2006; Kunkel-Razum & Münzberg, 2006).

To solve these issues and reduce the noise that surrounded the priming effect in translation in Experiment 2, Experiment 3 is set up with a related construction that has already been encountered (but excluded) in some of the productions of the previous experiment. Section 7.1 discusses these 'shifted' datives in more detail, while Section 7.2 presents general features of the experiment, in particular changes relative to Experiment 2. Predictions are updated for Experiment 3 in 7.3, and two separate experiment runs with speakers of L1 German and L1 English are presented in (respectively) 7.4 and 7.5. A comprehensive analysis of the two experiment runs, and a discussion of Experiment 3 in general, is presented in Section 7.6. Finally, Section 7.7 will attempt to develop a larger picture on the basis of the results of Experiment 3 and excerpts of the data from Experiment 2.

7.1 German ditransitives (in more detail)

I have discussed in 6.1 that both English and German allow the expression of (certain) ditransitive relations through structures that do or do not involve a preposition, as shown in *(27a)* and *(27b)* for English, and *(28a)* and *(28b)* for German. (Examples repeated from 6.1 for ease of reference.)

(27a) **DO:** The uncle sells the pope the bicycle.

(27b) **PO:** The uncle sells the bicycle to the pope.

(28a) **dative:** Der Onkel verkauft dem Papst das Fahrrad.

(28b) **prepositional:** Der Onkel verkauft das Fahrrad an den Papst.
"The uncle sells the pope the bike/the bike to the pope"

Yet, there is a remarkable difference between the constructions of the English dative alternation (27a–27b), and the German constructions that have been used to emulate it (28a–28b), not only in Experiment 2 but also in earlier cross-linguistic studies from various authors (Scheepers & Corley, 2000; Loebell & Bock, 2003; Melinger & Dobel, 2005). In English, the Recipient is either marked explicitly through use of a preposition, as in *(27b)*, or implicitly through its position as the first of two otherwise unmarked objects, as in *(27a)*. In German, all nouns are obligatorily case-marked (as already observed in 6.1). Thus, the Recipient in a German prepositional construction receives case-marking appropriate to the preposition; in a German dative construction, however, the Recipient is still explicitly marked through the dative case (*de**m*** in 28a). The themes of ditransitive verbs receive no explicit marking in English, but accusative case in German.

In German syntax, the default order of arguments and other complements is largely dependent on the case-marking of the arguments that are involved. Restricting the presentation to the types of arguments and constructions that were used in the main clauses of Experiment 2, the order can be represented as a hierarchy (from Kunkel-Razum & Münzberg, 2006, p.882):

dative argument $>$ accusative argument $>$ other complements

Hence, unmarked situations without special focus will find the finite verb followed most closely by arguments in dative case (frequently recipients or beneficiaries of the verbal action), next by arguments in accusative case (commonly the object that is directly affected by the verbal action), and finally by arguments that are embedded into prepositional constructions. From this hierarchy, it follows that both the dative construction of *(28a)* and the prepositional construction of *(28b)* correspond to relatively unmarked, default instantiations of ditransitive verbs. In this sense, German dative vs prepositional constructions are clearly different from their surface-structural equivalents in the English dative alternation, for which there is frequent reference to pragmatic-semantic reasons (see 6.1).

I have already pointed out (see p.126) that prepositional constructions with ditransitive verbs in German may result from the alternation of prefix and particle verbs; the suitability of this alternation for a translation experiment is questionable, however. The relative flexibility of German word order allows for easy reordering of syntactic units for pragmatic purposes (see Kunkel-Razum & Münzberg, 2006, pp.883, 889). Due to the case-marking outline above, this cannot lead to ambiguities with regard to thematic functions. Following the case hierarchy cited above, dative constructions where the Recipient precedes the Theme can be understood to represent an unmarked, canonical situation. However, pragmatic motivations (e.g. newness of information, see Kunkel-Razum & Münzberg, 2006, p.889) make it possible to 'shift around' the arguments, so that the Theme precedes the Recipient *(29b)*:

(29a) **canonical:** Der Onkel verkauft dem Papst *das Fahrrad*. =*(28a)*

(29b) **shifted:** Der Onkel verkauft *das Fahrrad* dem Papst.
''The uncle sells the pope the bike/the bike to the pope''

This shift leaves the underlying construction and its semantics intact; the meaning of *(29b)* is not different from that of *(29a)*, and all thematic contingencies of a dative construction remain intact. Different from the prepositional constructions studied in Experiment 2, shifting arguments is possible with all ditransitive verbs and not restricted in its use.

This phenomenon was involved the study of Scheepers & Corley (2000), who used a sentence completion task. In two of their experimental conditions, participants were primed with sentences of structures *(29a)* or *(29b)*. The target fragments that had to be completed in trials were specified for participants as containing either an accusative NP (Theme) or a dative NP (Recipient) immediately after a verb that allowed both monotransitive and ditransitive use. The percentage of acceptable responses after shifted dative primes was significantly lower than after canonical datives (Scheepers & Corley, 2000, p.438). Ditransitive responses were significantly more frequent with targets that contained a dative NP, i.e. where a ditransitive response required construction of a canonical dative; overall, only very few shifted datives were elicited (Scheepers & Corley, 2000, p.439). At that, ditransitive responses with dative targets were also most frequent if participants had been primed with a canonical dative, and least frequent after a shifted dative; ditransitive responses for two other conditions — priming with monotransitive verbs that required either a dative or an accusative object — stayed between these extremes. These findings suggest that the production of canonical datives may have been facilitated by canonical datives but inhibited by shifted datives. While Scheepers & Corley's subsequent discussion is concerned with larger issues of the selection of verb-frames, their findings allow as a minimal observation in this respect that the production of German canonical datives is primed by other canonical datives but not by shifted datives.

Levin (2006, p.11) has pointed out that a comparable kind of argument shift appears to be one underlying feature of the English dative alternation, and undoubtedly has a pragmatic motivation. It follows that structural reordering is a feature of interface grammar between German and English; following the Interface Hypothesis, it can be expected that structural reordering is subject to strong cross-linguistic influences, which should be observable as different response patterns under priming conditions.

Moreover, this type of 'shifted' construction has already been encountered in responses during both tasks of Experiment 2, not only in productions by speakers of L1 German, but also in responses by L1 English speakers (as reported in 6.4.2, 6.5.2). This provides additional evidence that structural reordering is anchored as a feature in both groups, and is not subject to avoidance (see 3.1.3) by L2 speakers of German with L1 English. I am not aware of a discussion of argument shifts of this kind in current psycholinguistic research on bilingual production.

With particular regard to the process of translation, it is necessary to notice that there is a difference between the relations of German dative constructions *(28a)* with prepositional constructions *(28b)*, and the relations of German canonical datives *(29a)* with shifted datives *(29b)*: while both sentence pairs differ in terms of argument sequence, dative constructions *(28a)* and prepositional constructions *(28b)* differ also in terms of argument *status*: the Recipient of a dative construction occurs as an NP, the Recipient of a prepositional construction as a PP. This difference in argument status is also encountered between English DOs *(27a)* and POs *(27b)*.

It follows that all translations in Experiment 2 involved either no changes at all, or a change of both argument sequence and argument status. Using German canonical and shifted datives as sources for translation, instead of German dative and prepositional constructions, the change in argument status becomes a necessary operation during translations into POs, but not during translations into DOs. As an additional processing requirement during translation into PO, this change of argument status may be reflected by slightly increased processing requirements.

A corresponding observation can be found in Levin's (2006, p.2) statement that *to*-NPs in English POs cannot be compared with dative NPs in case languages like German. Bock & Loebell's (1990) finding that priming does not depend on identical constructions is not relevant in this context: in their studies, identity of constructions refers to the syntactic function of arguments (as a locative vs prepositional object or passive subject); in this thesis, however, I am concerned with syntactic structure.

7.2 Experiment 3: Practical Issues

In Experiment 3, speakers of L1 German and L2 English and of L1 English and L2 German repeated items in German or translated them from German into English. Experimental conditions corresponded to two possible constructions with German ditransitive verbs, the canonical dative construction and what has been called the shifted dative construction. Expected target constructions in the translation task were English DO and PO. This section describes the alterations of materials that are necessitated by changes to the source constructions, and inclusion of observations from Experiment 2.

7.2.1 Participants

Participants for Experiment 3 were drawn from the same population as in Experiment 2. None of them had participated in Experiment 2. More detailed information about each set of participants is given in the corresponding sections for each of the two experiment runs (Experiment 3a with L1 German in 7.4.1, Experiment 3b with L1 English in 7.5.1).

7.2.2 Materials

Materials for Experiment 3 were created according to the criteria laid out in 5.1.4. The verbs that were used for this purpose followed similar criteria as those outlined for Experiment 2 (see 6.2.2): they should allow the creation of grammatical source sentences, and exclude monotransitive use (i.e. not instantiate a Beneficiary instead of a Recipient). In the light of the strong evidence from the occurrence of non-alternating verbs in Experiment 2, it was also required that likely translation equivalents in English should allow dative alternation between DO and PO.

Analysis of Experiment 2 found also various low-level influences of lexical features of the items used, in particular from the first NP of source sentences, suggesting that translations may have been processed under conceptual guidance rather than lexical guidance. Following the discussion in 5.1.4 and 6.4.4, I assume that the verbs that had to be selected to fulfil the structural requirements of Experiment 2 could not be accessed in their context with sufficient ease to instantiate lexical guidance. To increase accessibility, verbs for Experiment 3 were selected from a range of higher relative frequency (at least four times more frequent than nouns).

Based on a list of the 200 most frequent German verbs as listed by Wängler (1963), this led to selection of the verbs *bringen* "to bring", *erzählen* "to tell", *reichen* "to pass, to hand", *schenken* "to give (as a present)", *schicken* "to send", *verkaufen* "to sell", *versprechen* "to promise", and *zeigen*, "to show". (See also Table B.2) in Appendix B.) The two most frequent verbs of Experiment 2, *schicken* and *verkaufen*, were included in this set (in newly created items) with a view to comparisons of participants' responses in Experiments 2 and 3.

The set of nouns that were used for the items in Experiment 3 remained unchanged from Experiment 2. Trial items were created in the same fashion as before and are listed in Appendix C.2, while fillers were re-used from Experiment 2 and are listed in Appendix D.2.

Notice that the dative constructions of Experiment 2 are structurally identical with the canonical dative sources of Experiment 3. The prepositional constructions of Experiment 2 are not different from the shifted datives sources of Experiment 3 in terms of argument order, but only in terms of morphology: while there, Recipients occurred in accusative case under a prepositional construction, here they carry dative case.

7.2.3 Procedure

The experiment procedure was identical between Experiments 2 and 3.

7.2.4 Scoring

Participants' productions in Experiment 3 were treated and scored according to the same protocol as in Experiment 2.

7.2.5 Design and data analysis

Design and setup of analyses were identical between Experiments 2 and 3 (see 6.2.5).

Each participant of Experiment 3 responded to all experimental items, repeating one half and translating the other, in separate tasks. Each item was seen only once by each participant. Across participants, each item was seen eight times in each of the two conditions, and four times in each task for each participant. Thus, every participant and every item contributed equally to all cells in the analysis. In each of the two possible task sequences, each list of source sentences occurred equally often in each task.

As before (see 5.3.6, 6.2.5), a first approach to experimental data is taken through a 2-stage Least Square linear regression analysis, estimating the contribution of other predictors to variance of analysed measures.

A first analysis considered whether the ratio of acceptable responses to the two *source construction*s indicated specific problems with the processing of either, whether in general or in only one of the tasks. Using the proportion of acceptable responses as a measure, two sets of repeated measures Analyses of Variance were carried out, once treating participants as the random factor, once items. The analysis followed a 2×2 design, using *task* (repeating vs translation) and *source* (canonical vs shifted dative) as factors both within participants and within items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

The second step of analysis was concerned with the distribution of *target construction*s in participants' productions during the translation task. This is analysed as repeated measures Analyses of Variance with the proportion of PO productions among all acceptable responses as the analysed measure, treating participants as the random factor in one set of analyses, items in the second one. Analyses treated *source* as a 2-way factor both within participants and within items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

For the third step of analyses, Linear Mixed Effects models were developed as described in 6.2.5, above, first for data from each task separately, and then for both tasks together, using loglinearized *RT* as the independent variable. To model the repeating task, the 2-way factor *source* is employed as a fixed effect; for the translation task, *source*, *target*, and their interaction (in a 2×2 design); and for the combination of tasks, *source*, *event* (see 6.2.5), and their interaction (in a 2×3 design).

7.3 Predictions

The main expectations for Experiment 3 are similar to those for Experiment 2 (see 6.3). Specifically, the effect of *task* is expected to be replicated, with repeating responses generally faster than translation responses. Following Experiments 1 and 2, the effect can be expected with considerable confidence, and, if present, will not be discussed in further detail any more.

I also expect a priming effect from *source* similar to that observed in Experiment 2. The finding (in 7.1) that structural reordering is pragmatically motivated in German (see also Scheepers & Corley, 2000), and partially also in English, suggests that priming is taking place.

Provided that a priming effect from *source* can be observed, and changes in the internal configuration of materials have been appropriate, there is also reason to expect a facilitation of production similar to what was observed in Experiment 1: response latencies for primed translations, where the target structure matches that of the source, should be faster than those where source and target structures do not match. Specifically, shorter reaction times should ensue when a canonical dative is translated as a DO, or a shifted dative as a PO; in turn, translations of canonical datives as POs or of shifted datives as DOs should take longer. The reasons for this expectation remain unchanged from Experiment 1 (see 5.3.4).

Finally, I have pointed out how a translation of German canonical or shifted datives into POs may involve additional processing, in comparison to their translation into DOs. One way in which this may be reflected in data from the translation task is an increase in processing time that should become discernible during latency analysis for the translation task; alternatively, the overall occurrence rate of POs may drop.

Predictions that are specific to L1 groups will be reported in the introduction of the respective experiments, in Sections 7.4 and 7.5. Predictions with respect to differences between the two participant groups are stated in the introduction of the comprehensive analysis of Experiment 3 in Section 7.6.

7.4 Experiment 3a: L1 German

In this part of Experiment 3, native speakers of German repeated (L1-L1) or translated (L1-L2) German shifted and canonical dative constructions.

Following the assumption that the restructuring in canonical and shifted datives is sufficient to instantiate a priming effect, the results of Experiment 3a for construction choice were expected as similar to those of Experiment 2a. There, I have pointed out already that Loebell & Bock (2003) reported a preference of L1 German for PO constructions in L2 English, a claim that was confirmed by the results of Experiment 2a. Hence, a similar production bias towards POs was

Table 7.1: *Experiment 3a: Participant demographics*

	Range	
participants		16 (5M)
age (years)	19–54	(mean: 29)
learning age (yrs since onset)	6–44	(mean: 17.8)
time of residence (months)	2–200	(median: 24)
self-rating (7 = best)	3.25–7	(median: 5.8)
self-rating: L2 reading (1–7, 7=best)	4–7	(median: 7)
self-rating: L2 listening (1–7, 7=best)	3–7	(median: 6)
self-rating: L2 speaking (1–7, 7=best)	3–7	(median: 6)
self-rating: L2 writing (1–7, 7=best)	3–7	(median: 6)
recent exposure (7 = most)	7	(const.)

expected in Experiment 3a; possible interactions with the general prediction of increased processing requirements for translations into PO remain to be seen.

7.4.1 Participants

Natively monolingual speakers of L1 German with L2 English were found in the same way as the participants of Experiment 2a (described in 6.2.1, above). No participant had any formal training as a translator or interpreter. Table 7.1 lists biographic details and self-judgements elicited from the post-experimental questionnaire (see Appendix F). Through a technical fault, language test data is available for only four participants of Experiment 3a, and cannot be included in the analysis.

Participants in Experiment 3a reported knowledge of 0–9 additional languages, most frequently French (10), Spanish (6), and Russian (4). Six participants reported occasional translation activities for personal or professional purposes. Three of these had also carried out paid translation jobs solely on the basis of their qualification as bilinguals.

Similar to those in Experiments 1 and 2a, participants in Experiment 3a reported occasional reliance on reading strategies to cope with brief exposure times, and showed some awareness that "the long sentences" were more difficult. However, the experimental manipulation caused hardly any comments, and none of the participants indicated particular concern with syntactic ordering.

Table 7.2: *Experiment 3a: Response types*

task	construction produced	German source canonical	shifted dat.	TOTAL
repeating	canonical	245	0	**245**
	shifted dat.	0	219	**219**
	other	11	37	**48**
translation	DO	78	37	**115**
	PO	146	180	**326**
	other	32	39	**71**

7.4.2 Results

Table 7.2 shows the response type counts for all productions after application of the exclusion criteria. Only one verb was elicited that is categorized as non-alternating by Levin (1993, pp.46–47); namely "to explain" (in 2 translations of *erzählen*). As in Experiment 2, these instances are excluded from response type data but not from response time data (see also 6.2.4). No exclusion of items was required, due to the overall low incidence of non-alternating verbs.

As a side observation, 10 responses in this experiment corresponded morphologically undisputably to acceptable ditransitive constructions, but had to be scored as 'other' because their syntax deviated in the repeating task from the exact word order, or in the translation task from the canonical word order for English ditransitive constructions shown in *(27a)* and *(27b)*. Thus, a shifted dative was translated as a DO with inverted argument order "*the man gave the package the king*"; a translation attempt for a canonical dative was: "*the author offered to the count a stick*". Deviating syntax of this type involved 1 shifted dative repetition of a canonical dative, 3 canonical dative repetitions of shifted datives, 1 PO translation of a canonical dative, 4 DO translations of shifted datives, and 1 PO translation of a shifted dative.

Response Type. 464 (90.6%) of the responses in the repeating task were acceptable, and 9.4% rated as 'other'. 52.8% of all acceptable repetitions covered a canonical dative construction, and 47.2% a shifted dative construction.

Out of the 441 (86.1%) acceptable translation responses, 50.8% translated a canonical dative, 49.2% a shifted dative. A strong preference for English PO constructions is discernible — they are encountered in 63.7% of all translations, while only 22.5% are DOs. (13.9% are rated as 'other'.) At that, DO targets

Table 7.3: *Experiment 3a: Mean Response Times [ms]*

task	construction produced	German source canonical	shifted dat.	mean
repeating	canonical	1219	n.a.	1219
	shifted dat.	n.a.	1207	1207
	mean	1219	1207	
translation	DO	2699	3150	2841
	PO	2829	2893	2863
	mean	2782	2941	

Note: *n.a.* identifies systematically unrepresentative response cells in the repeating task.

occur predominantly after canonical dative sources (67.8%), while POs are more frequent after shifted dative sources (55.2%).

Response times. Table 7.3 shows the mean response times (RTs) to the experimental conditions in both tasks of Experiment 3a. As in previous experiments, a number of data points had to be excluded out of technical considerations. These are not included in the mean RTs shown in Table 7.3. In the repeating task, this concerned 6 dative constructions and 4 prepositional constructions; in the translation task, 6 translations of datives into DOs and 18 into POs had to be excluded, as did 4 translations of prepositional constructions into DOs and 35 into POs.

7.4.3 Analysis

Likelihood of responses

An overview of the significance of participant- and item-specific predictors for general likelihood of acceptable responses is given in Table G.9 in Appendix G.

Considering the likelihood of acceptable responses under experimental conditions, repeated measures Analysis of Variance did not reveal an effect from *task* ($F_1(1,3) = 1.257$, $p = .344$; $F_2(1,63) = 2.850$, $p = .096$), but a significant effect from *source* ($F_1(1,3) = 21.621$, $p < .05$; $F_2(1,63) = 13.746$, $p < .001$). Successful responses were more likely after canonical datives (estimate by participant, 91.7%; by item, 91.6%) than after shifted datives (84.6%/85.2%). A weak interaction between *task* and *source* ($F_1(1,3) = 5.224$, $p = .106$; $F_2(1,63) = 4.168$, $p < .05$) indicated that, in the repeating task, the likelihood of acceptable responses was bigger following canonical dative sources (95.4%/95.7%) than after shifted dative sources (84.9%/85.5%). This difference was not observed in the translation task (canonical datives 88.0%/87.5%, shifted datives 84.4%).

By participants, *total years learning L2* had no influence on their overall ability to respond, $F(12,3) = 1.722$, $p = .361$.

Construction

An overview of the significance of participant- and item-specific predictors is given in Table G.9 in Appendix G.

Again, a preference for translations into PO constructions is discernible from data in Table 7.2. However, repeated measures Analysis of variance discovers a significant main effect of *source* ($F_1(1,15) = 11.169$, $p < .01$; $F_2(1,62) = 18.820$, $p < .001$) in the translation task: canonical datives are translated into POs at an estimated 64.6%/66.3% of all cases, shifted datives receive translation as a PO 82.2%/83.5% of the time.

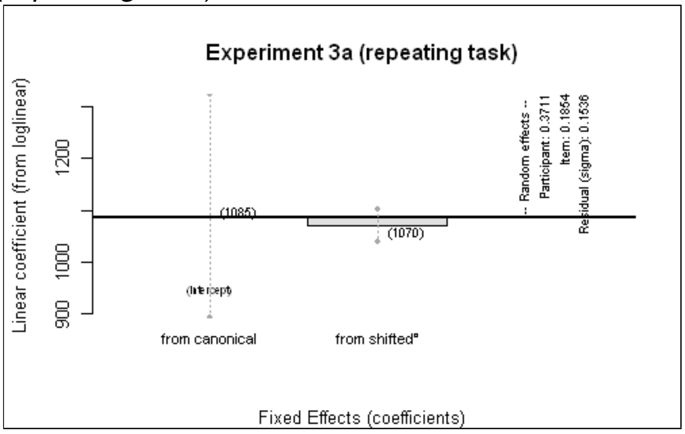
Latency

Before carrying out a more detailed analysis through Linear Mixed Effects modeling, a repeated measures Analysis of Variance was carried out on loglinearized latency times for possible evidence of differences in latency due to characteristics of the source constructions. Two analyses were carried out, respectively treating participants and items as random factors. Both analyses used a 2×2 design and used *task* (repeating vs translation) and *source* (default vs shifted) as factors both within participants and within items.

This found a significant effect of *task* ($F_1(1,15) = 95.908$, $p < .001$; $F_2(1,62) = 1445.127$, $p < .001$), but not of *source* ($F_1(1,15) = 1.842$, $p = .195$; $F(2,1) < 162$). The interaction between *task* and *source* ($F_1(1,15) = 3.916$, $p = .066$; $F_2(1,62) = 2.949$, $p = .091$) was still not significant, and hence allowed to exclude task-specific latency effects from *source* constructions.

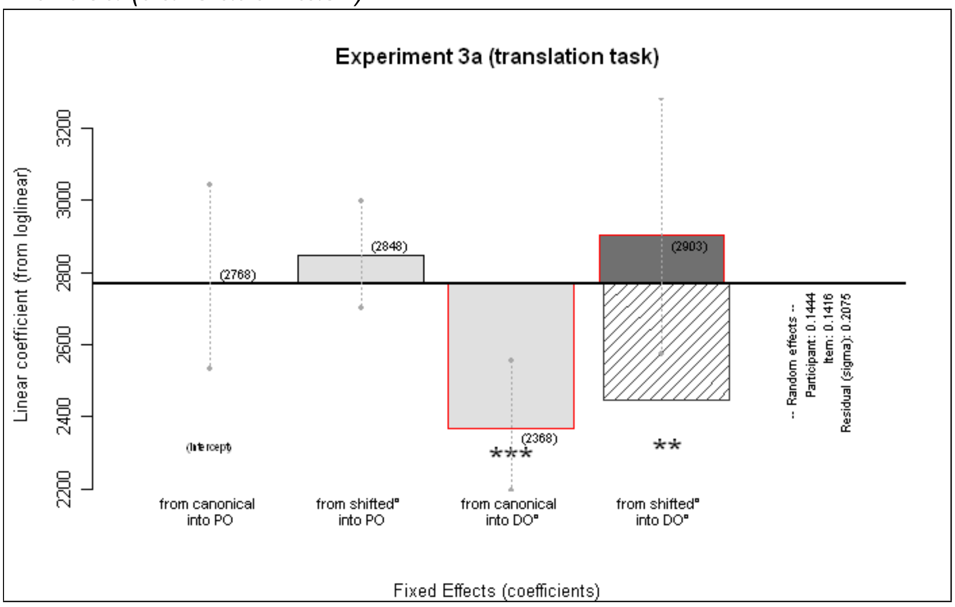
In the repeating task, analysis of latency data through Linear Mixed Effects found that no effect from *source* had occurred in Experiment 3a ($t = -0.88$, $p_{mc} = n.s.$), as shown in Figure 7.1.

Figure 7.1: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3a (repeating task)*



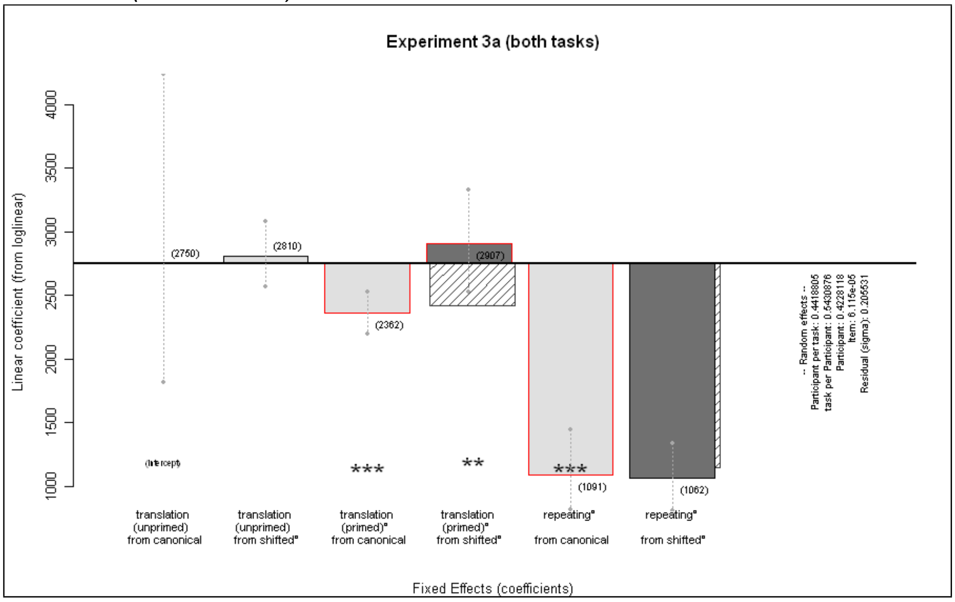
Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.2: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3a (translation task)*



Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.3: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3a (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See notes for Figure 6.1 and Figure 6.2.

In the translation task (see Figure 7.2), the analysis reveals that instances where a canonical dative was translated as a PO were not significantly different from those where a shifted dative was rendered as a PO ($t = 1.71$, $p_{mc} = n.s.$). However, translations of canonical datives into DOs were found to be significantly faster ($t = -4.21$, $p_{mc} < .001$). Translations of shifted datives into DOs, in turn, were significantly slower, relative to the combined effects of *source* and *target* relative to the comparison effect ($t = 2.22$, $p_{mc} < .05$).

Considering latency data from Experiment 3a as a whole (see Figure 7.3), there were no significant differences between the two types of translations into unprimed structures ($t = 0.84$, $p_{mc} = n.s.$). Translations of datives into the primed construction, however, were significantly faster than their translation into the unprimed constructions ($t = -3.66$, $p_{mc} < .001$). Translations of shifted datives, in turn, are slower ($t = 2.11$, $p_{mc} < .05$) than would be expected from the effects of shifted datives and priming alone. The repeating of datives was significantly faster ($t = -8.98$, $p_{mc} < .0001$), while the repeating of prepositional constructions was not significantly different from what could be expected on the basis of its components ($t = -1.03$, $p_{mc} = n.s.$).

As in Experiment 2a, the Linear Mixed Effects models of response latencies in Experiment 3a show no significant effect of *trial* as a random factor: no habituation effects are in evidence for this group of participants.

7.4.4 Discussion

Production analysis of Experiment 3a indicates a significant difference between the two source constructions in terms of likelihood of acceptable responses. The effect is not found in the translation task, suggesting that it is strictly not a phenomenon of comprehension. However, the absence of an effect of *source* from the latency data for the repeating task argues also against a production-based account (which would assumpe that facilitated/easier production reduces response latency); no conclusion can be found for this dilemma without further research.

In the translation task, clear evidence of priming is discovered: again, POs are less likely to be produced as translations of canonical datives, and significantly more often so for shifted datives. This is partially reflected in the analysis of latency data (see Table 7.2): latency times for translations of datives into DOs are significantly shorter than for their translations into POs.

The priming latency pattern, however, does not appear to repeat at first sight for shifted datives: their response latencies for translation into PO are not significantly different from those of canonical datives. However, the interaction of source and target shows that translations of shifted datives into DOs are slower than would be expected from the combined effects over baseline from translation dative-to-DO and shifted-to-PO; hence, a priming effect *is* present for shifted datives.

Turning now to the analysis by production events (illustrated in Figure 7.3), the picture becomes clearer still: response latencies for unprimed translations do not differ depending on source construction; neither do repeating productions (which are significantly faster than translations). Translations of dative sources are significantly faster if they have been primed. Translations of shifted dative sources under priming influence, however, are slower than expected; while primed translations of datives result in DOs, primed translations of shifted datives result in POs. Hence, this is taken as evidence for the predicted additional processing requirements for the transformation of the source's NP into the target's PP.

Following this line further, it becomes obvious that this effect of morphological transformation is *not* observed in unprimed translations; i.e. translations of shifted datives into DOs (requiring syntactic restructuring) are *not* faster than translations of datives into POs (where both syntactic and morphological restructuring are required). This indicates that the two levels or morphological and syntactic representation are not processed simultaneously, as outlined in Bock & Levelt's (1994) model of language production (see p.18): morphology belongs to the level of functional processing, which is presumably carried out prior to syntactic-positional processing. It follows that the priming observed in Experiment 3a corresponds in first line with the absence of any necessity to carry out structural transformations between source and target.

Notice that POs are still the most frequent target construction for both source constructions in Experiment 3a, although the analysis has found that they require an additional step in processing. To a certain degree, this argues against claims that syntactic priming might serve to to reduce processing efforts (see Smith & Wheeldon, 2001, pp.157ff; discussion in V. S. Ferreira & Bock, 2006); however, in the light of the discussion in 4.2.2 about the role of effort in on-line processes of translation, the possibility of an different causal relation between priming and effort needs to be pointed out: priming may be the result of a shortage of available activation energy. I will return to this issue in the comparison of Experiments 2 and 3.

Finally, McDonough's (2006) claim that only POs can be primed in L2 English has already ben mentioned (see p.125). The results here provide no support for her conclusion; rather, the on-line priming effect of facilitated production has been observed most clearly for productions of DOs; although POs are preferred as a syntactic structure, the current analysis has shown that they are more problematic for production in the given context than DOs.

7.5 Experiment 3b: L1 English

In this part of Experiment 3, speakers of L1 English and L2 German repeated (L2-L2) or translated (L2-L1) German shifted and canonical dative constructions. Due to the different status of the experiment's source and target languages for them, it was expected that this group would show characteristic differences from speakers of L1 German and L2 English, either in terms of their reaction to source constructions, or in terms of the characteristics of their productions. Specifically,

Table 7.4: *Experiment 3b: Participant demographics*

	Range	
participants		16 (8M)
age (years)	18–69	(mean: 37.1)
learning age (yrs since onset)	3–54	(mean: 24.9)
time of residence (months)	4–186	(median: 12)
self-rating (7 = best)	4–7	(median: 6)
self-rating: L2 reading (1–7, 7=best)	4–7	(median: 5.5)
self-rating: L2 listening (1–7, 7=best)	4–7	(median: 5)
self-rating: L2 speaking (1–7, 7=best)	3–7	(median: 4)
self-rating: L2 writing (1–7, 7=best)	3–7	(median: 4)
test results (percentages)	72–98	(mean: 86.7)
recent exposure (7 = most)	1–7	(median: 3)

if the source constructions are problematic for this group, this was expected to become discernible in particular in performance during the repeating task, where both comprehension and production had to be carried out in L2.

Experiment 3a has found indication of some dispreference for shifted datives in L1 German speakers. Because argument shifts are pragmatically motivated in both English and German, and thus part of interface syntax, different performance with argument shifts by L1 English speakers is expected in comparison to L1 German speakers. However, following from Levin's (2006) objection to comparisons between datives and POs, speakers of L1 English may experience difficulties with the processing of shifted datives, in which they encounter a sequence of two postverbal NPs that is *not* a DO — i.e., L1-specific strategies cannot be employed in this case as a support for L2 processing. The resulting increase in processing difficulty may be reflected in participants' overall likelihood to produce acceptable responses, or in response latencies.

7.5.1 Participants

Participants in Experiment 3b were found as in Experiment 2b, and fulfilled the same general description: all were natively monolingual speakers of L1 English with L2 German, without formal training as translators; all had a minimum experience of living in a German-speaking environment of one month. Table 7.4 lists biographic details elicited from questionnaires and language tests as in Experiment 2b.

Table 7.5: *Experiment 3b: Response types*

task	construction produced	German source canonical	shifted dat.	TOTAL
repeating	canonical	149	0	**149**
	shifted dat.	0	102	**102**
	other	75	122	**197**
translation	DO	109	28	**137**
	PO	55	141	**196**
	other	60	55	**115**

Participants in Experiment 3b reported knowledge of 0–4 additional languages, most frequently French (10), Dutch, Italian, and Spanish (4 each). Thirteen reported occasional translation activities for personal or professional purposes. Of these, three had also carried out paid translation jobs solely on the basis of their qualification as bilinguals.

In debriefing sessions, the participants of Experiment 3b provided similar feedback as those in Experiment 2b: being non-native speakers, several of them felt that "the long sentences" had proved a particular challenge for their *ad hoc* reading strategies. However, none of the comments showed specific awareness of the experiment manipulation in source materials.

7.5.2 Results

Table 7.5 shows the response type counts for all productions in Experiment 3b after application of the exclusion criteria. Fifteen translation responses in this experiment (4.1% of all acceptable ones) elicited a verb that is indicated as non-alternating by Levin (1993, pp.46–47); namely "to explain" (in 14 translations of *erzählen*, and 1 of *versprechen*). As in Experiment 2, these instances are excluded from response type data but not from response time data. Thus, nearly 30% of all acceptable translations of the verb *erzählen* involve a non-alternating verb; adopting the ruling used in previous experiments, all items with this verb are excluded from construction analysis, but retained for latency analysis (see also 6.2.4).

As a side observation, 15 responses in Experiment 3a corresponded morphologically undisputably to acceptable ditransitive constructions, but had to be scored as 'other' because their syntax deviated from the word order templates that were employed in this experiment. Of particular interest here, and characteristic

Table 7.6: *Experiment 3b: Mean RTs [ms]*

task	construction produced	German source canonical	shifted dat.	mean
repeating	canonical	1324	n.a.	1324
	shifted dat.	n.a.	1209	1209
	mean	1324	1209	
translation	DO	2748	2876	2777
	PO	2722	2669	2684
	mean	2739	2708	

Note: *n.a.* identifies systematically unrepresentative response cells in the repeating task.

for this combination of L1 and source constructions, is the repetition of shifted datives as prepositional constructions. Thus, a source *"Der Meister schenkt den Gewinn dem Chef"* ("The master gives the profit (acc.) the boss (dat.)", see example structure *(29b)*, above) was repeated as *"Der Meister schenkt den Gewinn **an** den Chef"* (see example structure *(28b)*, above), a structure that does not correspond with native speaker usage.[1] For examples of translations that were excluded at this point, see 7.4.2. Exclusions for structural reasons involved 2 canonical dative repetitions of shifted datives, 1 shifted dative repeating of a canonical dative, 7 prepositional construction repetitions of shifted datives, 2 PO translations of canonical datives, 2 DO translations of shifted datives, and 1 PO translation of a shifted dative.

Response Types. 251 (56.0%) of the responses in the repeating task were acceptable as reproductions of one of the two source constructions. 59.4% of all acceptable repetitions covered a canonical dative, 40.6% a shifted dative.

Out of the 333 (74.3%) acceptable translation responses, 49.2% translated a canonical dative, 50.8% a shifted dative. An overall preference for English PO constructions was observed with 43.8% PO responses, but only 30.6% DO responses. (25.7% had to be scored as 'other'.) At that, DO targets occur predominantly with canonical dative sources (79.6%), while POs are more frequent after shifted datives (71.9%).

Response times. Table 7.6 shows the mean response times (RTs) to the experimental conditions in both tasks. As in previous experiments, a number of data points

[1]To make for an acceptable prepositional construction, the verb *schenken* would need to be prefixed as ***ver**schenken*, in a special form of the German prefix-participle alternation discussed on p.126.

had to be excluded out of technical considerations. These are not included in the mean RTs shown in Table 7.6. In the repeating task, this concerned 9 canonical and 6 shifted datives; in the translation task, 38 translations of canonical datives into DOs and 14 into POs had to be excluded, and also 7 translations of shifted datives into DOs and 42 into POs.

7.5.3 Analysis

Likelihood of responses

Repeated measures Analysis of Variance reveals an effect from *task* on the likelihood to produce an acceptable response ($F_1(1,3) = 274.673$, $p < .001$; $F_2(1,52) = 18.039$, $p < .001$). Acceptable responses are less likely to occur in the repeating task (estimate by participants, 58.9%; by items, 57.2%) than in the translation task (69.2%/74.0%).

The construction of the *source* had a significant effect on the likelihood of acceptable responses ($F_1(1,3) = 7.588$, $p = .070$; $F_2(1,52) = 10.675$, $p < .01$), so that acceptable responses were more likely after canonical datives (68.2%/71.8%) than after shifted datives (60.0%/59.4%) This was modulated by an interaction of *task* and *source* ($F_1(1,3) = 16.673$, $p < .05$; $F_2(1,52) = 14.884$, $p < .001$). In the repeating task, acceptable responses were more likely to dative sources (69.3%/69.5%) than to shifted datives (48.5%/44.8%); only very small differences between sources were encountered in the translation task (canonical datives 67.0%/74.1%, shifted datives 71.4%/74.0%).

By participants, the *sequence* of tasks had no influence on the overall ability to respond, $F(1,3) = 1.603$, $p = .295$). *Test results* could not serve as predictors of performance in this respect ($F(11,3) = 2.603$, $p = .233$).

By items, *frequency of verb* had only a marginal influence on the likelihood of acceptable responses ($F(3,52) = 2.728$, $p = .053$), indicating better responses for more frequent verbs. This effect did not interact with any other effect on response likelihood.

Construction

An overview of the significance of participant- and item-specific predictors is given in Table G.12 in Appendix G.

POs still make out the majority of the constructions that were produced in Experiment 3b, but only by a small margin. Repeated measures Analysis of Variance discovers a main effect of *source* on the selection of target constructions in the translation task ($F_1(1,15) = 43.384$, $p < .001$; $F_2(1,54) = 165.600$, $p < .001$). Default datives are translated as POs at an estimated 38.9%/33.9% of all instances, while shifted datives are translated as POs 84.4%/84.8% of the time.

Latency

Before carrying out a more detailed analysis through Linear Mixed Effects modeling, a repeated measures Analysis of Variance was carried out on loglinearized latency times for possible evidence of differences in latency due to characteristics of the source constructions. Two analyses were carried out, respectively treating participants and items as random factors. Both analyses used a 2×2 design and used *task* (repeating vs translation) and *source* (default vs shifted) as factors both within participants and within items.

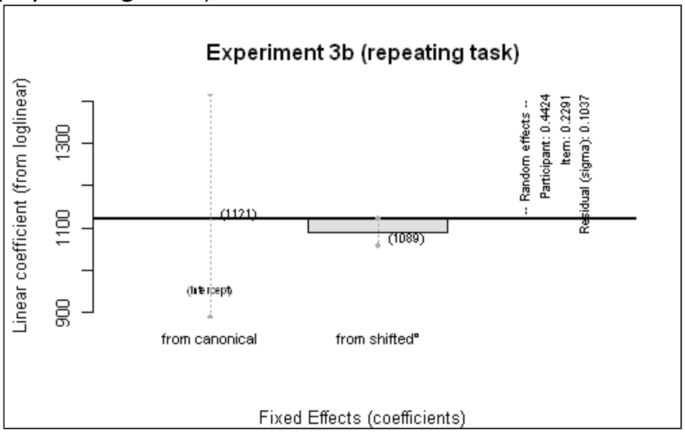
This found a significant effect of *task* ($F_1(1,14) = 19.425$, $p < .01$; $F_2(1,47) = 220.608$, $p < .001$), but not of *source* ($F_{1,2} < 1$). Nor was there evidence of any significant interaction between the two factors ($F_1(1,14) = 2.829$, $p = .115$; $F(2,1) < 147$), which allowed to exclude even task-specific latency effects from *source* constructions.

In the repeating task, analysis of latency data through Linear Mixed effects found that no effect from *source* had been observed ($t = -1.84$, $p_{mc} = .067$, as shown in Figure 7.4.

Analysing data from the translation task (see Figure 7.5), the analysis finds that instances where a canonical dative source was translated as a PO were not significantly different from those where a shifted dative was rendered as a PO ($t = -0.84$, $p_{mc} = n.s.$), or a canonical dative as DO ($t = -0.96$, $p_{mc} = n.s.$). Translations of shifted datives as DOs are not significantly different from what is expected on the basis of translations of shifted dative sources or into DOs alone ($t = 1.06$, $p_{mc} = n.s.$).

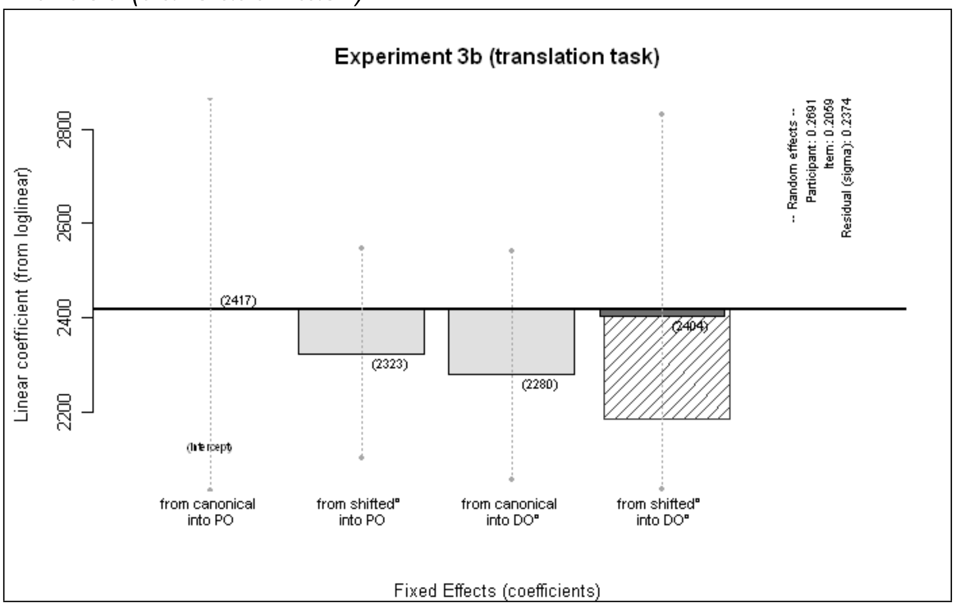
Considering latency data from Experiment 3b as a whole (see Figure 7.6), the analyses reveal no significant differences between translations of the two types of sources into unprimed structures ($t = 0.52$, $p_{mc} = n.s.$). There was no significant difference between translations of canonical datives, whether primed or

Figure 7.4: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3b (repeating task)*



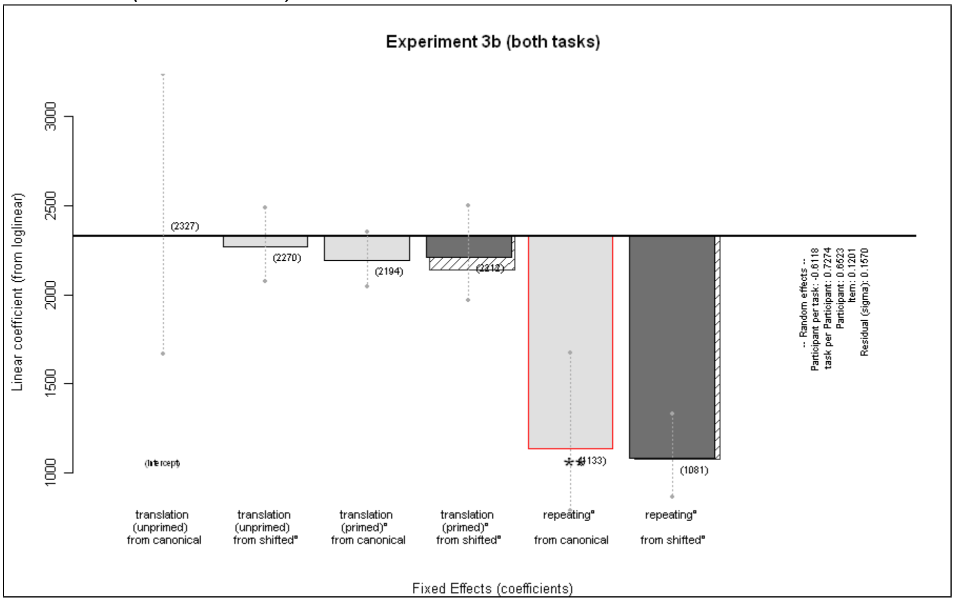
Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.5: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3b (translation task)*



Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.6: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3b (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See notes for Figure 6.1 and Figure 6.2.

unprimed ($t = -1.11$, $p_{mc} = n.s.$). The effect of primed translations of shifted datives was not significantly different from what can be expected on the basis of its components ($t = -0.14$, $p_{mc} = n.s.$). The repeating of canonical datives was significantly faster than their translation ($t = -4.32$, $p_{mc} < .0001$), while the repeating of shifted datives was not significantly different from what could be expected on the basis of its components ($t = -0.97$, $p_{mc} = n.s.$).

Different from Experiment 2b, the Linear Mixed Effects models of response latencies in Experiment 3b show no significant effect of *trial* as a random factor: no habituation effects are in evidence for this group of participants.

7.5.4 Discussion

The repeating task of Experiment 3b provides clear evidence that L1 English speakers of L2 German face a challenge with shifted datives. Apart from the high incidence of restructurings during scoring (see 7.5.2) — in particular into prepositional constructions that are not acceptable by native standards in the given context — they are significantly less likely to repeat these constructions in acceptable form than they are with canonical datives. At closer analysis, acceptable repeating is less likely than acceptable translation, indicating that the problems that have been observed are due not only to overall comprehension, but also to syntactic structure. Specifically, I argue that the constellation of argument order and morphological marking in shifted datives is not accessible for speakers of L1 English through transfer; i.e. it is less well integrated into their overall language system and thus not accessible during production with equal ease as canonical datives.

More interesting in the context of this thesis are results for the translation task. Here, clear evidence has been found that the selection of constructions for the target is primed by the construction encountered in the source — PO targets are less likely after canonical dative sources, and significantly more likely after shifted datives. There is, however, no evidence of a facilitation effect through priming, as it had been observed in Experiment 3a. Another topic of interest in an analysis of translations in direction L2→L1 is of course the asymmetric 'translation-equivalent boost' of priming that has been reported by Schoonbaert et al. (2007). To approach the asymmetry, however, comparison is needed, and the following section will compare the two datasets from Experiments 3a and 3b.

7.6 Experiment 3: Comprehensive Analysis and Discussion

7.6.1 *Analysis*

As in Experiment 2, the analyses that were carried out in Experiments 3a and 3b are repeated over their combined dataset, with *L1* as a factor between Participants and within Items in repeated measures Analyses of Variance. For Experiment 3, I also carried out latency analyses through Linear Mixed Effects modelling with *L1* as a fixed effect. The comparison effect in these models will be that for translations of canonical datives into POs by speakers of L1 German (see p.134).

Restrictions of the dataset due to occurrence of non-alternating verbs in target productions are combined from both datasets. Thus, no items are included in construction analysis that involve the source verb *erzählen*. Due to the heterogeneity of the two language groups, participant- and item-specific information cannot be taken into account.

Likelihood of responses

Analysis of Variance shows a significant effect of participants' *L1* on their overall task performance ($F_1(1, 30) = 16.807$, $p < .001$; $F_2(1, 55) = 168.286$, $p < .001$). Speakers of L1 German produced (by participants and by items) an estimated 89.4% acceptable responses, while speakers of L1 English provided 65.1%.

A main effect of *task* is observed on the overall performance in Experiment 3, $F_1(1, 30) = 6.145$, $p < .05$; $F_2(1, 55) = 13.348$, $p < .001$: in general, an estimated 73.2% of productions in the repeating task is acceptable, but 81.3% during translation. There is, however, a significant interaction between *task* and *L1* ($F_1(1, 30) = 9.602$, $p < .01$; $F_2(1, 55) = 25.068$, $p < .001$). While speakers of L1 German provided an estimated 90.4% acceptable responses in the repeating task and 88.4%% in translation, speakers of L2 English provided only 56.0% acceptable responses when repeating, but 74.1% when translating.

In both experiments, there was a main effect of *source* on the overall acceptability of participants' responses ($F_1(1, 30) = 19.677$, $p < .001$; $F_2(1, 55) = 23.963$, $p < .001$). Successful responses were generally more likely after dative sources (81.6%) than after prepositional ones (72.9%). This effect did not interact with *L1* ($F_{1,2} < 1$). There was significant interaction of *task* and *source* ($F_1(1, 30) = 134.800$, $p < .001$; $F_2(1, 55) = 20.178$, $p < .001$), modulated in a significant 3-way interaction with *L1* ($F_1(1, 30) = 2.884$, $p = .100$; $F_2(1, 55) = 4.662$, $p < .05$).

Construction

Analysis of Variance finds a significant difference between the selection of target constructions by *L1* ($F_1(1, 30) = 7.864$, $p < .01$; $F_2(1, 54) = 31.505$, $p < .001$). Speakers of L1 German produced significantly more translations into POs (estimate by participants, 66.3%; by items, 77.0%) than speakers of L1 English (43.5%/59.4%).

For both groups, there was a main effect of *source* on the constructions that were actually selected ($F_1(1, 30) = 39.318$, $p < .001$; $F_2(1, 54) = 207.910$, $p < .001$): PO translations followed less often after a canonical dative source (42.2%/51.3%) than after a shifted dative (67.6%/85.1). In addition, there was an interaction between *L1* and *source* ($F_1(1, 30) = 9.488$, $p < .01$; $F_2(1, 54) = 26.970$, $p < .001$), indicating that speakers of L1 German would provide POs as translations for 59.8%/68.6% of all canonical dative sources but for 72.8%/85.3% of all shifted datives. Speakers of L1 English, in turn, provided translations into a PO for only 24.6%/33.9% of all canonical datives, but 62.5%/84.8% of all shifted datives.

Latency

As shown in Figure 7.4, Linear Mixed Effects models find no significant effects or interaction for *source* and *L1* in the repeating task (all $t < 1$, $p_{mc} = n.s.$).

Effects in the translation task for the baseline group of L1 German have been reported in 7.4.3 and remain essentially unchanged in the combined analysis, except for slight changes to the linear coefficient, to t- and p-values due to different simulation runs. (Compare Figure 7.2 with the corresponding left half of Figure 7.8.) The only effect that is interesting here is a marginal interaction of *target* and *L1* ($t = 1.83$, $p_{mc} = .067$, indicating that translations of datives into DOs might be slower if carried out by speakers of L1 English.

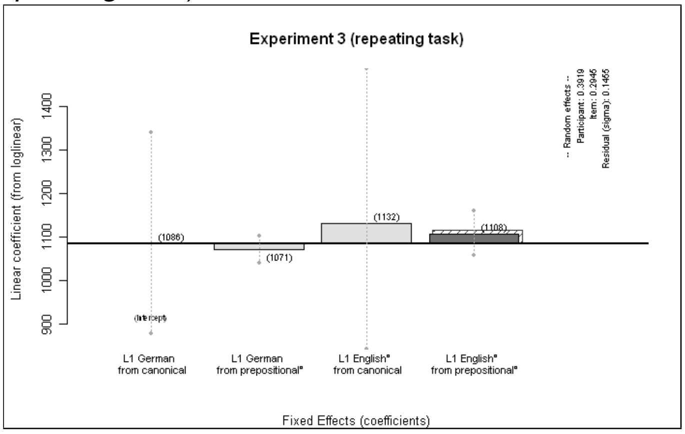
The same is essentially documented in the analysis of all latency data under consideration of production events, instead of target constructions (shown in Figure 7.9). Here, the interaction of *event* and *L1* has become clearly significant, though still weak ($t = 2.10$, $p_{mc} = .036$. Translations of canonical datives into (primed) DOs by speakers of L1 English have a weakly significant tendency to be slower than corresponding translations by speakers of L1 German.

7.6.2 Discussion

Findings from combined analyses of all data from Experiment 3 indicate that both groups provide significantly and characteristically more acceptable responses in the task that requires them to produce in their L1 (i.e. in the repeating task for speakers of L1 German, in the translation task for speakers of L1 English). Highly distinctive are also the problems of L1 English speakers with responses to shifted datives, observed before in the analysis of Experiment 3b. No comparable or contrary effect is observed for native speakers of L1 German. An account for this observation has already been proposed in the discussion of Experiment 3b, arguing that processing of this structure cannot be supported by transfer.

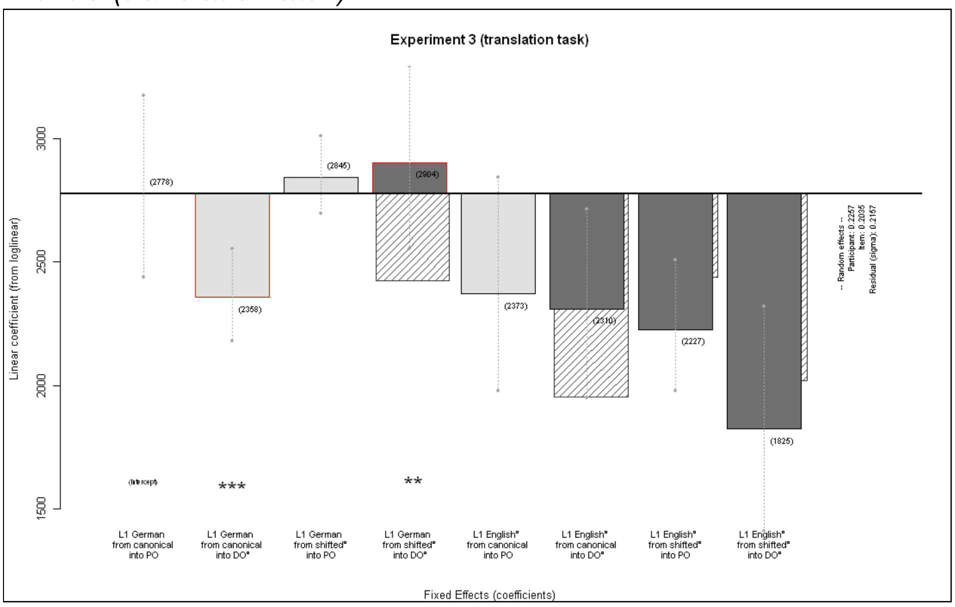
In terms of the selection of target constructions, there is clear indication of a general priming effect for both participant groups, but also of characteristically different basic preferences for DO and PO constructions between the two groups.

Figure 7.7: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3 (repeating task)*



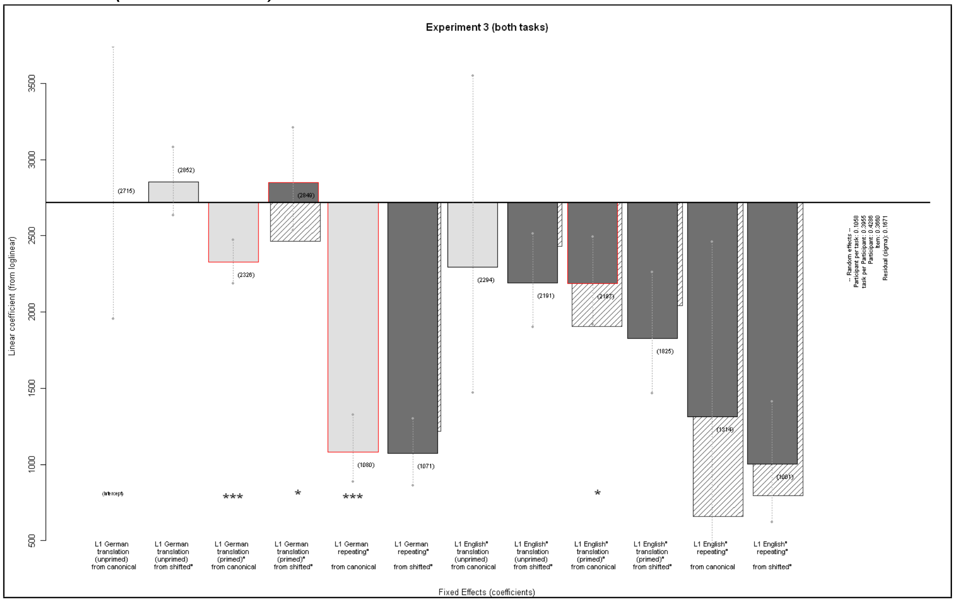
Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.8: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3 (translation task)*



Note: See notes for Figure 6.1 and Figure 6.2.

Figure 7.9: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 3 (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See notes for Figure 6.1 and Figure 6.2.

The priming that is experienced from source constructions differs between speaker groups, and is less pronounced in translations by speakers of L1 German, i.e. in translations from L1 into L2. This finding seems to stand in contradiction with the 'translation-equivalent boost of priming' reported by Schoonbaert et al. (2007). However, analysis has also shown that the preference of L1 German speakers for English PO constructions is significantly stronger than that of L1 English speakers. This stronger bias towards POs might have reduced priming for DOs and enhanced priming for POs; it is certainly in line with the prediction of overall different production patterns that follows from the Interface Hypothesis.

Considering finally response latencies as a measure of processing load, the combined analysis suggests that (primed) translations of canonical datives into DOs receive less facilitation in speakers of the L1 English group than in speakers of the L1 German group. This finding appears to support Schoonbaert et al.'s (2007) 'translation-equivalent boost of priming' again.

Hence, the findings with respect to the 'translation-equivalent boost of priming' are not conclusive. In particular, the role of L2 proficiency in the instances of language production that are observed in a translation experiment is not clear yet;

none of the analyses has suggested a role for proficiency, although proficiency is clearly the main distinguishing factor between the two participant groups.

In the last section of this Chapter, I will attempt to develop a slightly larger picture of processes during the translation of ditransitives in general. For this purpose, I conduct analyses over data from Experiments 2 and 3 together. Analyses will be carried out separately for L1 German and L1 English groups, to allow inclusion of participant- and item-specific information — which may help to identify influences of proficiency-related factors.

7.7 Experiments 2 and 3: Comprehensive Analysis and Discussion

The verbs *schicken* and *verkaufen* have been employed in the creation of items for both Experiments 2 and 3 with the explicit intention to make a comparison between the results that were retrieved from each. This section presents an analysis and discussion of the combined results for this verbs.

The dataset for this analysis consisted only of those items from both Experiments that involved the two verbs in question. A first step in the analysis tested the responses to canonical datives in each task for significant differences between the experiments. Further analyses were only considered feasible if no effect was found at this point. L1 groups were analyzed separately so that participant- and item-specific information could be included.

The likelihood of producing an acceptable response was analysed through a repeated measures Analysis of Variance that treated participants as a random factor in one set of analyses, items in the second. The analysis was carried out as a 2×2 design, using *task* and *source* as factors within participants or within items, and *experiment* as a factor between participants or between items. Because the pre-test had already shown at this point that there is no effect from *experiment* on canonical datives, a significant interaction between *source* and *experiment* had to indicate that there were differences between prepositional constructions and shifted datives. This might further interact with *task*.

To analyse construction choice, a second repeated measures Analysis of Variance targeted the occurrence of POs in acceptable productions, treating participants as a random factor in one set of analyses, items in the second. Because production of English POs could be observed only in the translation task, a 2-way design was sufficient, using *source* as a factor within participants or items, and *experiment* as a factor between participants or items. For the same reason, the pre-test could be carried out as a univariate Analyses of Variance. Again, interactions between *source* and *experiment* are most interesting, as they indicate differences between prepositional constructions and shifted datives.

For the analysis of latency times through a Linear Mixed Effects model, the distribution of data across the possible effects had to be considered. Tables 6.2, 6.5, 7.2 and 6.2 show that data cells for unprimed productions were often filled only scantily, and further reduction of the data set might empty these cells completely. This was the case for Experiments 2a and 3a. To keep language-specific analyses comparable, only response latencies for the *events* of repeating and primed translation were included in the model. Different from other Linear Mixed Effects analyses of translation results in this thesis, repeating of canonical datives was used as the comparison effect. As above, data from responses to (canonical) dative sources were analysed beforehand as a pre-test. Test models involved *experiment* and *event* as fixed factors; to allow joint analysis of the two data sets, no effect from *experiment* should be obsderved in the pre-test.

7.7.1 Analysis — L1 German

Likelihood of responses

The pre-test of data, considering datives only, found no significant differences in the likelihood of acceptable productions to the two verbs between the two experiments ($F_{1,2} < 1$).

In addition, no main effect of *experiment* was observed in the full analysis, either ($F_{1,2} < 1$). Significant effects are observed from *task* ($F_1(1, 30) = 4.032$, $p = .054$; $F_2(1, 30) = 4.234$, $p < .05$) and *source* ($F_1(1, 30) = 3.449$, $p = .073$; $F_2(1, 30) = 3.173$, $p = .085$).

There was no significant interaction between *experiment* and *source* ($F_2(1, 30) = 2.469$, $p = .127$; $F_2(1, 30) = 2.272$, $p = .142$), nor any other significant interaction.

Construction

The pre-test of data, considering datives only, found no significant differences in the preference to produce POs for their translation in the two experiments ($F_1(1, 29) = 2.058$, $p = .162$; $F_2(1, 30) = 2.216$, $p = .147$).

No main effect of *experiment* was observed in the full analysis ($F_{1,2} < 1$). However, there was a significant main effect of *source* ($F_1(1, 29) = 9.496$, $p < .01$; $F_2(1, 30) = 8.398$, $p < .01$). POs were significantly less likely as translations of canonical datives (estimate by participants, 78.0%; by items, 78.9%) than after the two other constructions (94.2%/93.8%).

There was also a weakly significant interaction between *experiment* and *source* ($F_1(1, 29) = 6.000$, $p < .05$; $F_2(1, 30) = 3.539$, $p = .070$). This indicates that the gap between the likelihoods of translations into a PO was larger between dative and prepositional constructions (dative: 69.3%/72.4%; prepositional: 98.4%/96.9%) than between canonical and shifted datives (canonical: 86.7%/85.4%; shifted: 90.0%/90.6%).

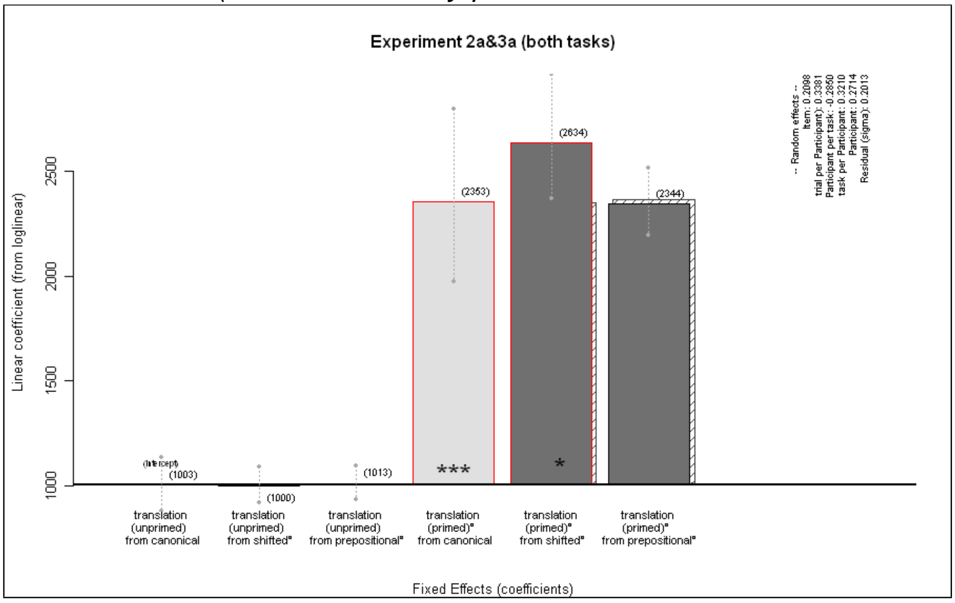
Latency

The pre-test model (discussed above; not illustrated) finds no significant differences between the latency data from only canonical datives ($t = 1.16$, $p_{mc} = .248$; hence, joint analysis of the two data sets is warranted.

The main analysis of translation latencies for L1 German, L2 English, from the full data set for verbs *schicken* and *verkaufen*, illustrated in Figure 7.10, finds no significant differences between the response latencies when repeating any of the three source constructions (both contrasts $t < 1$, $p_{mc} = n.s.$).

The response latency for primed translations of canonical datives (i.e. into DOs) is significantly longer than for repeating them ($t = 9.28$, $p_{mc} < .0001$). The response latency for primed translations of shifted datives (i.e. into POs) is significantly longer than predicted by the component effects ($t = 2.43$, $p_{mc} < .05$). The response latency for primed translations of prepositional constructions (i.e. into POs) is not significantly different from what should be expected on the basis of its component effects ($t = -0.61$, $p_{mc} = n.s.$). The model contains *trial* as a factor on the random effect of participants; participants' response latencies varied regularly across the time course of the experiment.

Figure 7.10: *Fixed Effects on latency in Linear Mixed Effects model of Experiments 2 and 3 (L1 German, only primed translations*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The baseline in this graph is repetition of canonical datives, as discussed in 7.7.1. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See also notes for Figure 6.1 and Figure 6.2.

Brief summary

There is no evidence of any problems with the processing of any of the source constructions in speakers of L1 German. Apparently, they experience stronger priming influence from L1 German towards the use of a PO in L2 English when translating prepositional constructions than when translating shifted datives. At the same time, their response latencies for primed translations of shifted datives (i.e. into PO) are significantly longer than for other constructions. Modelling of the latencies from both experiments has rendered an influence of their time course discernible that had remained unnoticed in their separate models.

7.7.2 *Analysis — L1 English*

Likelihood of responses

The pre-test of data, considering datives only, finds no significant differences in the likelihood of acceptable productions to the two verbs between the two experiments ($F_{1,2} < 1$).

No main effect of *experiment* is observed in the full analysis, either ($F_{1,2} < 1$). The effects that are observed for *task* ($F_1(1, 30) = 7.573$, $p < .01$; $F_2(1, 30) = 10.515$, $p < .01$) and *source* ($F_1(1, 30) = 4.172$, $p = .050$; $F_2(1, 30) = 5.000$, $p < .05$) are marginal, at best.

There is no significant interaction between *experiment* and *source* ($F_{1,2} < 1$). A significant interaction between task and source ($F_1(1, 30) = 6.151$, $p < .05$; $F_2(1, 30) = 6.255$, $p < .05$) shows that, in the repeating task, datives are significantly more likely to provide acceptable responses (estimate 68.8%, both by participants and by items) than other constructions (49.2%). No such difference is observed in the translation task (datives 72.7%, non-datives 75.0%). No other interactions are observed.

Construction

The pre-test of data, considering datives only, finds a marginal differences in the preference to produce POs as translation constructions in the two experiments ($F(1, 29) < 1$; $F_2(1, 30) = 5.621$, $p < .05$), indicating that prepositional responses to datives were more likely in Experiment 2 (estimate by participant 51.0%; by item, 63.0%) than in Experiment 3 (40.6%/34.9%).

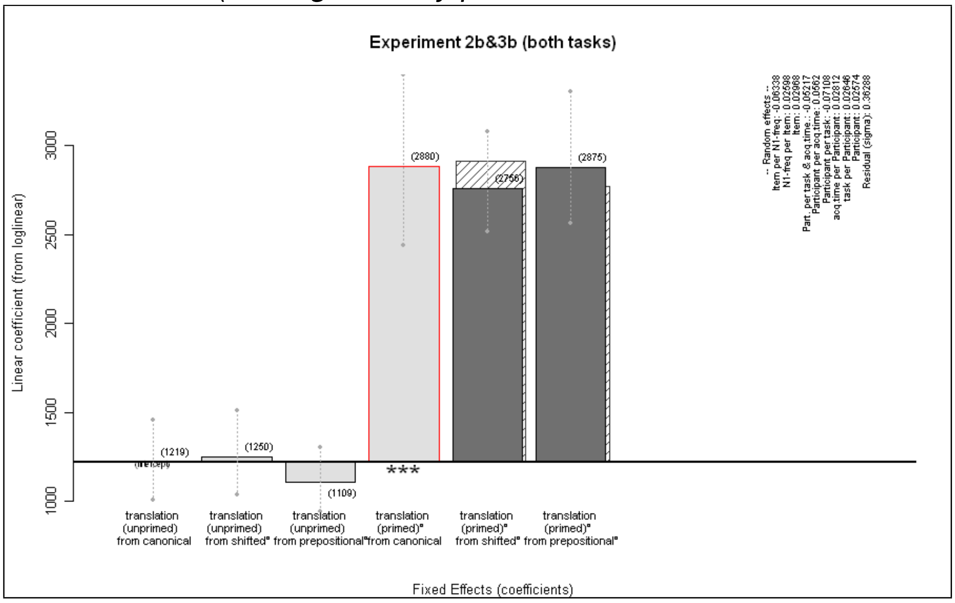
Latency

The pre-test model (discussed above; not illustrated) finds no significant differences between the latency data from only canonical datives ($t = -0.01$, $p = .994$); hence, joint analysis of the two data sets is warranted.

The main analysis of translation latencies for L1 English, L2 German, from the full data set for verbs *schicken* and *verkaufen*, illustrated in Figure 7.11, finds no significant differences between the response latencies when repeating any of the three source constructions (both contrasts $t < 1$, $p_{mc} = n.s.$).

The response latency for primed translations of canonical datives (i.e. into DOs) is significantly longer than for repeating them ($t = 5.84$, $p_{mc} < .0001$). The response latency for primed translations of shifted datives (i.e. into POs) is not significantly different from what should be expected on the basis of its component effects ($t = 0.56$, $p_{mc} = n.s.$). The response latency for primed translations of prepositional constructions (i.e. into POs) is not significantly different from what should be expected on the basis of its component effects ($t = 1.83$, $p_{mc} = .069$.

Figure 7.11: *Fixed Effects on latency in Linear Mixed Effects model of Experiments 2 and 3 (L1 English, only primed translations*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. The baseline in this graph is repetition of canonical datives, as discussed in 7.7.1. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See also notes for Figure 6.1 and Figure 6.2.

The model contains *trial* as a factor on the random effect of participants; participants' response latencies varied regularly across the time course of the experiment. The model was also significantly improved through inclusion of *years in acquisition* as a factor over the random effect of participants and of *frequency of first noun* as a factor over the random effect of items.

Brief summary

Production analysis suggests that speakers of L1 English find it significantly easier to repeat canonical datives in L2 German than any other ditransitive construction. It is not possible to judge the relative magnitude of priming effects for the three constructions from the experiments that have been presented; the observed effect of *experiment* on construction choice indicates a stronger proclivity to produce L1 English POs in Experiment 2. There is no indication of source-based latency effects. Modelling of the latencies from both experiments has rendered an influence of their time course discernible that had remained unnoticed in their separate models. Moreover, indicators for participant- and item-specific effects have become discernible that had been covered by the general random effects in the two separate models of the experiments.

7.7.3 Discussion

The comparison of production events in Experiment 2 and Experiment 3 confirms in particular the conclusions from Experiment 3a. Response latencies by speakers of L1 German are slowed down significantly for translations where there is a necessity to carry out an additional task of morphological processing; there is no significant difference between translations where source and target are fully matched in terms of syntax *and* morphology.

For speakers of L1 English, production results suggest some problems with the production of non-canonical ditransitive structures in German. A comparison of the magnitudes of priming effects is not possible due to the particular nature of the data. The stronger occurrence of POs in the responses to datives in Experiment 2b (where the second condition involved a matching-form prepositional construction) may be due to a longer-lasting structural priming effect *between* trials. In this respect, it is also relevant that participant- and item-specific factors are found to improve the model's fit to the data. They suggest strongly that proficiency-related factors have at least some impact on results, and that processing under conceptual guidance might again play a larger role.

To develop a larger picture, it is necessary to take into account the unprimed translations that could not be included in the latency analyses above (Figures 7.10, 7.11), but were shown in particular in the analyses of Experiment 3 (Figures 7.3, 7.6). Analysis has shown that facilitation is not a significant factor in their production by speakers of L1 English who are translating from L2 into L1; but it is for speakers of L1 German who are translating from L1 into L2. In other words, in translations L2→L1 there is no difference between the activation that is required (i.e. the 'effort') that is necessary to produce a primed structure or an unprimed structure. In translations L1→L2, however, primed structures have a clear advantage (albeit moderated by structural preferences) to be selected over unprimed structures, in particular in situations where the available activation is restricted. (The fact that it is not always the primed structure that is selected may have multiple causes that may require further research. The example of L1 German speakers and their preference for English POs, documented in Experiments 2a and 3a, suggests an inhomogeneity of connections within the cognitive network of the language system as one plausible factor.) Following this account, the findings in this thesis appear to document evidence for directionality of translation that is based on empirically measured data, rather than quality ratings.

Another account of interaction between priming and efforts is encountered in the literature in Levelt & Kelter (1982), most recently in Smith & Wheeldon (2001, p.157): priming, they suggest, may function as a method to reduce production efforts to a speaker "and so to promote the fluency and rapidity of utterance generation". Notice that the direction of causality is inverted in my account: priming, I argue, does not *lead* to a reduction of required activation, but it is rather a *result* of its restricted availability.

CHAPTER 8

Experiment 4: Resolving the syntactic bracket

Experiment 3 has shown that it is possible to observe structural priming and the corresponding facilitation for the same translation event. I have also shown that this facilitation depends on syntactic and morphological match relationships between source and target construction, which relate to criteria of form-based translation. In this chapter, I pursue this line of thought one step further, and consider modifications of the elementary syntactic correspondences between source and target constructions. The resulting predictions are tested in an experiment, the outcomes of which might be relevant for theories of language production in general.

In 7.4.4, I have found that the response latencies in the translation task of Experiment 3 reflected three types of translation processes:

- translations that involved neither a phrasal nor a structural adjustment to the structure of the source received maximum facilitation
- translations that involved a phrasal, but no structural adjustment to the structure of the source received significantly less facilitation
- translations that involved a structural adjustment to the structure of the source received the least facilitation, irrespective of phrasal adjustments

I have already observed that the effect of phrasal modifications of the functional level of processing may be cloaked by the effects of structural modifications on the subsequent positional level, and does not add to overall processing requirements.

Not clear, however, is the question what happens if two adjustments occur on the same organizational level of language. If the two processes are carried out separately, drawing activation from the same global source (see Sections 2.1.4, 4.2.2), then an additional processing load is incurred, and should be observable. However, if both processes are accessed automatically as parts of a larger, level-specific processing component (e.g. the positional processing component in the Bock-Levelt model of syntactic processing; see p.21), then no additional processing load is incurred. This scenario is predicted by Potter & Lombardi (1998) and discussed in more detail below, p.200. Finally, if both processes are accessed through a larger, level-specific processing component but not automatically, then some additional processing load is incurred but not to the same degree as if they were separate.

German allows to test the effects of having two structural adjustments instead of one, while allowing comparison of results with those of Experiment 3. Thus, 8.1 will introduce the German *Perfekt* and discuss various concerns that arise from its application in a priming/translation experiment; 8.2 and 8.3 present Experiment 4 and discuss its results, and 8.4 draws a comparison between Experiments 3a and 4.

8.1 Objects in a frame: the *midfield*

Section 7.1 discussed the hierarchical ordering of objects and complements in German main clauses, which follows preferences depending on case and phrasal status. To recapitulate, in canonical main clauses dative objects will preferably follow directly after the inflected verb, then accusative objects, and finally prepositional complements (see p.161). Thus, objects and other complements in a German sentence will commonly follow after the inflected verb, in a region that known as the 'midfield' (*Mittelfeld*).

The German midfield can be defined as the part of the sentence that is contained in the verbal frame, or syntactic 'bracket' (*Satzklammer*). Its 'left' end is instantiated (in main clauses) by the inflected verb; the 'right' end may not be realized, and coincide with the end of the sentence instead — shown in *(30a)*. Both ends of the *Satzklammer* are discernible whenever the verbal part of the sentences contains verbal material other than the lexical verb itself, such as auxiliaries or modals. In these cases, the 'left bracket' is instantiated by inflected parts only, while uninflected material occurs as the 'right bracket' close to the end of the sentence — shown in *(30b)*, *(30c)* (see Kunkel-Razum & Münzberg, 2006, p.879–81).

(30a) **present tense:** Die Tante **gibt** dem Papst eine Kartoffel.
(The aunt gives the pope a potato.)

(30b) **modal adjustment:** Die Tante **sollte** dem Papst eine Kartoffel **geben**.
(The aunt should give the pope a potato.)

(30c) ***Perfekt*** **tense:** Die Tante **hat** dem Papst eine Kartoffel **gegeben**.
(The aunt has given the pope a potato.)

This feature is interesting in the context of this thesis because, on one side, it changes the order in which concepts are presented. While *(30a)* delivers lexical units in the order of Subject-Verb-Recipient-Theme, the same units occur in *(30c)* as Subject-Recipient-Theme-Verb. Hence, when translating *(30c)* into English, it will be necessary to re-order these units to accommodate the canonic SVO order of English (Givón, 1993b, p.96). On the other side, the order of the objects, i.e. of the recipient and the theme, is not affected by the presence or absence of the 'right bracket', and may still prime for DO or PO target structures when translated.

The materials of Experiments 2 and 3 used only German constructions with one-word VPs like *(30a)*, i.e. the 'right bracket' was kept empty. The resulting one-word V2 structures matched the English SVO and kept the syntactic 'background noise' during translation at a minimum. Larger VPs may result from addition of a modal verb (modifying semantic contents), or from application of certain tenses that require an auxiliary verb: a frequent example is the *Perfekt*, the most common narrative past tense in spoken German, shown in *(31a)* and *(31b)*. For comparison, corresponding English sentences in the (morphologically similar) English Perfect tense retain continuous VPs, as shown in *(32a)* and *(32b)*:

(31a) Die Tante *hat* dem Papst die Kartoffel *gegeben*. = *(30c)*

(31b) Die Tante *hat* die Kartoffel dem Papst *gegeben*.

(32a) The aunt has given the pope the potato.

(32b) The aunt has given the potato to the pope.

It will be noticed that the change in word order is similar to that between Dutch participle-final passives and English passives in Experiment 1. This change however will be obligatory in translations from German.

Following the findings of Pickering & Branigan (1998), it is safe to assume that the change of verbal tense from the *Präsens* of *(30a)* to the *Perfekt* of *(31a)* should not lead to changes in the structural priming effect that has been observed in Experiment 3 (see 2.1.3).

However, the influences of this operation on the concomitant facilitation of production are less than clear. Experiment 3 has shown that the facilitation that is associated with priming, i.e. with situations where no syntactic restructuring from source to target is necessary, may be diminished if an unrelated morphosyntactic operation (transformation of an NP into a PP) needs to be carried out. The effect is additionally cloaked if an operation of syntactic restructuring is carried out at the same time, suggesting that activation resources for functional and positional processing are allotted separately and not in direct communication.

From the perspective of the Integrated Model of syntactic representation, assuming assignment of phrasal sub-frames at the inflectional stage of positional processing (see p.21), I expect that one or several additional syntactic operations need to be carried out during translation. Minimally, a switch will be necessary from a hypothetical Aux(iliary)-X-Part(iciple) structure for the German 'syntactic bracket' into an alternative structure Aux-Part-X. Notice that in the case of ditransitives, X contains the two objects that are separately subject to structural priming. It follows that, under this account, overall response times should be longer (there is an additional process that needs to be carried out), but the basic facilitation effect should remain unchanged from Experiment 3.

A very different account may be possible on the basis of work by Potter & Lombardi (1990); Lombardi & Potter (1992); Potter & Lombardi (1998): Potter & Lombardi (1990) had observed that semantically appropriate distractor synonyms could replace words of sentences in a recall task independent of processing pressure (presentation rate in RSVP), language modality (written or auditory), or speaker age (adults vs children). They concluded that these sentences had been stored not as syntactic sequences, but as conceptual structures. Following up on this finding, Potter & Lombardi (1998) conducted a similar experiment in which recalled target sentences contained an English ditransitive structure, i.e. a DO or PO. Distractor sentences contained the alternation counterpart of this structure, a surface-similar construction that was not a ditransitive, or a neutral control structure. Erroneous recall of the target sentence was more frequent after (priming) ditransitives than after other distractors. In summary, Potter & Lombardi

(1998) claim that comprehension transforms sentences into conceptual representations; thus, the syntactic features of apparently verbatim repeated sentences are actually generated from scratch, enhanced possibly through self-priming from previous comprehension.

It will be noticed that a comparable notion of comprehension up to a strictly conceptual level has occurred earlier in this thesis, in the discussion of the vertical model of translation (see 4.1.2). Different from Seleskovitch's (1976) model, however, there is no separation between comprehension and production in the model of the language system proposed by Potter & Lombardi (1998); the possibility that previously (i.e. in comprehension) encountered structural features are re-used in production is expressly permitted.

Potter & Lombardi's (1998) original account makes no indications how these processes might reflect on processing and latency. Based on the findings from Experiment 3, however, it appears plausible to assume that the possibility to re-use structures (i.e. priming) must lead to facilitated processing. The main difference between the account of the Integrated Model and that of Potter & Lombardi (1998) is their perspective on syntactic processes:

- Under the integrated model, translation events in Experiment 3 can be described as requiring one or no morphological operation, and one or no syntactic operation. For Experiment 4, *Perfekt* tense adds another syntactic operation as discussed above, but leaves everything else unchanged: hence, similar patterns of facilitation can be expected.
- Following Potter & Lombardi (1998), the translations of Experiment 3 involve one or no morphological operation, and one or no syntactic recast. In Experiment 4, syntactic recasting is necessary under all circumstances; even if parts of the previous structure can be re-used (i.e. the primed order of ditransitive arguments), Experiment 3 has found that a syntactic recast cloaks morphological operation. Hence, facilitation of primed constructions may be expected as before, but there should be no evidence of reduced facilitation for translations into POs.

8.2 Experiment 4: Practical Issues

In Experiment 4, speakers of L1 German and L2 English repeated items in German (L1-L1) or translated them from German into English (L1-L2). Experimental

Table 8.1: *Experiment 4: Participant demographics*

	Range	
participants		16 (5M)
age (years)	21–48	(mean: 30.1)
learning age (yrs since onset)	2–38	(mean: 19.3)
time of residence (months)	2–200	(median: 18)
self-rating (7 = best)	3.75–7	(median: 5)
self-rating: L2 reading (1–7, 7=best)	3–7	(median: 6)
self-rating: L2 listening (1–7, 7=best)	2–7	(median: 5)
self-rating: L2 speaking (1–7, 7=best)	3–7	(median: 6)
self-rating: L2 writing (1–7, 7=best)	4–7	(median: 5.5)
test results (percentages)	72–100	(mean: 88.4)
recent exposure (7 = most)	6–7	(median: 7)

conditions corresponded to two possible constructions with German ditransitive verbs, the canonical dative construction and what has been called the shifted dative construction. Different from Experiment 3, source constructions for Experiment 4 were created in the *Perfekt* tense, with sentence-final participles. Expected target constructions in the translation task were English DO and PO. This section describes the alterations of materials that are necessitated by changing the source construction.

Participants in Experiment 4 were restricted to L1 German; significant latency effects in Experiment 3 were only observed with speakers from this L1 group.

8.2.1 *Participants*

Natively monolingual speakers of L1 German with L2 English were found in the same way as the participants of Experiments 2a and 3a, described in 6.2.1, above. No participant had any formal training as a translator or interpreter. Participants were paid a small amount of money for their participation; none had previously participated in Experiments 2a or 3a. Table 8.1 lists biographic details elicited from questionnaires and language tests, as before.

Participants in Experiment 4 reported knowledge of 0–4 additional languages, most frequently French (12), Spanish (6), and Italian and Russian (2 each). Six of them reported occasional translation activities for personal or professional needs. Three of these had also carried out paid translation jobs solely on the basis of their qualification as bilinguals.

8.2.2 Materials

The item lists used for Experiment 4 were the same as in Experiment 3; however, the actual source sentences were created not in the German present tense, but in *Perfekt*. German verbs alternate between *sein* 'to be' and *haben* 'to have' as auxiliaries for the *Perfekt* only in the intransitive range, i.e. in some of the fillers. The change of tense did not introduce any surface changes to experimental materials beyond what has been discussed above. Trial items used in Experiment 4 are listed under the corresponding entries of Experiment 3 in Appendix C.2, and fillers in Appendix D.2.

8.2.3 Procedure

The procedure applied in Experiment 4 remained unchanged from Experiments 2 and 3, as outlined in 6.2.3.

Participants of this experiment reported similarly unsystematic application of reading strategies, similar to participants in Experiments 1, 2a, and 3a. Different from previous experiments with non-native speakers of the target language, participants in Experiment 4 perceived the task to be challenging in general. No specific references to trial items were made, and there was no evidence for any particular awareness of the experimental manipulation.

8.2.4 Predictions

The change of tense between the materials Experiments 3 and 4 has not affected the order of the arguments in ditransitive constructions. Hence, no changes are expected in comparison to the results of Experiment 3, as far as structural priming is concerned.

However, the changed syntactic surface structure in Experiment 4 should lead to a change in processing requirements. As discussed in 8.1, the Integrated Model predicts that the effect discovered in Experiment 3a (NP needs to be transformed into a PP) will remain largely intact. Opposed to this, the account of Potter & Lombardi (1998) predicts that it will not be observable any more.

8.2.5 Scoring

Participants' productions in Experiment 4 were treated and scored using the same protocol as Experiments 2 and 3.

8.2.6 Design and data analysis

The design of groups and the setup of analyses for Experiment 4 are essentially identical with those for Experiments 2 and 3 (see 6.2.5).

Each participant responded to all experimental items, repeating one half and translating the other in separate tasks. Each item was seen only once by each participant. Across participants, each item was seen eight times in each of the two conditions, four times in each of the two tasks. Thus, every participant and every item contributed equally to all cells in the analysis. In each of the two possible task sequences, each list of source sentences occurred equally often in each task.

As before (see 5.3.6, 6.2.5, 7.2.5), a first approach to experimental data is taken through a 2-stage Least Square linear regression, estimating the contribution of other predictors to variance of analysed measures.

A first analysis considered whether the ratio of acceptable responses to the two *source construction*s indicated specific problems with the processing of either, in general or in one specific task. Using the proportion of acceptable responses as a measure, two sets of repeated measures Analysis of Variance were carried out, once treating participants as the random factor, once items. The analysis followed a 2×2-design, using *task* (repeating vs translation) and *source* (canonical vs shifted dative) as factors both within participants and within items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

The second step of analysis was concerned with the distribution of *target construction*s in participants' productions during the translation task. This is analysed as repeated measures Analyses of Variance with the proportion of PO productions among all acceptable responses as the analysed measure, treating participants as the random factor in one set of analyses, items in the second one. Analyses treated *source* as a 2-way factor both within participants and within

Table 8.2: *Experiment 4: Response Types*

task	construction produced	German source canonical	German source shifted dat.	TOTAL
repeating	canonical dat.	251	0	**251**
	shifted dat.	0	232	**232**
	other	5	24	**29**
translation	DO	55	30	**85**
	PO	150	177	**327**
	other	51	49	**100**

items. Additional predictors found in Linear Regression were applied as factors between participants or between items, as appropriate.

For the third step of analyses, Linear Mixed Effects models were developed as described in 6.2.5, above, first for data from each task separately, and then for both tasks together, using loglinearized *RT* as the independent variable. To model the repeating task, *source* is used as a fixed effect; for the translation task, *source*, *target*, and their interaction (in a 2×2-design); and for the combination of tasks, *source*, *event* (see 6.2.5), and their interaction (in a 2×3-design).

8.3 Experiment 4: Results and Discussion

8.3.1 Results

Table 8.2 shows the response type counts for all productions in Experiment 4 after application of the exclusion criteria. Only one verb was elicited that is categorized as non-alternating by Levin (1993, pp.46–47); namely “to explain” (in 3 translations of *erzählen*). As before, these instances are excluded from response type data but not from response time data (see also 6.2.4). No exclusion of items was required, due to the overall low incidence of non-alternating verbs.

As a side observation, 15 responses in this experiment corresponded morphologically undisputably to acceptable ditransitive constructions, but had to be scored as ‘other’ because their syntax deviated in the repeating task from the exact word order, or in the translation task from the canonical word order for English ditransitive constructions shown in *(32a)* and *(32b)*. Examples are comparable to those presented in 7.4.2. This involved 9 canonical dative repetitions of shifted datives, 4 PO translations of canonical dative sources, 1 DO translation of a shifted dative source, and 2 PO translations of shifted dative sources.

Table 8.3: *Experiment 4: Mean RTs [ms]*

task	construction produced	German source canonical	shifted dat.	mean
repeating	canonical dat.	1090	n.a.	1090
	shifted dat.	n.a.	1045	1045
	mean	1090	1045	
translation	DO	3104	3359	3192
	PO	3128	3133	3131
	mean	3122	3165	

Note: *n.a.* identifies systematically unrepresentative response cells in the repeating task.

Response Type. 483 (94.3%) of the responses in the repeating task were acceptable, and 5.7% had to be rated as 'other'. 52.0% of all successful repetitions covered a canonical dative construction, and 48.0% a shifted dative construction.

Out of the 412 (80.5%) acceptable translation responses, 49.8% translated a canonical dative, 50.2% a shifted dative. A strong overall preference for English PO constructions is discernible — they are encountered in 63.7% of all translation responsess, while only 16.6% are DOs. (19.5% of all translation responses had to be rated as 'other'.) At that, DO targets occur predominantly after canonical dative constructions (64.7%), while POs are more frequent after shifted dative sources (54.1%).

Response times. Table 8.3 shows the mean response times (RTs) to the experimental conditions in both tasks. As in previous experiments, a number of data points had to be excluded out of technical considerations. These are not included in the mean RTs shown in Table 8.3. In the repeating task, this concerned 5 dative constructions and 2 prepositional constructions; in the translation task, 4 translations of datives into DOs and 14 into POs had to be excluded, as did 3 translations of prepositional constructions into DOs and 13 into POs.

8.3.2 Analyses

Likelihood of responses

An overview of the significance of participant- and item-specific predictors for general likelihood of acceptable responses is provided in Table G.15 in Appendix G.

Repeated measures Analysis of Variation finds a significant effect from *task* on the likelihood to produce an acceptable response ($F_1(1,5) = 29.463$, $p < .01$; $F_2(1,63) = 29.149$, $p < .001$). Successful responses were more likely to occur in the repeating task (estimate by participant, 94.2%; by item, 94.3%) than in the translation task (80.5%, both by participant and by item).

There was no significant effect from *source* on the likelihood of acceptable responses ($F_1(1,5) < 1$; $F_2(1,63) = 3.367$, $p = .071$). However, a weak interaction between *source* and *task* ($F_1(1,5) = 2.978$, $p = .145$; $F_2(1,63) = 5.287$, $p < .05$) indicated that acceptable responses were more likely to canonical dative sources (97.4%/98.0%) than to shifted dative sources (90.9%/90.6%) in the repeating task. In the translation task, canonical datives (78.7%/80.1%) were less likely than shifted datives (82.4%/80.9%).

By participants, *test results* could not serve as a predictor of performance in the experiment ($F(10,5) = 1.286$, $p = .412$).

Construction

An overview of the significance of participant- and item-specific predictors is provided in Table G.15 in Appendix G.

The repeated measures Analysis of Variance discovers a main effect of *source* ($F_1(1,15) = 12.777$, $p < .01$; $F_2(1,63) = 8.814$, $p < .01$): canonical datives are translated less frequently into POs (estimate by participant, 73.2%; by item, 71.4%) than shifted datives (86.2%/83.7%).

Latency

Before carrying out a more detailed analysis through Linear Mixed Effects modeling, a repeated measures Analysis of Variance was carried out on loglinearized latency times for possible evidence of differences in latency due to characteristics of the source constructions. Two analyses were carried out, respectively treating participants and items as random factors. Both analyses used a 2×2 design and used *task* (repeating vs translation) and *source* (default vs shifted) as factors both within participants and within items.

This found a significant effect of *task* ($F_1(1,15) = 99.909$, $p < .001$; $F_2(1,63) = 1312.758$, $p < .001$), but not of *source* ($F_1(1,15) = 1.876$, $p = .191$; $F(2,1) < 163$). Nor was there evidence of any significant interaction between the two factors

($F_{1,2} < 1$), which allowed to exclude even task-specific latency effects from *source* constructions.

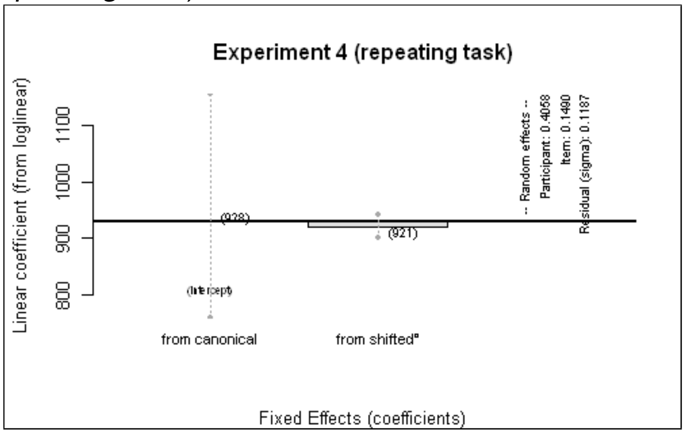
In the repeating task, analysis of latency data through Linear Mixed effects found that no effect from *source* had been observed in Experiment 4 ($t = -0.35$, $p_{mc} = n.s.$), as seen in Figure 8.1.

Analysing data from the translation task (see Figure 8.2), the analysis finds that instances where a canonical dative was translated as a PO were not significantly different from those where a shifted dative was rendered as a PO ($t = 0.54$, $p_{mc} = n.s.$), or a canonical dative as a DO ($t = 1.67$, $p_{mc} = .095$. Translations of shifted datives into DOs showed a tendency to be faster than expected from the effects of their components, but only marginally so ($t = -1.91$, $p_{mc} = .057$. Remarkably, however, this model contains *trial* as a factor on the random effect of participants; participants' response latencies varied regularly across the time course of the experiment.

Considering latency data from Experiment 4 as a whole (see Figure 8.3), analysis discovers no significant differences between the two types of translations into unprimed structures ($t = -0.21$, $p_{mc} = n.s.$). Translations of datives into the primed construction, however, are found to be significantly *slower* than their translation into the unprimed construction ($t = 2.85$, $p_{mc} < .01$). Translations of shifted datives, in turn, show a tendency to be faster than expected from the effects of shifted datives and priming alone, but not significantly so ($t = -1.35$, $p_{mc} = n.s.$) The repeating of datives was significantly faster ($t = -9.16$, $p_{mc} < .0001$), while the repeating of prepositional constructions was not significantly different from what could be expected on the basis of its components ($t = -0.02$, $p_{mc} = n.s.$). Like the translation task (but not the repeating task), the combined model was improved through inclusion of *trial* as a random factor over participants.

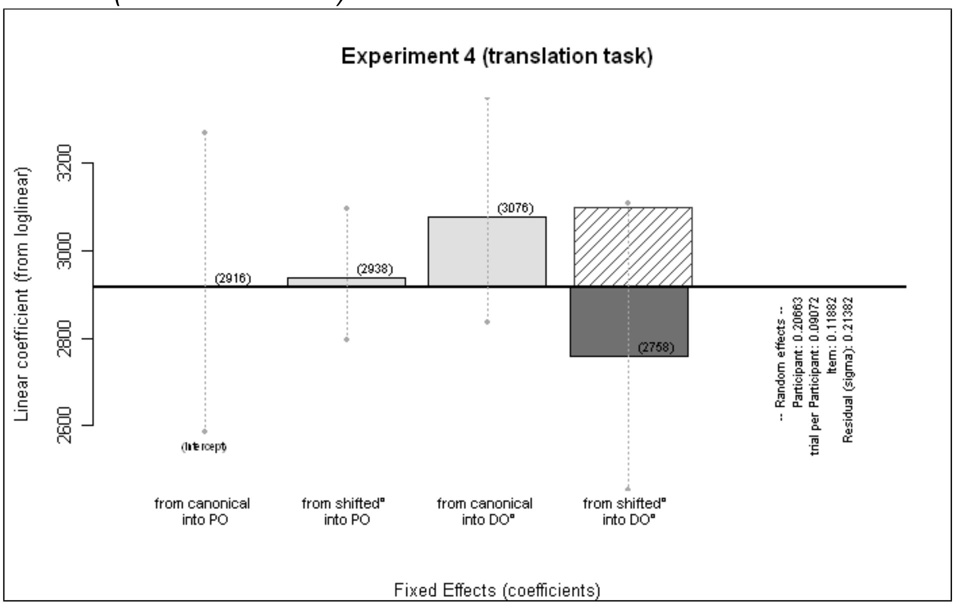
The Linear Mixed Effects model of response latencies in Experiment 4 shows an influence from *trial* that can be traced back to the translation task, where a significant random effect of 0.09744 points on the logarithmic scale is encountered between trials. The restriction of this effect to the translation task suggests that the observed effect of habituation is (again — see p.153) specific to the production of L2. As before, a more detailed discussion would require further experimentation and is beyond the scope of this thesis.

Figure 8.1: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 4 (repeating task)*



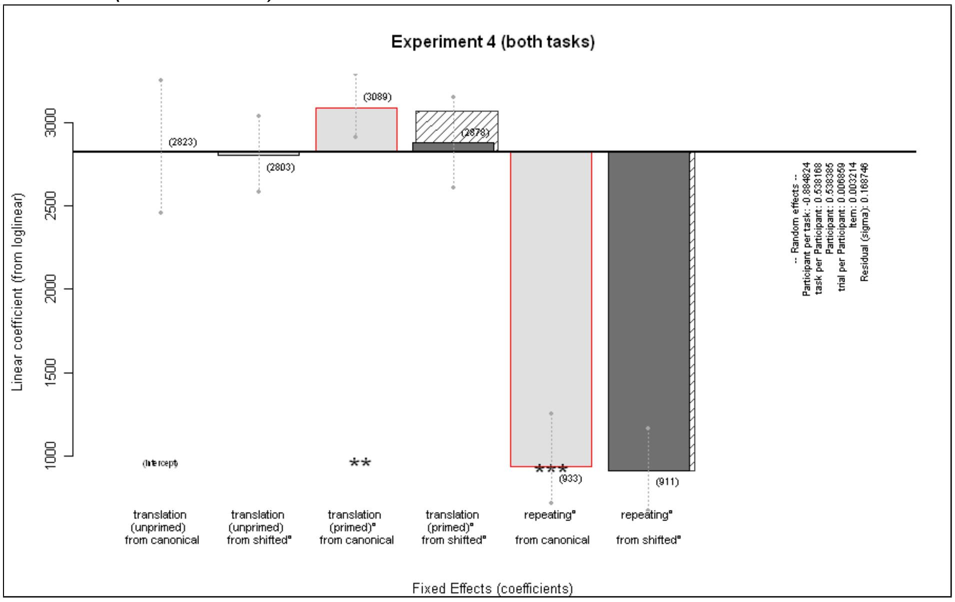
Note: See notes for Figure 6.1 and Figure 6.2.

Figure 8.2: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 4 (translation task)*



Note: *Trial* is present as a factor over the random effect of participants. In all other respects, see notes for Figure 6.1 and Figure 6.2.

Figure 8.3: *Fixed Effects on latency in Linear Mixed Effects model of Experiment 4 (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. *Trial* is present as a factor over the random effect of participants. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. See notes for Figure 6.1 and Figure 6.2.

8.3.3 *Discussion*

The repeating task of Experiment 4 shows a slight advantage in the repeating of canonical datives that parallels the findings in the repeating task of Experiment 3a, and is similarly not reflected in latency data.

While production data suggests that spontaneous translation of verb-final sentences might be a larger challenge than repeating them, the construction choices in the translation task indicate that priming is still a factor; POs are less likely after canonical datives but significantly more likely after shifted datives. A comparison of the magnitude of the priming effects in Experiments 3a and 4 will be discussed in Section 8.4.

Most puzzling, however, is the finding that primed productions are found to be slower than unprimed productions — a finding that suggests that priming incurred an additional processing load during the translation of these sentences. At the same time, there is no significant trace of an influence from the additional morphological operation in translations of shifted datives into POs.

This finding makes it impossible to come to a clear conclusion with respect to the accounts of production from Potter & Lombardi (1998) and the Integrated Model of Hartsuiker et al. (2004). It remains to observe that the unexpected direction change of the processing effects of priming indicates either that there must be more syntactic processes going on than expected under the account of Potter & Lombardi (1998), or that processes tamper with the two arguments that are subject to priming in a way that had not been anticipated by the Integrated Model.

Under both accounts, it is problematic to explain how priming can be found as an impediment in the latency of production while still occurring as a clear characteristic of production. A third account, postulating neither additional processes nor unknown priming effects, is developed on the basis of a more detailed comparison between Experiments 3a and 4 in 8.4.2, below.

8.4 Experiments 3a and 4: Comprehensive Analysis and Discussion

As discussed in 8.1, lexical verbs in Experiments 4 were at the end of the midfield region of the German sentence, but at its beginning in Experiment 3. Because Experiments 3a and 4 differed only in this respect, it will be possible to evaluate the differences between the translation processes in both through combined analysis. For this purpose, the datasets from Experiments 3a and 4 are combined and analysed as before. For this purpose, a new factor *tense* is introduced, with levels *Präsens* (the present tense) and *Perfekt*. As before, analysis is carried out as repeated measures Analyses of Variance with *task* (where applicable) as a factor within participants and items, and *source* and *tense* as factors between participants but within items. The comparison effect in Linear Mixed Effects models will be the translation of canonical datives in German *Präsens* tense into English POs. My particular interest in this analysis will be on the effects of *tense*.

8.4.1 Analysis

Likelihood of responses

Repeated Measures Analysis of Variance on combined data from Experiments 3a and 4 finds main effects of *task* ($F_1(1, 30) = 14.043$, $p < .001$; $F_2(1, 63) = 18.748$, $p < .001$) and *source* ($F_1(1, 30) = 6.371$, $p < .05$; $F_2(1, 63) = 12.370$, $p < .001$), but not *tense* ($F_{1,2} < 1$). There is not only an interaction of *task* and *source* ($F_1(1, 30) = 5.437$, $p < .05$; $F_2(1, 63) = 10.032$, $p < .01$), but also a marginal interaction between *task* and *tense* ($F_1(1, 30) = 3.662$, $p = .065$; $F_2(1, 63) = 9.372$, $p < .01$): items in present tense could be successfully repeated at an estimated 90.6% and translated 86.1% of all instances, items in *Perfekt* tense were repeated in 94.3%, but translated in only 80.5% of all cases.

Construction

Considering construction choices during the translation tasks of Experiments 3a and 4, a repeated measures Analysis of Variance reveals a main effect of *source* ($F_1(1, 30) = 12.585$, $p < .01$; $F_2(1, 62) = 22.980$, $p < .001$), but not of *tense* ($F_{1,2} < 1$), nor any interactions.

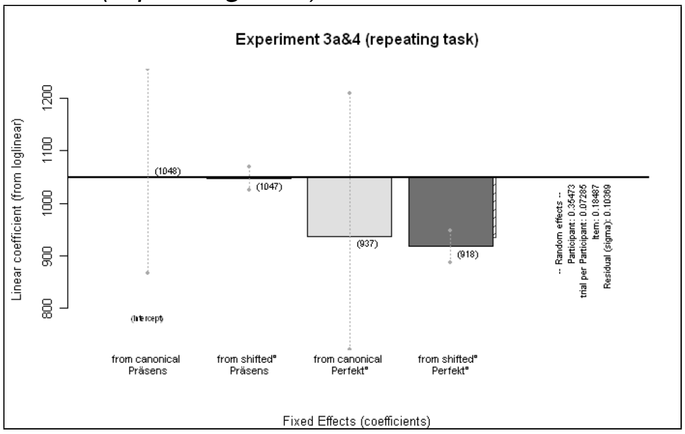
Latency

In the repeating task, analysis of latency data through Linear Mixed effects (illustrated in Figure 8.4) shows that repeating times in comparison to canonical datives in the *Präsens* tense are not significantly different for shifted datives in *Präsens* tense ($t = 0.09$, $p_{mc} = n.s.$), for canonical datives in *Perfekt* tense ($t = -0.69$, $p_{mc} = n.s.$), or for shifted datives in *Perfekt* tense ($t = -1.27$, $p_{mc} = n.s.$).

Analysing data from the translation task, the findings from the translation latency data of Experiment 3a remain essentially unchanged (compare Figures 7.2 and 8.5). Continuing from that, the experimental manipulation of Experiment 4 makes no significant difference for translations of canonical datives into POs ($t = 0.61$, $p_{mc} = n.s.$), while translations of canonical datives into DOs are now significantly slower ($t = 4.08$, $p_{mc} < .0001$). In comparison to the *Präsens* tense, the translation into *Perfekt* tense of shifted datives into a PO is not significantly different ($t = -0.55$, $p_{mc} = n.s.$), while their translation into DOs is significantly faster ($t = -3.13$, $p_{mc} < .01$).

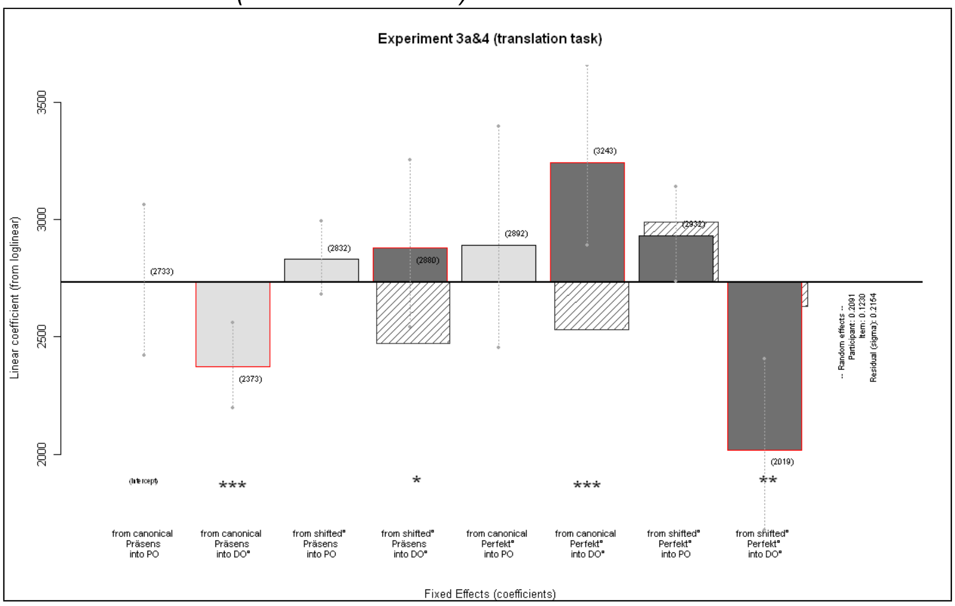
Comparing finally the tasks in their entirety, the essential analysis of Experiment 3a remains largely unchanged (compare Figures 7.3 and 8.6); a weak effect on the repeating of shifted datives in *Präsens* suggests that it was slightly faster than expected in relation to other shifted datives in the combined data set ($t = -2.24$, $p_{mc} < .05$). Continuing from that, the experimental manipulation of Experiment 4 makes no significant difference for unprimed translations of

Figure 8.4: *Fixed Effects on latency in Linear Mixed Effects model of Experiments 3a and 4 (repeating task)*



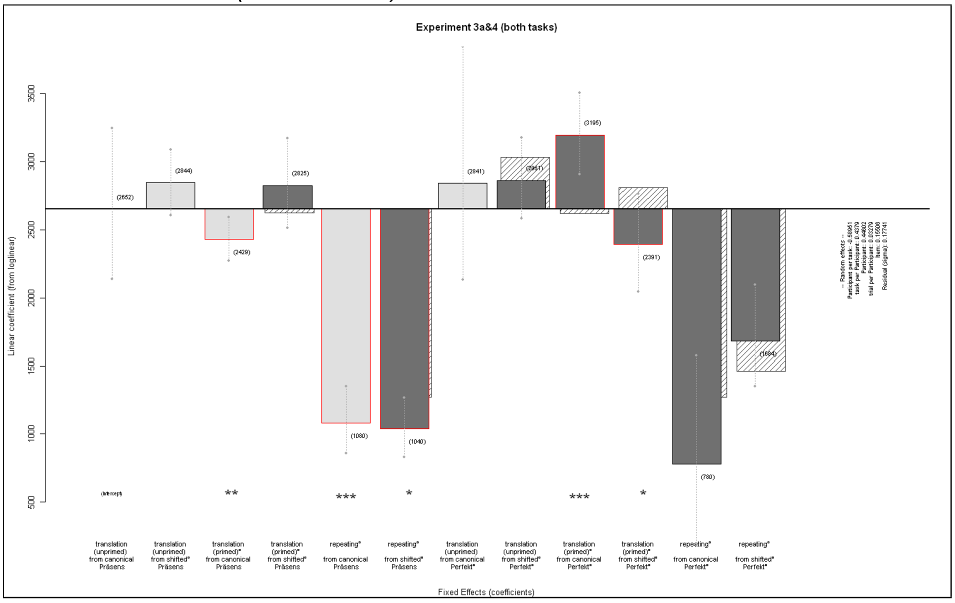
Note: *Trial* is present as a factor over the random effect of participants. In all other respects, see notes for Figure 6.1 and Figure 6.2.

Figure 8.5: *Fixed Effects on latency in Linear Mixed Effects model of Experiments 3a and 4 (translation task)*



Note: See notes for Figure 6.1 and Figure 6.2.

Figure 8.6: *Fixed Effects on latency in Linear Mixed Effects model of Experiments 3a and 4 (both tasks)*



Note: The production factor in this graph is *event*, as discussed in 6.2.5. *Trial* is present as a factor over the random effect of participants. The presence of *task* as a factor on the random effect of participants is explained through individual proficiency differences for the two tasks. In all other respects, see notes for Figure 6.1 and Figure 6.2.

canonical datives ($t = 0.76$, $p_{mc} = n.s.$) or shifted datives ($t = -1.16$, $p_{mc} = n.s.$). Primed translations in the *Perfekt* tense are significantly slower for canonical dative sources ($t = 3.81$, $p_{mc} < .001$), but remain unaffected for shifted dative sources ($t = -1.79$, $p_{mc} = .074$. No significant changes from the experimental manipulation are encountered where sources are repeated for canonical datives ($t = -1.38$, $p_{mc} = n.s.$) or shifted datives ($t = 1.35$, $p_{mc} = n.s.$).

8.4.2 Discussion

Comparison between the data sets from Experiments 3a and 4 has found only a weak effect of the change in tense on the certainty of production; in line with the findings of Pickering & Branigan (1998), the effect of structural priming remains fully unaffected.

As in the analysis of Experiment 4 alone, the most interesting aspect of the comparison is the analysis of response latencies. While the combined analysis of production events can again only suggest that primed translations of canonical datives are slower (see 8.3.3, above), the combined analysis of translation targets indicates clearly that differences between the effects of Experiment 3a and Experiment 4 are connected to the production of DOs, whether from canonical dative sources or shifted dative sources. However, while the translation into a DO of a shifted dative in *Perfekt* tense appears to be facilitated, translation into a DO of a canonical dative in *Perfekt* tense is apparently inhibited.

Closer inspection of source and target structures finds, however, that they are related in an inverse fashion. In other words, the facilitated translation for canonical datives *(33a)*, where semantic units follow each other in the order Recipient-Theme-Verb, is found to be PO *(33b)*, in which semantic units follow each other in the inverse order of Verb-Theme-Recipient. Similarly, the facilitated translation for shifted datives *(34a)*, where semantic units follow each other in the order Theme-Recipient-Verb, is found to be DO *(34b)*, in which semantic units follow each other in the inverse order of Verb-Recipient-Theme:

(33a)	...	dem Papst	die Kartoffel	geschickt
		Rec	Th	V
(33b)	...	sent	the potato	to the pope
		V	Th	Rec

(34a)	...	die Kartoffel	dem Papst	geschickt
		Th	Rec	V
(34b)	...	sent	the pope	the potato
		V	Rec	Th

Although the exact order of arguments is not retained, translations are facilitated in which the serial continuity of syntactic segments, as encountered in the source, is retained. Translations where this order is broken up require additional processing, although a smaller part (the order of the verb's arguments) remains unchanged and is even structurally primed, as the analysis of target constructions has shown.

This suggests that the sequence of processes that are executed during the comprehension of a source sentence is not primarily primed as a hierarchical series, but rather as connections between sub-processes. Between the members of a set of three sub-processes (Verb, Recipient, Theme), there are three connections possible, but only two of them will be employed in the processing of any specific sentence that involves all three processes. These connections are given preference during subsequent target production. I am not aware of any directly comparable phenomena; the tendency in German to order arguments in the mid-field by their case (see p.161) is presumably not related, as it is observed irrespective of the position of the lexical verb (Kunkel-Razum & Münzberg, 2006, pp.880f).

Hence, the combined analysis of Experiments 3a and 4 reveals that both experiments have observed the same priming effect in terms of syntactic structures. Only in Experiment 3a, however, is this structural priming accompanied by a facilitation of production, as it was assumed by Corley & Scheepers (2002) and Smith & Wheeldon (2001). In Experiment 4, primed responses appear to be inhibited. For this phenomenon of paradoxical facilitation, I have proposed an account that hinges on the connections that are struck between semantic units. Hence, processing faces a choice between retention of the hierarchical order of Theme and Recipient (i.e. the construction), and leaving the string of semantic carriers. No overlap exists between the syntactic frames that support the construction and those that support the string, and response latencies show that more activation must be accrued before a construction frame can be selected. More research will be necessary to study the exact nature of the connections between structural selection and latency in more detail.

Remarkably, this account allows the observation that translations of canonical datives into POs, involving transformation of an NP into a PP, are slower than those without additional phrasal processing. This facet of the findings corresponds with the predictions for Experiment 4 that have been drawn from Experiment 3a and the Integrated Model. Although it remains for future research to show whether the account outlined above can fully serve as an extension for the integrated model of syntactic representation, it is remarkable that the effect on the phrasal level remains untouched. This suggests clearly that the phenomena on this phrasal level are unrelated to those that are observed for the structure of the utterance as a whole. Hence, the dative alternation has to be seen as a compound phenomenon of two processes that are unrelated in their nature, on the phrasal and structural levels of linguistic organiastion

CHAPTER 9

General discussion and concluding remarks

In this last chapter, I will attempt to summarize the findings from my thesis. To begin, I will recapitulate the perspective on syntactic representation in bilinguals that has emerged from the literature on language production, Second Language Acquisition, and translation. After showing how this view shaped the experimental paradigm that was implemented throughout, I give a synopsis of the main findings of the experiments, and conclusions drawn from them. Finally, I consider questions that had to remain unanswered, that have arisen from this work, and possibilities of future research.

9.1 Syntactic representation in bilinguals

The review of literature on cross-linguistic phenomena in bilingual production has provided a very detailed picture of syntactic representation in bilinguals.

Literature attests at least two types of general architectures for the language production system, one derived from Levelt's (1989) computational 'Blueprint' model, the other a connectionist network. Both models, however, consider the lexicon as a cognitive network that is crucially a shared storage space for all languages that are known to a speaker. Following a computational approach, the lexical units (of any language) are represented at this level as lemmas, which combine information about its semantics with information concerning its syntactic categories and features. To account for priming, the Combinatorial Model (2.1.3) of syntactic representation introduces additional information about how a unit may combine with others. The Integrated Model of bilingual syntactic representation (2.2.4) claims that this combinatorial information, too, is part of the shared lexicon, and has successfully accounted in this way for cross-linguistic structural priming. Recent research in this framework by Schoonbaert et al. (2007) appears to suggest that the connections between lemmas and combinatorial nodes may be weaker for non-native languages.

This model is complemented by research in Second Language Acquisition and Translation and Interpreting. Following the Interface Hypothesis (3.2.1), grammatical features of a non-native language cannot be acquired to a native-like level of proficiency where they involve interface of syntax with other areas of cognition (e.g. semantics, pragmatics). The previous existence of similar features in the representation of L1 may affect the process of acquisition, even for features that are not part of this 'interface syntax' and may eventually be acquired to a level of native-like proficiency. If no comparable L1 features are available, the L2 feature is newly acquired but only weakly integrated into the overall linguistic system. In effect, it is accessed less frequently by L2 speakers than by L1 speakers, a performance characteristic that is known as "avoidance". If, inversely, a parallel L1 feature is available, it (and its further connections within the system) may become involved in the processing of the newly acquired features, in a process known as "transfer". It follows that newly acquired features of a non-native language differ from each other in terms of their embedding into the language system; a conclusion that echoes the findings of recent psycholinguistic research cited above. Going beyond the strength of connections between units, theoretical models of Simultaneous Interpreting point out that the availability of resources for cognitive activation may be limited, further influencing overall performance (4.2.2). Still, the accessibility of individual items is described as a major factor for translation performance (4.2.1).

This view of bilingual language representation as a cognitive network in which units and features from different languages are stored together and connected by links of varying strength, and in which activation is a restricted resource, provided the starting point of my work. I developed an experimental paradigm for the further exploration of this network through a translation task, in which participants translated individual sentences without further context, and the constructions and response latencies of their responses were recorded.

9.2 Findings

- In all experiments, **translations took longer to produce than repetitions** — not only when translating from L1 into L2 and repeating in L1 (Experiments 1, 2a, 3a, and 4), but also when translating from L2 into L1 and repeating in L2 (Experiments 2b and 3b). Hence, the time difference between translation and interpreting cannot be due to proficiency in the languages involved, and it must be assumed instead that additional cognitive processes are involved in translation. This, however, provides further support for horizontal models of translation, and argues against vertical ones: while cognitive processes of this kind are fully supported by horizontal models, it is the characteristic of vertical models to be compounded of comprehension and production alone, without intervening additional processing (see Section 4.1.2).
- In all experiments, speakers' **choice of target constructions was strongly influenced by the source construction** that was translated. As such, this finding can be accounted for in terms of both form-based translation and cross-linguistic structural priming. This suggests that it is possible to account for (structurally) form-based translation through the same mechanisms that are responsible for cross-linguistic structural priming.
- Speakers produced **different response patterns in translations depending on L1**; preferences for target constructions differed depending on whether translation was carried out into L1 or into L2. The fact that these patterns corresponded persistently along L1 suggests that the phenomena described in the Interface hypothesis are at least in part responsible for this observation. This is not to say that direct transfers occurred; proficiency in L2 may still be involved, albeit in a more indirect fashion (see also the discussion for Experiments 2 and 3 in 9.3.1, below). It is not clear at this point whether the effect is holistic or compounded from structural priming and a phrasal feature that is specific to L1.
- Experiments observed **facilitated production only when L1 was translated into L2**; translation from L2 into L1 never influenced response latencies. This suggests that the facilitating effect of cross-linguistic influences on the structural level is significantly weaker in the direction from L2 to L1 than it is from L1 to L2. It remains a distinct possibility that this finding may be connected to the observation of asymmetric cross-linguistic priming in the same direction (Schoonbaert et al., 2007). This need not indicate that persistence in L1 should be qualitatively different from persistence in L2;

rather, the two language systems may differ in their conductibility to activation. Combined with the view of activation as a limited resource, this would mean that the L2 system is not in the position to pass on much more activation to that of L1, and all possibilities for facilitated processing are filled in at an early point — i.e. with the selection of an overarching structural frame. Again, this possibility requires further research.

- Contrary to earlier assumptions, **facilitated production is not a direct result of structural priming.** This was shown by the paradoxical facilitation observed in Experiment 4, where structural priming was evident only in terms of construction choice, but apparently led to an inhibition of production. The results suggested that facilitation had followed instead from the possibility to maintain strings of arguments that were longer than the primed sequence, and — in the given situation — never coincided with one of the primed constructions. This account is still somewhat tentative and will require further research.
- **Syntactic structure is processed separately from the items that it contains.** This becomes fully evident from the findings in Experiment 3a (and possibly also Experiment 4), where the necessity to change a NP in a primed structure into a PP reduced the facilitation that followed from structural priming, but did not lead to additional inhibition when no priming was involved. This separation is a feature both in the dual-path model of Chang et al. (see p.25) and in the Bock-Levelt model of syntactic representation (see p.21), but can be accounted for in bilingual production only through the Integrated Model of Hartsuiker et al. (see p.43, and the discussion below in 9.3). Future research will have to show whether the separation between facilitated production and structural priming is related to this separate processing of syntactic structure and units.
- Analyses of response latencies suggest **very weak habituation effects** in L2 production. This finding is not directly related to the concerns of this thesis, and merely observed.
- Analyses show that there appears to be only a very **restricted influence of proficiency** on translation. Each participant provided at least three out of five proficiency measures (*years since first exposure*, *immersion time*, self-reported *recent exposure*, a proficiency *test*, and a *self-rating*). Effects of these are only observed in the two experiment parts where translations were carried out L2→L1. While *test results* are weakly correlated with comprehension for one L2→L1 group, *years since first exposure* are only discovered as a relevant random factor in a combined analysis of both L2→L1

groups together, i.e. at doubled group size. It follows that the influences of proficiency on translation are weak, and can be observed only over a relative large group of informants. My conclusion at this point is that L2 proficiency (or the lack thereof) does not belong to the major causes of source language influence in translation. A last observation in this respect concerns the linguistic circumstances of participants. Three groups can be distinguished among them not only in terms of their native languages, but also in terms of their linguistic circumstances: *a*) speakers of Dutch (Experiment 1) lived in an L1 environment and had no major experience with L2 immersion, *b*) speakers of English (Experiments 2b and 3b) lived also in an L1 environment but had experienced L2 immersion at some earlier point, and *c*) speakers of German (Experiments 2a, 3a and 4) were living in an L2 environment at the time of their participation, i.e. they were currently in L2 immersion.

9.3 Consequences

I have arrived at the findings reported above on the basis of an experimental paradigm that was developed on the basis of research in Translation & Interpreting, Second Language Acquisition, and Psycholinguistics. In consequence, they bear some relevance for all these areas. In the following sections, I endeavour to outline major connections to, and implications for, the major theoretical approaches that have been discussed in Chapters 2–4.

9.3.1 *Bilingual representations of language*

Among the findings listed above, the one that is most important for models of (bilingual) representation and production is the separate processing of syntactic units and syntactic structures. Of the models that have been introduced in Chapter 2, only Hartsuiker & Pickering's (2008) Integrated Model (of the lemma node) is fine-grained enough to represent these divided processes in sufficient detail. In the following, I will present extensions and modifications of the model shown in Figure 2.11 (see p.44) that will suffice to provide an account for experimental results.

Experiment 1: Priming syntactic voice

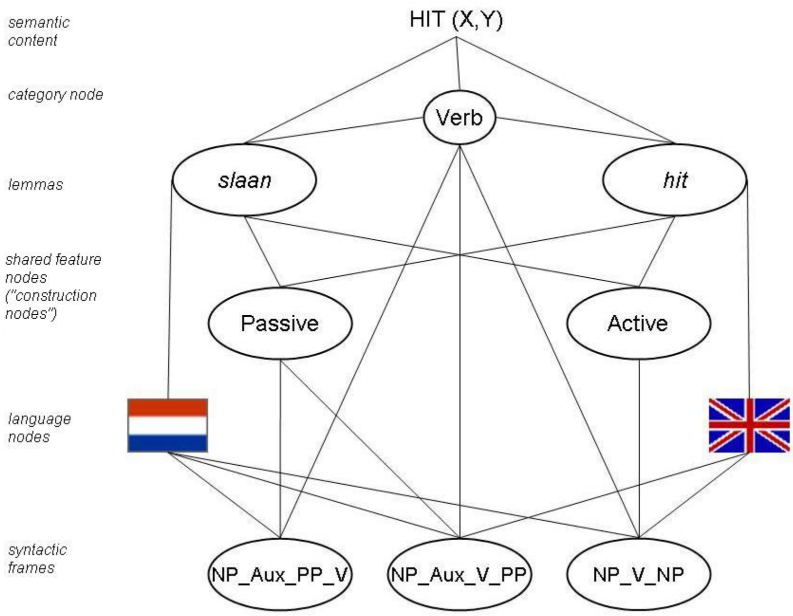
An appropriate model of the processes observed in Experiment 1 must be able to account for the following data conditions: *a*) the persistent translation of passives as passives and actives as actives, *b*) the absence of structural copies of participle-final passives into English, and *c*) faster translation of Dutch participle-medial passives (i.e. with matching surface structures between source and target).

The simplistic approach of adding one extra node for Participle-final Passives into Figure 2.11 (and redeclaration of the existing Passive node into Participle-medial Passive) is not sufficient. If such a third node were shared, i.e. connected to lemmas from both languages, production of participle-final passives in English would be a predictable result — violating data condition (*b*). If, in turn, the third node were not shared and only connected to Dutch lemmas, e.g. because it was never encountered when processing English input, then the comprehension of a participle-final passive would leave the two other voice nodes equally activated. In consequence, English actives and passives should be equally likely after a Dutch participle-final passive, violating data condition (*a*).

However, a model that represents the two possible structures in nodes that are separate from the Passive node (Figure 9.1) and connected to the languages in which they are encountered, is fully sufficient to explain the data. Importantly, this extends the model beyond verb lemmas and their nodes and reaches out into Levelt's (1989) (and also de Bot's, 1992) Formulator component (see Figures 2.5, 2.10), respectively into Bock & Levelt's (1994) Positional Processing level. In the view of incremental accounts of language production (see 2.1.4), it appears unlikely that possible structures are stored for entire utterances. The exact nature of the processes that pertain to this component is still under discussion beyond the topic to endeavour an appropriate representation of these processes — structural orders may be generated specifically, as in Bock & Levelt (1994, p.948), or they might be the result of other, more general processes, as appears to be the opinion of Chang et al. (2006) — see also p.25. To avoid terminological bias or misdirection, this thesis will apply the term 'syntactic frame' for the outcome of these processes. Syntactic frames that are repeatedely encountered in the context of a particular language are presumably connected with the relevant language node (i.e. the speaker has 'learned' them).

The connection of structural frames to language nodes blocks the possibility of producing a structure that is unacceptable in the target language, and warrants

Figure 9.1: *The Integrated Model modified for translation: Syntactic Voice*



Based on Hartsuiker & Pickering (2008, p.481).

data condition (*b*). After comprehension of a participle-final passive, both the node for its structure and the Passive node are activated; hence, the passive is primed by both types of passive to equal degrees, which secures data condition (*a*). Moreover, in this case the target structural frame will not have as much residual activation than would be the case after comprehension of a target-medial passive. The difference in activation to achieve selection is presumably responsible for the time difference between translations of the two types of passive, i.e. data condition (*c*). To illustrate this in more detail, I will give a detailed account of the translation of the example sentence *De prins wordt door de koningin geslagen* ("The prince is hit by the queen", participle-final passive).

Comprehension. Following comprehension of *De prins wordt...*, the structure of the initial input fragment has presumably been computed as NP_Aux..., and the language node for Dutch has been selected. Based on earlier experience with syntactic structures in Dutch, plausible possibilities of continuation include prepositional phrases (e.g. if the input sequence turns out to be a participle-final passive), verbs (e.g. for a participle-medial passive), and various others (not illustrated). All eligible nodes receive some activation.

The next comprehended item is recognized as *geslagen*, a participle of the verb "*slaan*". Selection of the corresponding lemma through the input spreads activation across all connected nodes, selecting in the process the semantic content HIT(A,T) which is itself connected to the node "Verb". With this second activation, the category node receives more activation than any alternative continuation and is thus eligible for selection, confirming the continuation of the fragmentary structure as NP_Aux_V.... At the same time, the combination of a past participle with a preceding auxiliary leads, in a fashion that need not concern us here in its details, to selection of the feature node "Passive", rather than "Active".

After this, the fragmentary structure NP_Aux_V... will suggest that one of several possible PPs will complete the structure, indicating one from a range of semantic functions such as location, agent, or instrument. With comprehension of the concluding agent PP, transfer of this particular message is completed; activation levels of the selected nodes begin to return to their regular levels of activation.

Production. The comprehended message involved HIT(X,Y) as the relation that holds between its arguments. For translation, this semantic content remains selected, and activation is passed on to all connected nodes. Among them, the category node "Verb" is likely to have some residual activation, and hence be selected in an instance of lexical priming. The linguistic subsystem (i.e. language node) for the target language of production is also selected and passes activation to its connected nodes. Hence, activation waves from the various nodes selected so far coincide in the lemma node "*hit*": its activation level increases beyond that of all co-activated competitors, and it is selected and sends activation to all connected nodes. Selection of the language node heightens also the activation levels of those syntactic structures that are connected to it.

Selection of the lemma node has led to equal activation of the feature nodes for voice, i.e. "Passive" and "Active". However, the Passive node has not yet fully reverted to its default level of activation after its use in previous comprehension and retains some residual activation. At this point, its accrued activation is sufficient for it to be selected anew. This again triggers activation of the two syntactic frames that are connected to it, leading in similar fashion to selection of NP_Aux_V_PP.

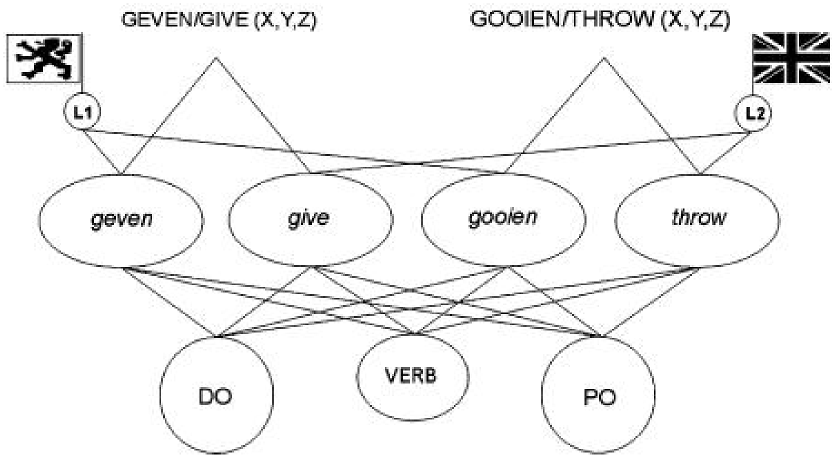
To arrive at Figure 9.1, Hartsuiker & Pickering's (2008) model was expanded in various ways:

- The additional indication of languages' status as L1 or L2 is irrelevant for the model, and left out for the sake of clarity.
- First findings that suggested a connection between semantic representations and category nodes were encountered in experiments by Marslen-Wilson (1975) and Marslen-Wilson & Tyler (1975). It is an integral part of current models of incremental parallel processing in language comprehension (see Levy, 2008). For a full account of processes in the course of translation, it will be necessary to consider both of the linguistic tasks that are involved.
- A connection between semantic content and category node is not in conflict with current theories of syntactic production, and explicitly stated in Levelt et al.'s (1999) model of lexical access (see Figure 2.6). It is introduced here as a first approach to categorial aspects of so-called word-for-word translation, and indicates one possible direction of future research.
- The arguments of the semantic node are not indicated generically (as X, Y), as they are in Hartsuiker & Pickering (2008), but with abbreviations of their semantic functions (as A, T). Only the discussion of the model for Experiments 2 and 3, below, will show the full reasons for this adjustment. For the time being, it is pointed out that semantic functions (which are presumably assigned to arguments early on in their processing) allow a less ambiguous identification of units than (superimposed) structural categories.

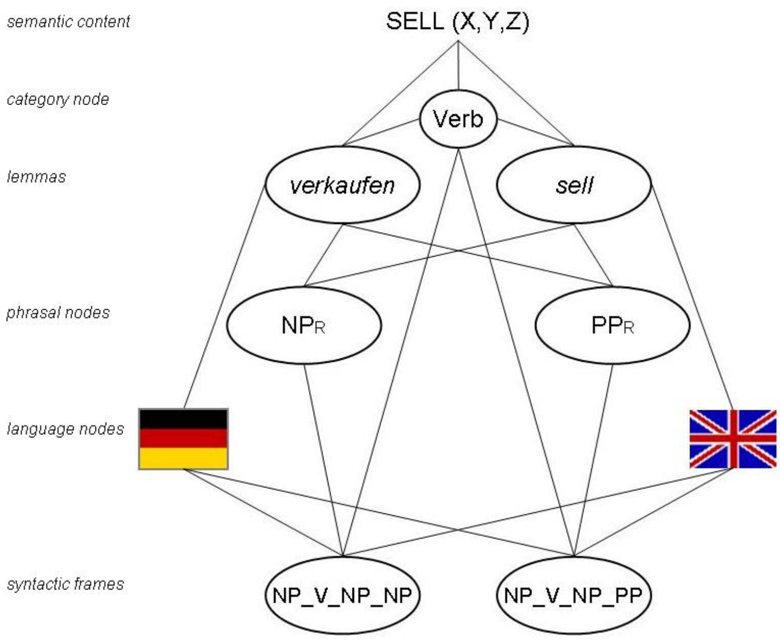
Experiment 2 and 3: Priming ditransitive arguments

Considering first the results of Experiment 2 alone, it can be observed that the structural choices during production are similar to those represented in Hartsuiker & Pickering's (2008) presentation of the Integrated Model. However, the choice between Active and Passive is replaced by one between Double Object (DO) and Prepositional Object (PO) constructions. A parallel model architecture is explicitly presented by Schoonbaert et al. (2007, p.157). Assuming that the main formal difference between the two constructions is the phrasal representation of the Recipient argument, this can be easily adapted to a clearer distinction between form and structural sequence: the DO node is replaced with a syntactic frame NP_V_NP_NP that is preceded by a node that specifies the NP that contains the Recipient argument (NP_R), and the PO node with a syntactic frame

Figure 9.2: *The Integrated Model modified for translation: Ditransitives*



(Schoonbaert, Hartsuiker, & Pickering, 2007, p.157)

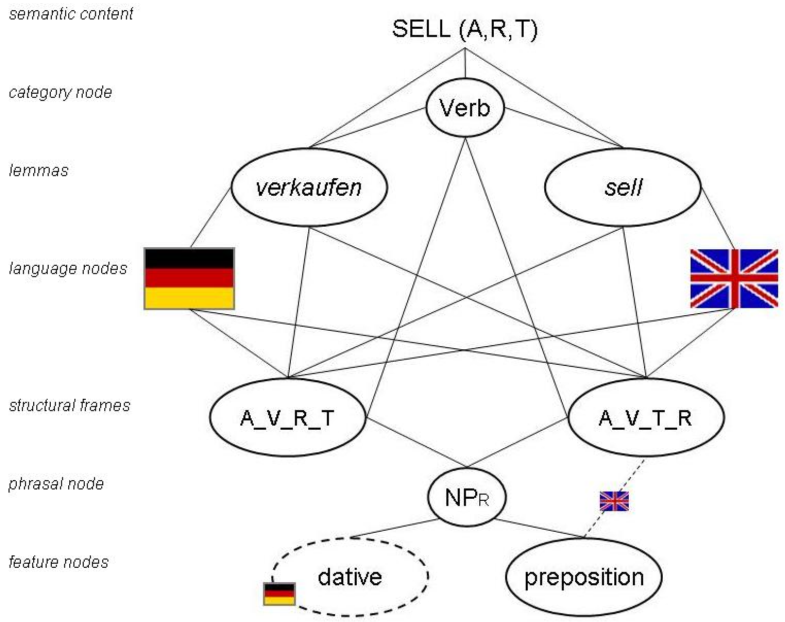


Adaptation of Schoonbaert et al.'s (2007) model to represent translation acts, distinguishing between processing of form and structural sequence. Both models account adequately for findings in Experiment 2, but must be replaced with Figure 9.3 to account for Experiment 3.

NP_V_NP_PP and a preceding node specifying the Recipient as a PP (PP_R). Each syntactic frame is connected only to the respective phrasal node, while phrasal nodes are shared, i.e. connected to all verb lemmas.

Because a PP can be analyzed as an NP that is embedded under a prepositional head, it is possible to describe the formal operation in the present case as one that is carried out on NP_R, i.e. on the phrasal representation of the Recipient

Figure 9.3: *Representation of ditransitives with PP as a feature function*



A: Agent argument. — **R:** Recipient argument. — **T:** Theme argument. — **V:** Verb. — **_:** indicator of structural sequentiality, 'is followed by'. — Broken lines indicate nodes or connections that are employed only by the language that is indicated, and thus not integrated as strongly into the linguistic representations of the native speakers of other languages.
This model results from Figure 9.2 (lower half) through re-analysis of PP as an NP with activated preposition feature.

argument. This view is implemented in Figure 9.3, treating the possible of a prepositional head as a feature of NP. Notice that structural frames, i.e. the order of syntactic units that represent arguments, are now indicated not as sequences of phrasal structures anymore (that have been assigned in the course of functional processing), but rather as permutations of the order of these arguments. Notice also that the connection that is indicated as a broken line in Figure 9.3 represents the single main difference between the two languages: as outlined in Sections 6.1 and 7.1, prepositional construction and argument order are closely yoked together in English, while in German they only correlate, i.e. they may still occur independently, without one conditioning the other. With L1 forming the basis of language representation in bilinguals, it can be assumed that the systems of native speakers of English and German will differ on the indicated connection: for native speakers of German, it can be assumed to be weaker in comparison than other connections.

Assuming that the formal differences between the constructions in question are processed strictly on feature nodes of NP_R, the formal identity of German prepositional Recipients with their English counterparts in PO constructions may be due to lexical-phrasal priming. Hence, it may be assumed that Recipient-final constructions in Experiment 2 elicited both structural persistence (argument order) and phrasal priming (prepositional construction), while those in Experiment 3 should have elicited structural persistence only. This is confirmed by the comparisons of the findings from both experiments for each participant group (see Sections 7.7.1 and 7.7.2): both groups produced significantly more PO targets in Experiment 2; native speakers of English showed a greater predilection for prepositional constructions even when repeating German sources, presumably due lexical priming that is characteristic of their L1 occurring during the processing of L2.

With respect to the differential effects on response latencies for primed translations that was observed in Experiment 3a, an account arises from this weak connection and the assumption that activation resources are limited: selection of the syntactic frame A_V_T_R triggers the release of activation into nodes NP_R and "preposition". Other features of positional processing (previous activation of NP_T?) ensure the selection of NP_R and lead to activation of its feature nodes. Because the activation from the syntactic node is spread over one node more than in the case of A_V_R_T, it takes longer for each node to accumulate an activation level that is sufficient for activation. Even more is this the case for the prepositional node that receives, through the weak connection, still less activation.

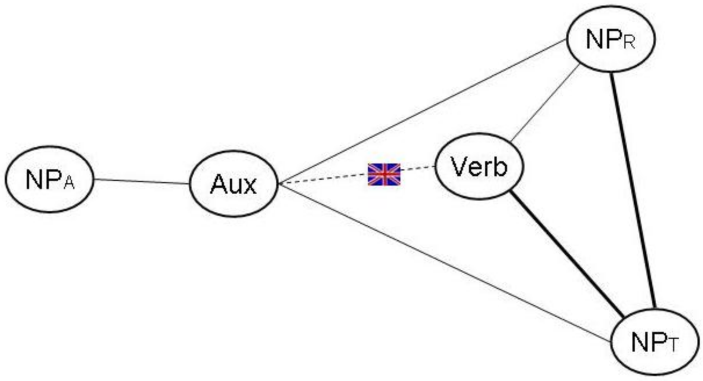
Experiment 4: Adding auxiliaries

An account for the results of Experiment 4 has been developed in 8.4 on the basis of a comparison with those of Experiment 3a has suggested that the sequence in which connections are struck during comprehension may play a role alongside their actual order. The particular finding of that Experiment was facilitated production of sentences in which the sequential order of verb, Recipient, and Theme is inverted from the source.

Although a complete model of syntactic production would be beyond the scope of this thesis, it is still possible to sketch a model that can account for this finding (Figure 9.4). In the following, I will discuss the proposed network on the examplary translation of the sentence "*Die Tante hat dem Papst die Kartoffel verkauft*" (*The aunt has sold the pope the potato*).

Comprehension of the source sentence has led to selection of category nodes in the sequence NP_A_Aux_NP_R_NP_T_V. Notice that, although that the Auxiliary

Figure 9.4: *Network of category nodes in Experiment 4 (sketch)*



This model sketches the proposed connections between higher-level nodes in a German-English language system that are involved in the sequences of comprehension and production during Experiment 4. All nodes and connections exist for both English and German. However, the broken line indicates a connection that is employed only in English, and thus less integrated into the linguistic representations of native speakers of German, i.e. it is weaker (see 3.2.3). Bold lines represent connections that were employed in the comprehension of the example sentence "*Die Tante hat dem Papst die Kartoffel verkauft.*" See main text for further details.

node is presumably a feature node of the Verb node, the two are not connected directly on the representational level that is relevant for structural features of German — leading to the phenomenon of the 'syntactic bracket' discussed in Section 8.1. Subsequent translation then reaches a point is reached where a target segment *The aunt has sold…* (i.e. NP_A_Aux_V…) has been produced. At this point, there are two continuations available: NP_R_NP_T, retaining the order of Recipient and Theme, and NP_T_NP_R, which inverts the order but begins with the node NP_T that was most recently connected to V. Both continuations are of course possible, but the latter selection requires less additional activation because of residual activation in its path. As before, processing of other features (realization of the preposition on NP_R if NP_T is selected!) occurs separately, and is an unconnected source of potential response delay. — While this account appears to suit the observed phenomena, it is still somewhat tentative and may require further research (e.g. a cross-linguistic priming experiment along the lines of Corley & Scheepers, 2002) for confirmation.

9.3.2 *Models of translation*

Apart from contributing still more evidence against a vertical model of translation (see Sections 5.4.3, 6.5.4), the research in this thesis has targeted in particular the phenomenon of form-based or word-for-word translation. Starting from the assumption that there is some correlation between form-based translation and psycholinguistic priming, it is now possible to spell out the relevant features of language production in more detail. Hence, word-by-word translation appears to result from a combination of *a*) structural priming, the persistence of syntactic strings (or parts thereof) that are found in the source, *b*) phrasal priming, favouring the realization of phrase structures in the target language on the basis of strategies that are found in the source, and *c*) lexical priming (not extensively discussed in this thesis but see discussion of Experiment 1 in 9.3.1, above), triggering realization of a semantic content in the same grammatical category that is encountered for it in the source.

While entirely in line with the assumption that activation is a restricted resource (see 4.2.2), this finding provides a more detailed picture and points to the necessity to re-state the claim that "professional Interpreters and Translators rely commonly on meaning-based translation" (see p.74). It might imply that professionals are able to avoid priming in general; yet, increased priming resilience to only one or two of the sub-categories appears more plausible. Current research in cognitive aspects of Translation and Interpreting has not yet provided findings that could further contribute to this issue, and it has to await further studies.

Another issue that should not remain without mention is the difference between the two best-known translation tasks, i.e. between Interpreting as on-line performance and Translation as off-line (see Chapter 4). This thesis has predominantly dealt with language production in an on-line task, i.e. with a form of Interpreting. However, there is also evidence of source-language influence in Translation corpora (see p.84). It is currently impossible to estimate the role of form-based translation in these off-line productions, and once more it has to remain a topic of future research to find a plausible account of the phenomenon. A sharper perspective on the differences and parallels between Translation and Interpreting translation will help to specify not only the particular challenges of these two task types (and the many intermediate forms) the better, but also the differences in their performance by naive bilinguals and professionals.

9.3.3 Second Language Acquisition

At first consideration, the experiments reported in this thesis can contribute only very little to the study of Second Language Acquisition. Taking the Interface Hypothesis as a starting point, their results provide essentially variations over the theme of the impossibility to acquire semantic-pragmatic constraints in an L2 that correspond to those of an L1 speaker. In everyday speech, the syntactic phenomena that have been studied in this thesis — voice in Dutch and English, English ditransitive constructions, German dative/prepositional alternations, and German argument order — are subject to triggering constraints from the semantic/pragmatic domain that are not identical in different languages. Hence, even if results appear to be structurally identical, spontaeous language production in different languages will lead to different patterns of activation on the structural and phrasal nodes that are involved. It follows that transfer of pragmatic constraints may also play a role in the different construction preferences that were observed between the two speaker groups in Experiments 2 and 3. Although pragmatic constraints are often described as topicalization or focussing, influencing the linear sequence of syntactic elements, their nature and representation remains under discussion. Hence, any attempt to include them in a model of production would need to be considered as highly speculative.

On a different note, however, a more practical use may be drawn from the cue to keep formal and structural operations separate. This distinction may allow to tell features of 'narrow syntax' from pragmatically-semantically triggered ones in the productions of L2 acquirers, i.e. to tell those that are in principle fully acquirable from those that are not. This would allow a new perspective on the debated position of L2 translation exercises as a pedagogical tool (see p.81): equipped with this information, it becomes possible to draw a clearer line between translation skill and acquisitional phenomena in learners' translations into L2. This diagnostic use of a translation task, however, is probably only feasible with written translations; again, it follows that more work is necessary to improve our understanding of the influence of on-line vs off-line production situations on translation.

9.4 Future work

The connections shown above between the results of existing research and those of the series of experiments reported in this thesis have already pointed to possible pathways for follow-up research. Yet there are still more possibilities for interdisciplinary research along the lines that I have employed:

9.4.1 Experimental paradigm

The paradigm for a psycholinguistic experiment involving a translation task that I have introduced offers new possibilities for research on bilingualism and cross-linguistic phenomena of bilingual production. It offers the possibility to observe features of the syntactic production of bilinguals in an environment where the effects of conceptual generation are strongly reduced (in contrast to e.g. sentence completion), and where aspects of lexical access are strictly controlled.

In the experiments presented in this thesis, lexical access was controlled following Schriefers et al.'s (1998) hypothesis of separate pathways for lexically guided processing vs conceptually guided processing. The dichotomy has seen little study in psycholinguistic research. Its evident relevance in translation suggests the possibility of further research on syntactic representations along these lines.

On the other side, it must be added that the research that has been presented in this thesis may still only have scratched the surface. For example, the disfluencies that have been observed as parts of the elicited translations could only be mentioned in passing, as a criterion for the exclusion of (latency) data. However, disfluencies are a current topic of research in both psycholinguistics (Corley & Stewart, 2008) and in cognitive approaches to Interpreting research (Piccaluga et al., 2005, 2007). Results from translations by speakers with professional translator training may contribute to both.

9.4.2 Bilingualism and translation

Without exception, participants in the experiment series were native speakers either of the source language or of the target language, without professional training as interpreters. This has granted insight into the language system of speakers that correspond to clearly defined groups in the sense of the Interface Hypothesis. Quite apart from the possibility of further work in support of the Interface Hypothesis (see 9.3.3), variation of participants may also offer new perspectives to the linguistic representations of natively bilingual speakers translating between their native languages, of multilinguals translating between two languages neither of which is their native language, or even syntactic acquisition. Currently, our knowledge and understand of the cognitive processes in bilingual production originate predominantly from speakers who are still firmly grounded in their L1. The possibility of expanding the available data on bilingualism beyond this group can be expected to provide insights into more complex (complete?) systems.

Equally interesting is the fact that the experimental paradigm that has been developed appears to offer a first, probably still very crude access to the cognitive processes during the act of translation — as carried out by any speaker, whether specifically trained for the task or not. This may allow a better view not only of the translation skill and its presumed development on the basis of Natural Translation, but also help to evaluate the way in which it may interact with proficiency, and the bilingual representations of language.

9.4.3 Further Suggestions

Beyond general considerations, the work presented in this thesis offers considerable possibilities for future research. To name but some:

- Participants with professional Interpreter training were explicitly excluded from the experiments that I have presented. The underlying assumption was that professionally trained translators might be less susceptible to the experimental manipulation. The question remains unanswered whether this is actually the case, and if so, to what degree. The contrast between trained and untrained speakers may shed more light on the nature of the skills that are involved in translation. The different development of these skills between trained Translators and trained Interpreters may provide even more depth.
- Another participant group that has been excluded systematically so far are native bilinguals of source and target language. Presumably, their performance should toe a line between the two groups of natively monolingual speakers. The interesting question here is whether factors can be found in bilinguals' linguistic biographies that predict their performance and provide an empirical correlation for the notion of a bilingual's "balance" between languages. This may also provide further insights into facilitated production.
- Not only participants can be varied, but also the constructions that are tested. An important consideration here comes from the Interface Hypothesis: the alternation of tested constructions in source and/or target language should not be motivated on purely syntactic grounds. Moreover, if speakers perceive constructions as close-to-identical, the effect of form-based

translation/priming might be too strong (as it was in Experiment 1). To name a specific example, possessive constructions in English may be morphological and involve the genitive (*my father's book*), or a prepositional construction (*the book of my father*). In German, a genitive construction exists but is strongly dispreferred (*meines Vaters Buch*); a prepositional construction is far more common (*das Buch von meinem Vater*), but an analytic construction involving the dative case (*meinem Vater sein Buch*, "my father (dat.) his book") is common in colloquial language. Most interesting here might be the instance of translations from L2 English into L1 German.

Psycholinguistic research can provide empirical data that can help to understand not only the language system of bilinguals in general, but also the process of translation. While research on bilingualism has a long history of finding applications in language teaching, the impact of empirical data on translation teaching has been small until very recently. At the same time, translation offers a highly focussed perspective on language production by bilinguals, and allows nearly full control of all circumstances. In this sense, I consider it a highly useful method for psycholinguistic research that will prove fruitful for all the disciplines involved.

Appendix A

Measuring response latencies

The approach to measurement of spoken RTs that has been applied in this thesis is based on the following considerations: on one side, experiments of the kind that has been outlined in 5.1 expect relevant results from response onset latencies. This measure can be taken by means of voice onset times (VOTs), measured with a voice-key apparatus. However, it has been observed that the measurements of classic voice-keys are highly prone to methodological insufficiencies and may be phonologically unsatisfactory (see Pechmann et al., 1989; Mestdagh, 2005). More recent builds appear to be riddled with an increased likelihood of technical data loss (see Duyck et al., in press). Close consideration of the functioning principles of these devices suggests that voice-keys are actually over-specified for the purpose at hand: information about voice onset events is required only for measurement purposes, and not in the course of the experiment procedure itself.

Since there is no requirement for on-line availability of RT data, it becomes a feasible alternative to record participants' responses and determine VOTs only later on. An algorithm for this very purpose is featured in the Praat software for phonetic analysis since version 4.5 (Boersma & Weenink, 2006). This finds all passages in the recorded signal where its intensity crosses above (=speech) and below (=silence) a specified threshold level for the length of a specified time window. Additional simple post-processing of recordings allows further improvement of the data that is retrieved in this way.

In the experiments reported in this thesis, the threshold for this speech-finding algorithm is set to

$$(min\_dB + (0.5 * (max\_dB + min\_dB)))$$

i.e. to a level of 50% of the distance (in dB) between the lowest and the highest intensity of the recording above its lowest intensity. Resulting thresholds ranged from 62-74dB.

Full availability of sound data opens up further possibilities, however: once voice-onset times have been found, more specialised search algorithms (based on acoustic characteristics) may provide better-still approximations to *speech* onset times, reducing acoustically based errors (measured by Pechmann et al., 1989, p.68f as up to 200ms). The onset phonemes that are to be expected in the previously reported experiments (/d/ in Dutch and German, /ð/ in English, all in unstressed environments) can already be described as being less problematic in acoustic terms. However, the location of the found VOTs can accurately be described only as being at some point of the onset's initial intensity slope. This could be improved by application of an algorithm that assigned presumptive SOT to the foot of the steepest intensity slope encountered in the 100ms prior to the found VOT. All SOTs for all latency analyses in this thesis are based on this algorithm; no SOTs were assigned manually.

In spite of this, a number of RT measures had to be excluded, because hesitation phenomena disrupted the desired close match between the onset of speech and the onset of syntactic production. For this reason, RTs for all productions that involved disfluencies before the main stress of the subject noun were discarded.

Sessions for Experiment 1 were recorded with the integrated microphone of a digital recorder Roland EDIROL R1, to 16bit-MP3 files at 192 kbps with a sampling rate of 44.1kHz. Sessions for Experiments 2-4 were conducted and recorded in the sound studio of the Department of Linguistics and English Language at the University of Edinburgh, encoding input from an AKG CK98 Hypercardoid microphone on a SONAR digital audio workstation, using a MOTU 828 audio interface.

A.1 Voice key vs algorithm

For comparison with voice-key methods, Experiment 1 measured VOTs additionally with a PP62 voice key, as described by Mestdagh (2005) and tested by Duyck et al. (in press), and its designated headset microphone (Sennheiser PC 130).

A.2 Dealing with disfluencies

While data quality in Experiment 1 was sufficient to exclude initial hesitations in all conditions wholesale, material requirements in the following experiments (and particularly in Experiment 2) induced greater production difficulties, and as a consequence, more disfluencies.

For this reason, recording data with algorithmically assigned SOT points was post-processed if the transcript indicated presence of a disfluency phenomenon around the onset. I reasoned that occurrence of a non-word filler indicates attention to speak while a speech plan is still under development. This logic allowed to search for such fillers that were acoustically separate from the actual utterance ("Uhm (1s) the writer..."). For these, the algorithm the algorithm was repeated so that the SOT following the filler(s) was found. As before, no SOTs were assigned manually.

SOT data discarded from latency analyses involves specifically:

- clearly drawn-out pronunciation of articles (e.g. "Theeeee writer...")
- occurrence of speech filler phenomena and/or pauses between article and noun (e.g. "The uhm (1s) writer...")
- occurrence of speech filler phenomena before articles without interruption in voicing (e.g. "Uhm the writer...") — without interruption of voicing, the algorithm outlined above cannot provide meaningful results

Essentially, response times were excluded for all productions where the immediate environment of the presumed onset diverged from the pattern of silence – unstressed article – subject noun.

APPENDIX B

Frequency measures: Frequency bands

From a corpus-linguistic perspective, two problems with frequency counts need to be addressed and overcome in the creation of materials for this experiment:

- *Corpus composition*: Raw frequency counts from corpora are direct results of their source corpora and allow no comparison between them. The difference between source corpora remains, however, and compilation of representative corpora is a major concern in corpus linguistics. For example, the (writing-based) Dutch CELEX corpus reports 158 instances per million for the word *paard* "horse"; in the (speech-based) *Corpus Gesproken Nederlands* (CGN — Nederlandse Taalunie, 2004) it is encountered only 29 times per million, i.e. with only 18% of the frequency in CELEX. Inversely, the word *les* "lesson, class" is found at 32 p.m. in the written corpus, but 105 p.m. in the spoken one. It is not clear how representative either of these corpora can be for the language that members of a linguistic community are exposed to, and contribute to, every day.
- *Frequency distribution*: Zipf's Law is a well-known regularity in Corpus Linguistics (see Baayen, 2001, pp.13–23). It states that the frequency of words in a linguistic corpus follows an inverse-exponential, i.e. logarithmic distribution. This suggests log linearization as a useful treatment of frequency information. However, raw frequency counts depend directly on corpus size; to allow comparison or correlation of different linguistic corpora, raw counts are often normalized to a set corpus-external value — commonly one million words, as shown in the example above. This method, however, is likely to distort the the relative frequency ratios between items, and in particular so for low-frequency items that will make

> up the lion's share of any corpus. (For example, an item that is encountered once in a corpus of 10,000,000 words would be listed with a frequency of 0.1 per million. In a corpus of 100,000 words, a single occurrence of the same item would place it at 10 per million — however, the smaller corpus may be a regular subset of the bigger one.) The reliability and comparability of mid-range frequency scores under this type of normalization are thus questionable. The solution lies in the use of a corpus-specific normalizer that reinforces relative frequency information, but abstracts from corpus size. By Zipf's Law, overall frequency ratios in comporable corpora should remain constant; thus, the most reliable and accessible denominator that can be found for normalization is the frequency of the most frequent item.

This thesis measures word frequencies in bilogarithmic frequency bands. For their calculation, the (type) frequency counts for individual items are normalized using the (type) frequency count for the most frequent item in the corpus, i.e. a corpus-internal value. Normalized values are straightened out by application of a binary logarithm. To remove fine-grained details that are subject to changes with the corpus setup, the results are rounded to the next integer:

$$FB = round[log_2(\frac{type\ count\ of\ most\ frequent\ item\ in\ corpus}{type\ count\ of\ item\ in\ corpus})]$$

Normalization by the count of the most frequent item addresses the problem that normalization with an arbitrary constant c will distort the naturally occurring Zipf frequency distribution: for corpora where $N > c$, the distribution is compressed, leading to an overall underestimation of frequencies; for corpora of $N < c$, the Zipf distribution is stretched out, leading to overall overestimation. The frequency count of individual words in a corpus is a function of the word's frequency rank and the magnitude of the corpus. By Zipf's Law, we can expect the ratio between the frequency counts of two specific rank positions to remain constant. Moreover, the most frequent item of corpora from the same language can be expected to be the same. Hence, normalization with the count for the most frequent item removes influences from corpus size as a factor from the frequency measures for a word and leaves a factor that correlates with the item's rank order position, i.e. does not distort the Zipf distribution. (see Baayen, 2001, in particular pp.13–32.)

Normalization into bilogarithmic frequency bands instead of normalization to a count per-million-words (as it is applied e.g. in the CELEX corpus) may not appear to make a major difference. In fact, little effect is to be feared from the application of a per-million measure if all data comes from only one corpus. However, as discussed in more detail below, Experiment 1 took reference to data from two different corpora. The reasons discussed above suggested that an approach through words-per-million would be inappropriate. For continuity's sake, the bilogarithmic frequency approach was retained in subsequent experiments.

The resulting numbers express doubling increments of frequency in relation to the most frequent item (which is frequency band 0). Thus, considering as an example the verbs in Table B.1, the Dutch verb *slaan*, "to beat", is listed at frequency band 9. The band number indicates that this word is about $2^9 = 512$ *times less frequent* than the definite article *de*, the single most frequent item in Dutch. For comparison, another verb *zien* "to see" is listed at frequency band 6, i.e. it is about $2^6 = 64$ times less frequent than *de*. Compared to each other, *slaan* is $2^{(9-6)} = 2^3 = 8$ times less frequent than *zien*.

Table B.1 reports frequency bands and per-million frequencies of the words used in the material for experiment 1, Table B.2 does the same for experiments 2-4.

Experiment 1. As outlined in 5.3.2 the translation norms published by Tokowicz et al. (2002) served as a starting point for the creation of materials. Their frequency information, however, is based on the Dutch part of the CELEX database, which consists only of data from written corpora. For this reason, the frequency bands for experiment 1 were calculated over the averaged per-million frequency counts from written (CELEX) and spoken (CGN) corpora conjointly. The verbs that were used are on frequency bands 6-10 (median 7.5), the nouns cover frequency bands 8-12 (median 10).

Experiments 2-4. Frequency information about the lexical items that were used in these experiments was taken from the Database of Spoken German (Datenbank Gesprochenes Deutsch — DSAv des IDS, 2004).

Table B.1: Dutch lexemes for Experiment 1.

class	lexeme	FB	CELEX	CGN
V	dragen	9	282.0	61.8
V	geven	7	1285.0	744.3
V	horen	7	787.0	466.1
V	maken	6	2036.1	1082.4
V	nemen	7	1031.1	486.0

Continued on next page...

Table B.1 – Continued

class	lexeme	FB	CELEX	CGN
V	schrijven	8	501.0	237.5
V	slaan	9	324.0	93.5
V	trekken	8	475.0	188.3
V	verlaten	10	159.0	32.4
V	vertellen	8	514.0	236.3
V	vinden	6	1217.9	1593.3
V	zien	6	2321.1	1408.7
N	auteur	11	59.0	24.9
N	auto	9	208.0	170.8
N	bal	10	39.0	249.8
N	beeld	10	197.0	85.3
N	bericht	11	56.0	30.7
N	beslissing	11	105.0	38.9
N	besluit	11	78.0	17.8
N	betekenis	10	171.0	16.8
N	blad	11	114.0	37.7
N	bloem	11	94.0	31.4
N	boek	8	387.0	336.2
N	boer	11	100.0	52.3
N	boot	11	67.0	35.4
N	broer	10	128.0	78.2
N	brood	11	70.0	40.4
N	dame	11	89.0	34.2
N	dochter	10	120.0	53.3
N	dokter	10	145.0	41.4
N	eind	10	151.0	98.6
N	einde	10	156.0	69.8
N	ervaring	10	170.0	48.9
N	fiets	11	48.0	49.9
N	film	10	106.0	114.2
N	fles	11	112.0	28.7
N	gast	11	56.0	41.0
N	gebeurtenis	11	86.0	17.9
N	geld	9	280.0	207.6
N	geluid	10	146.0	42.1
N	hoek	11	111.0	42.3
N	hond	10	168.0	57.0
N	jongen	9	360.0	213.1
N	kaart	10	88.0	107.0
N	kat	11	72.0	17.9
N	kerel	11	62.0	17.8
N	kleur	10	155.0	48.8

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Table B.1 – Continued

class	lexeme	FB	CELEX	CGN
N	koe	12	36.0	26.1
N	koffie	10	111.0	44.9
N	koning	11	100.0	37.9
N	koningin	12	41.0	34.0
N	land	8	422.0	220.0
N	leider	11	71.0	26.2
N	les	11	32.0	105.2
N	maat	12	40.0	26.8
N	meerderheid	12	37.0	25.5
N	meester	11	77.0	35.2
N	meisje	9	357.0	126.7
N	muur	10	147.0	54.8
N	muziek	10	115.0	86.1
N	naam	9	420.0	193.6
N	opdracht	11	88.0	50.2
N	oplossing	11	97.0	43.3
N	paar	8	491.0	295.4
N	paard	10	158.0	29.2
N	plan	10	201.0	103.3
N	politie	10	95.0	110.8
N	pot	12	40.0	27.4
N	prins	11	68.0	28.0
N	reden	9	226.0	83.1
N	regel	10	139.0	44.1
N	resultaat	10	132.0	42.6
N	richting	10	199.0	99.9
N	schaap	12	26.0	34.1
N	schoen	11	68.0	24.9
N	schrijver	10	119.0	38.4
N	schuld	11	96.0	27.1
N	slachtoffer	11	52.0	32.3
N	spoor	11	73.0	29.7
N	stad	9	323.0	177.8
N	steen	10	117.0	37.7
N	straat	10	195.0	93.8
N	stuk	9	283.0	283.1
N	tafel	9	247.0	89.4
N	tante	11	104.0	41.9
N	teken	11	91.0	23.2
N	thee	12	51.0	22.0
N	toekomst	10	131.0	58.2
N	trots	11	73.0	21.8

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Table B.1 – Continued

class	lexeme	FB	CELEX	CGN
N	verhaal	9	238.0	148.5
N	vogel	11	96.0	22.9
N	volk	10	155.0	45.9
N	voorstel	11	80.0	67.9
N	vraag	8	476.0	307.0
N	vriend	9	284.0	110.6
N	vuur	11	104.0	33.8
N	water	9	364.0	138.3
N	wet	10	187.0	74.2
N	zoon	10	189.0	66.6

Legend: *class:* word class: N = noun, V = verb — *lexeme:* lexical entry — *FB:* frequency band (see above) — *CELEX:* frequency in CELEX database (per million) — *CGN:* frequency in CGN database (per million)

Table B.2: German lexemes for Experiments 2-4.

class	lexeme	FB	freq.
V	bringen	7	15.4
V	erzählen	7	15.2
V	zeigen	8	12.1
V	melden	10	6.2
V	reichen	10	6.7
V	schicken	10	6.5
V	verkaufen	10	7.4
V	liefern	11	5.3
V	schenken	11	5.0
V	versprechen	11	4.3
V	senden	12	3.6
V	verraten	12	3.3
V	übergeben	13	3.0
V	vermieten	14	2.1
N	Meister	11	5.7
N	Schriftsteller	11	5.7
N	Bürger	11	5.7
N	Bekannte	11	5.6
N	Kaffee	11	5.6
N	Präsident	11	5.6
N	Hund	11	5.5
N	Stoff	11	5.4
N	Gerät	11	5.3
N	Vogel	11	5.3
N	Karte	11	5.3
N	Papst	11	5.2
N	Kartoffel	11	5.2
N	Gewinn	11	5.1
N	Antrag	11	5.1
N	Angestellte	11	5.1
N	Erkenntnis	11	5.0
N	Blume	11	5.0
N	Graf	11	5.0
N	Holz	11	4.9
N	Absicht	11	4.8
N	Brot	11	4.8
N	Glas	11	4.8
N	Information	11	4.8
N	Autor	11	4.6
N	Wirkung	11	4.5
N	Tante	11	4.3

Continued on next page…

Table B.2 – Continued

class	lexeme	FB	freq.
N	Boot	12	4.2
N	Bursche	12	4.2
N	Decke	12	4.2
N	Witz	12	4.2
N	Chef	12	4.1
N	Dokument	12	4.1
N	Obst	12	4.1
N	Fahrrad	12	4.0
N	Onkel	12	4.0
N	Tasche	12	4.0
N	Kuchen	12	3.9
N	Beweis	12	3.8
N	Flugzeug	12	3.8
N	Ring	12	3.8
N	Typ	12	3.8
N	Apfel	12	3.7
N	Paar	12	3.7
N	Stock	12	3.7
N	Wahrheit	12	3.7
N	Zucker	12	3.6
N	Bub	12	3.6
N	Frucht	12	3.6
N	Topf	12	3.5
N	Erzählung	12	3.4
N	Gegner	12	3.4
N	Tee	12	3.4
N	Bauernhof	12	3.3
N	Fürst	12	3.3
N	Seil	12	3.3
N	Kasten	12	3.2
N	Schwein	12	3.2
N	Vermögen	12	3.2
N	Feind	12	3.2
N	Opfer	12	3.2
N	Schild	12	3.2
N	Held	13	3.0
N	Schreiber	13	2.9
N	Kerze	13	2.8

Legend: *class:* word class: N = noun, V = verb — *lexeme:* lexical entry — *FB:* frequency band (see above) — *freq:* frequency in DGD corpus (per million)

APPENDIX C

Trial Items

C.1 Experiment 1

This list shows the experimental items created for the experiment reported in chapter 5 in active, participle-medial, and participle-final rendition. Approximate translations into English are given in active voice.

1 active: De dame verlaat het paard.
passive (p-medial): Het paard wordt verlaten door de dame.
passive (p-final): Het paard wordt door de dame verlaten.
(The lady leaves the horse.)

2 active: De meester maakt een beeld.
passive (p-medial): Een beeld wordt gemaakt door de meester.
passive (p-final): Een beeld wordt door de meester gemaakt.
(The master makes an image.)

3 active: De schrijver ziet het meisje.
passive (p-medial): Het meisje wordt gezien door de schrijver.
passive (p-final): Het meisje wordt door de schrijver gezien.
(The writer sees the girl.)

4 active: De schrijver neemt de fles.
passive (p-medial): De fles wordt genomen door de schrijver.
passive (p-final): De fles wordt door de schrijver genomen.
(The writer takes the bottle.)

5 active: De dame draagt een steen.
passive (p-medial): Een steen wordt gedragen door de dame.
passive (p-final): Een steen wordt door de dame gedragen.
(The lady carries a stone.)

6 active: De dochter vindt een dokter.
passive (p-medial): Een dokter wordt gevonden door de dochter.
passive (p-final): Een dokter wordt door de dochter gevonden.
(The daughter finds a doctor.)

7 active: Het paard hoort de broer.
passive (p-medial): De broer wordt gehoord door het paard.
passive (p-final): De broer wordt door het paard gehoord.
(The horse hears the brother.)

8 active: De leider vertelt het plan.
passive (p-medial): Het plan wordt verteld door de leider.
passive (p-final): Het plan wordt door de leider verteld.
(The leader tells the plan.)

9 active: De prins schrijft een boek.
passive (p-medial): Een boek wordt geschreven door de prins.
passive (p-final): Een boek wordt door de prins geschreven.
(The prince writes a book.)

10 active: De meester slaat de jongen.
passive (p-medial): De jongen wordt geslagen door de meester.
passive (p-final): De jongen wordt door de meester geslagen.
(The master hits the boy.)

11 active: De boer trekt een schaap.
passive (p-medial): Een schaap wordt getrokken door de boer.
passive (p-final): Een schaap wordt door de boer getrokken.
(The farmer pulls a sheep.)

12 active: De boer geeft een bericht.
passive (p-medial): Een bericht wordt gegeven door de boer.
passive (p-final): Een bericht wordt door de boer gegeven.
(The farmer gives a report.)

13 active: Het volk verlaat de stad.
passive (p-medial): De stad wordt verlaten door het volk.
passive (p-final): De stad wordt door het volk verlaten.
(The tribe leaves the town.)

14 active: De dochter maakt de koffie.
passive (p-medial): De koffie wordt gemaakt door de dochter.
passive (p-final): De koffie wordt door de dochter gemaakt.
(The daughter makes the coffee.)

15 active: De jongen ziet de koningin.
passive (p-medial): De koningin wordt gezien door de jongen.
passive (p-final): De koningin wordt door de jongen gezien.
(The boy sees the queen.)

16 active: De dochter neemt een pot.
passive (p-medial): Een pot wordt genomen door de dochter.
passive (p-final): Een pot wordt door de dochter genomen.
(The daughter takes a pot.)

17 active: Het paard draagt een meisje.
passive (p-medial): Een meisje wordt gedragen door het paard.
passive (p-final): Een meisje wordt door het paard gedragen.
(The horse carries the girl.)

18 active: De tante vindt de zoon.
passive (p-medial): De zoon wordt gevonden door de tante.
passive (p-final): De zoon wordt door de tante gevonden.
(The aunt finds the son.)

19 active: De vogel hoort de kat.
passive (p-medial): De kat wordt gehoord door de vogel.
passive (p-final): De kat wordt door de vogel gehoord.
(The bird hears the cat.)

20 active: De dochter vertelt een ervaring.
passive (p-medial): Een ervaring wordt verteld door de dochter.
passive (p-final): Een ervaring wordt door de dochter verteld.
(The daughter tells an experience.)

21 active: De boer schrijft een regel.
passive (p-medial): Een regel wordt geschreven door de boer.
passive (p-final): Een regel wordt door de boer geschreven.
(The farmer writes a line.)

22 active: De boer slaat een koe.
passive (p-medial): Een koe wordt geslagen door de boer.
passive (p-final): Een koe wordt door de boer geslagen.
(The farmer hits a cow.)

23 active: De koe trekt een boot.
passive (p-medial): Een boot wordt getrokken door de koe.
passive (p-final): Een boot wordt door de koe getrokken.
(The cow pulls a boat.)

24 active: De leider geeft een teken.
passive (p-medial): Een teken wordt gegeven door de leider.
passive (p-final): Een teken wordt door de leider gegeven.
(The leader gives a sign.)

25 active: Het paar verlaat de tafel.
passive (p-medial): De tafel wordt verlaten door het paar.
passive (p-final): De tafel wordt door het paar verlaten.
(The couple leaves the table.)

26 active: De auteur maakt een verhaal.
passive (p-medial): Een verhaal wordt gemaakt door de auteur.
passive (p-final): Een verhaal wordt door de auteur gemaakt.
(The author makes a story.)

27 active: De jongen ziet een beeld.
passive (p-medial): Een beeld wordt gezien door de jongen.
passive (p-final): Een beeld wordt door de jongen gezien.
(The boy sees a picture.)

28 active: De dame neemt een schoen.
passive (p-medial): Een schoen wordt genomen door de dame.
passive (p-final): Een schoen wordt door de dame genomen.
(The lady takes a shoe.)

29 active: Het water draagt de boot.
passive (p-medial): De boot wordt gedragen door het water.
passive (p-final): De boot wordt door het water gedragen.
(The watre carries the boat.)

30 active: De dame vindt een boek.
passive (p-medial): Een boek wordt gevonden door de dame.
passive (p-final): Een boek wordt door de dame gevonden.
(The lady finds a book.)

31 active: De hond hoort de muziek.
passive (p-medial): De muziek wordt gehoord door de hond.
passive (p-final): De muziek wordt door de hond gehoord.
(The dog hears the music.)

32 active: De broer vertelt het voorstel.
passive (p-medial): Het voorstel wordt verteld door de broer.
passive (p-final): Het voorstel wordt door de broer verteld.
(The brother tells the proposal.)

33 active: Het slachtoffer schrijft het verhaal.
passive (p-medial): Het verhaal wordt geschreven door het slachtoffer.
passive (p-final): Het verhaal wordt door het slachtoffer geschreven.
(The victim writes the story.)

34 active: De kerel slaat het paard.
passive (p-medial): Het paard wordt geslagen door de kerel.
passive (p-final): Het paard wordt door de kerel geslagen.
(The guy hits the horse.)

35 active: De jongen trekt een hond.
passive (p-medial): Een hond wordt getrokken door de jongen.
passive (p-final): Een hond wordt door de jongen getrokken.
(The boy pulls a dog.)

36 active: De tante geeft geld.
passive (p-medial): Geld wordt gegeven door de tante.
passive (p-final): Geld wordt door de tante gegeven.
(The aunt gives money.)

37 active: De jongen verlaat de hoek.
passive (p-medial): De hoek wordt verlaten door de jongen.
passive (p-final): De hoek wordt door de jongen verlaten.
(The boy leaves the corner.)

38 active: De dame maakt de film.
passive (p-medial): De film wordt gemaakt door de dame.
passive (p-final): De film wordt door de dame gemaakt.
(The lady makes the film.)

39 active: De zoon ziet een paard.
passive (p-medial): Een paard wordt gezien door de zoon.
passive (p-final): Een paard wordt door de zoon gezien.
(The son sees a horse.)

40 active: De tante neemt de maat.
passive (p-medial): De maat wordt genomen door de tante.
passive (p-final): De maat wordt door de tante genomen.
(The aunt takes the measurements.)

41 active: De muur draagt een teken.
passive (p-medial): Een teken wordt gedragen door de muur.
passive (p-final): Een teken wordt door de muur gedragen.
(The wall carries a sign.)

42 active: De meerderheid vindt de koning.
passive (p-medial): De koning wordt gevonden door de meerderheid.
passive (p-final): De koning wordt door de meerderheid gevonden.
(The majority finds the king.)

43 active: De auteur hoort de vraag.
passive (p-medial): De vraag wordt gehoord door de auteur.
passive (p-final): De vraag wordt door de auteur gehoord.
(The author hears the question.)

44 active: De schrijver vertelt het eind.
passive (p-medial): Het eind wordt verteld door de schrijver.
passive (p-final): Het eind wordt door de schrijver verteld.
(The writer tells the end.)

45 active: De koning schrijft een beslissing.
passive (p-medial): Een beslissing wordt geschreven door de koning.
passive (p-final): Een beslissing wordt door de koning geschreven.
(The king writes a decision.)

46 active: De vriend slaat een hond.
passive (p-medial): Een hond wordt geslagen door de vriend.
passive (p-final): Een hond wordt door de vriend geslagen.
(The friend hits a dog.)

47 active: De schrijver trekt een kaart.
passive (p-medial): Een kaart wordt getrokken door de schrijver.
passive (p-final): Een kaart wordt door de schrijver getrokken.
(The writer draws a card.)

48 active: De koningin geeft de naam.
passive (p-medial): De naam wordt gegeven door de koningin.
passive (p-final): De naam wordt door de koningin gegeven.
(The queen gives the name.)

49 active: De trots verlaat de jongen.
passive (p-medial): De jongen wordt verlaten door de trots.
passive (p-final): De jongen wordt door de trots verlaten.
(The pride leaves the boy.)

50 active: De boer maakt een vuur.
passive (p-medial): Een vuur wordt gemaakt door de boer.
passive (p-final): Een vuur wordt door de boer gemaakt.
(The farmer makes a fire.)

51 active: De dame ziet de toekomst.
passive (p-medial): De toekomst wordt gezien door de dame.
passive (p-final): De toekomst wordt door de dame gezien.
(The lady sees the future.)

52 active: De jongen neemt een les.
passive (p-medial): Een les wordt genomen door de jongen.
passive (p-final): Een les wordt door de jongen genomen.
(The boy takes a lesson.)

53 active: De politie draagt de schuld.
passive (p-medial): De schuld wordt gedragen door de politie.
passive (p-final): De schuld wordt door de politie gedragen.
(The police force carries the blame.)

54 active: De broer vindt een oplossing.
passive (p-medial): Een oplossing wordt gevonden door de broer.
passive (p-final): Een oplossing wordt door de broer gevonden.
(The brother finds a solution.)

55 active: Het meisje hoort de dame.
passive (p-medial): De dame wordt gehoord door het meisje.
passive (p-final): De dame wordt door het meisje gehoord.
(The girl hears the lady.)

56 active: De dochter vertelt het resultaat.
passive (p-medial): Het resultaat wordt verteld door de dochter.
passive (p-final): Het resultaat wordt door de dochter verteld.
(The daughter tells the result.)

57 active: De auteur schrijft het einde.
passive (p-medial): Het einde wordt geschreven door de auteur.
passive (p-final): Het einde wordt door de auteur geschreven.
(The author writes the end.)

58 active: De zoon slaat de dame.
passive (p-medial): De dame wordt geslagen door de zoon.
passive (p-final): De dame wordt door de zoon geslagen.
(The son hits the lady.)

59 active: Het meisje trekt een kat.
passive (p-medial): Een kat wordt getrokken door het meisje.
passive (p-final): Een kat wordt door het meisje getrokken.
(The girl pulls a cat.)

60 active: Het resultaat geeft een richting.
passive (p-medial): Een richting wordt gegeven door het resultaat.
passive (p-final): Een richting wordt door het resultaat gegeven.
(The result gives a direction.)

61 active: De auto verlaat de straat.
passive (p-medial): De straat wordt verlaten door de auto.
passive (p-final): De straat wordt door de auto verlaten.
(The car leaves the street.)

62 active: Het meisje maakt het brood.
passive (p-medial): Het brood wordt gemaakt door het meisje.
passive (p-final): Het brood wordt door het meisje gemaakt.
(The girl makes the sandwich.)

63 active: Het paar ziet een hond.
passive (p-medial): Een hond wordt gezien door het paar.
passive (p-final): Een hond wordt door het paar gezien.
(The couple sees a dog.)

64 active: De meerderheid neemt een besluit.
passive (p-medial): Een besluit wordt genomen door de meerderheid.
passive (p-final): Een besluit wordt door de meerderheid genomen.
(The majority takes a decision.)

65 active: De koe draagt een boer.
passive (p-medial): Een boer wordt gedragen door de koe.
passive (p-final): Een boer wordt door de koe gedragen.
(The cow carries a farmer.)

66 active: Het meisje vindt een fiets.
passive (p-medial): Een fiets wordt gevonden door het meisje.
passive (p-final): Een fiets wordt door het meisje gevonden.
(The girl finds a bicycle.)

67 active: De kat hoort het meisje.
passive (p-medial): Het meisje wordt gehoord door de kat.
passive (p-final): Het meisje wordt door de kat gehoord.
(The cat hears the girl.)

68 active: De prins vertelt een gebeurtenis.
passive (p-medial): Een gebeurtenis wordt verteld door de prins.
passive (p-final): Een gebeurtenis wordt door de prins verteld.
(The prince tells a story.)

69 active: De politie schrijft een bericht.
passive (p-medial): Een bericht wordt geschreven door de politie.
passive (p-final): Een bericht wordt door de politie geschreven.
(The police writes a report.)

70 active: De schrijver slaat de dokter.
passive (p-medial): De dokter wordt geslagen door de schrijver.
passive (p-final): De dokter wordt door de schrijver geslagen.
(The writer hits the doctor.)

71 active: De vogel trekt een blad.
passive (p-medial): Een blad wordt getrokken door de vogel.
passive (p-final): Een blad wordt door de vogel getrokken.
(The bird pulls a leaf.)

72 active: De dokter geeft een les.
passive (p-medial): Een les wordt gegeven door de dokter.
passive (p-final): Een les wordt door de dokter gegeven.
(The doctor gives a lesson.)

73 active: De koningin verlaat het land.
passive (p-medial): Het land wordt verlaten door de koningin.
passive (p-final): Het land wordt door de koningin verlaten.
(The queen leaves the country.)

74 active: De zoon maakt thee.
passive (p-medial): Thee wordt gemaakt door de zoon.
passive (p-final): Thee wordt door de zoon gemaakt.
(The son makes tea.)

75 active: De vogel ziet de vriend.
passive (p-medial): De vriend wordt gezien door de vogel.
passive (p-final): De vriend wordt door de vogel gezien.
(The bird sees the friend.)

76 active: De hond neemt een steen.
passive (p-medial): Een steen wordt genomen door de hond.
passive (p-final): Een steen wordt door de hond genomen.
(The dog takes a stone.)

77 active: Het meisje draagt een bloem.
passive (p-medial): Een bloem wordt gedragen door het meisje.
passive (p-final): Een bloem wordt door het meisje gedragen.
(The girl carries a flower.)

78 active: De kerel vindt een auto.
passive (p-medial): Een auto wordt gevonden door de kerel.
passive (p-final): Een auto wordt door de kerel gevonden.
(The guy finds a car.)

79 active: Het paar hoort de dochter.
passive (p-medial): De dochter wordt gehoord door het paar.
passive (p-final): De dochter wordt door het paar gehoord.
(The couple hears the daughter.)

80 active: De meester vertelt een verhaal.
passive (p-medial): Een verhaal wordt verteld door de meester.
passive (p-final): Een verhaal wordt door de meester verteld.
(The master tells a story.)

81 active: De koningin schrijft een wet.
passive (p-medial): Een wet wordt geschreven door de koningin.
passive (p-final): Een wet wordt door de koningin geschreven.
(The queen writes a law.)

82 active: De koningin slaat de prins.
passive (p-medial): De prins wordt geslagen door de koningin.
passive (p-final): De prins wordt door de koningin geslagen.
(The queen hits the prince.)

83 active: Het paard trekt een auto.
passive (p-medial): Een auto wordt getrokken door het paard.
passive (p-final): Een auto wordt door het paard getrokken.
(The horse pulls a car.)

84 active: De regel geeft de betekenis.
passive (p-medial): De betekenis wordt gegeven door de regel.
passive (p-final): De betekenis wordt door de regel gegeven.
(The rule gives the meaning.)

85 active: Het paard verlaat het water.
passive (p-medial): Het water wordt verlaten door het paard.
passive (p-final): Het water wordt door het paard verlaten.
(The horse leaves the water.)

86 active: De fiets maakt een geluid.
passive (p-medial): Een geluid wordt gemaakt door de fiets.
passive (p-final): Een geluid wordt door de fiets gemaakt.
(The bicycle makes a noise.)

87 active: De dokter ziet de jongen.
passive (p-medial): De jongen wordt gezien door de dokter.
passive (p-final): De jongen wordt door de dokter gezien.
(The doctor sees the boy.)

88 active: De meester neemt een opdracht.
passive (p-medial): Een opdracht wordt genomen door de meester.
passive (p-final): Een opdracht wordt door de meester genomen.
(The master accepts a commission.)

89 active: De gast draagt de kleur.
passive (p-medial): De kleur wordt gedragen door de gast.
passive (p-final): De kleur wordt door de gast gedragen.
(The guest carries the colour.)

90 active: Het paard vindt de richting.
passive (p-medial): De richting wordt gevonden door het paard.
passive (p-final): De richting wordt door het paard gevonden.
(The horse finds the direction.)

91 active: Het schaap hoort een auto.
passive (p-medial): Een auto wordt gehoord door het schaap.
passive (p-final): Een auto wordt door het schaap gehoord.
(The sheep hears a car.)

92 active: De dokter vertelt de reden.
passive (p-medial): De reden wordt verteld door de dokter.
passive (p-final): De reden wordt door de dokter verteld.
(The doctor tells the reason.)

93 active: De auteur schrijft een stuk.
passive (p-medial): Een stuk wordt geschreven door de auteur.
passive (p-final): Een stuk wordt door de auteur geschreven.
(The author writes a play.)

94 active: De jongen slaat de bal.
passive (p-medial): De bal wordt geslagen door de jongen.
passive (p-final): De bal wordt door de jongen geslagen.
(The boy hits the ball.)

95 active: De auto trekt een spoor.
passive (p-medial): Een spoor wordt getrokken door de auto.
passive (p-final): Een spoor wordt door de auto getrokken.
(The car draws a track.)

96 active: De meester geeft de kleur.
passive (p-medial): De kleur wordt gegeven door de meester.
passive (p-final): De kleur wordt door de meester gegeven.
(The master indicates the colour.)

C.2 Experiment 2

This list shows the experimental items created for the experiments reported in chapter 6 in dative and prepositional rendition. Approximate translations into English are given as PO constructions.

1 Dativ: Das Paar liefert dem Grafen das Obst.
Präpositional: Das Paar liefert das Obst an den Grafen.
(The couple delivers the fruit to the earl)

2 Dativ: Die Tante liefert dem Meister den Vogel.
Präpositional: Die Tante liefert den Vogel an den Meister.
(The aunt delivers the bird to the master)

3 Dativ: Der Schreiber meldet dem Fürsten die Absicht.
Präpositional: Der Schreiber meldet die Absicht an den Fürsten.
(The scribe reports the intention to the prince)

4 Dativ: Die Bekannte meldet dem Meister die Information.
Präpositional: Die Bekannte meldet die Information an den Meister.
(The acquaintance (f.) reports the information to the master.)

5 Dativ: Das Opfer schickt dem Paar das Dokument.
Präpositional: Das Opfer schickt das Dokument an das Paar.
(The victim sends the document to the couple.)

6 Dativ: Der Fürst schickt dem Burschen die Decke.
Präpositional: Der Fürst schickt die Decke an den Burschen.
(The prince sends the blanket to the boy.)

7 Dativ: Der Autor sendet dem Präsidenten das Dokument.
Präpositional: Der Autor sendet das Dokument an den Präsidenten.
(The author sends the document to the president.)

8 Dativ: Der Papst sendet dem Schreiber die Information.
Präpositional: Der Papst sendet die Information an den Schreiber.
(The pope sends the information to the scribe.)

9 Dativ: Der Autor übergibt dem Helden den Bauernhof.
Präpositional: Der Autor übergibt den Bauernhof an den Helden.
(The author gives the farm to the hero.)

10 Dativ: Der Feind übergibt dem Präsidenten das Gerät.
Präpositional: Der Feind übergibt das Gerät an den Präsidenten.
(The enemy gives the device to the president.)

11 Dativ: Der Meister verkauft dem Helden das Glas.
Präpositional: Der Meister verkauft das Glas an den Helden.
(The master sells the glass to the hero.)

12 Dativ: Die Bekannte verkauft dem Onkel das Fahrrad.
Präpositional: Die Bekannte verkauft das Fahrrad an den Onkel.
(The acquaintance (f.) sells the bicycle to the uncle.)

13 Dativ: Der Bursche vermietet dem Helden das Boot.
Präpositional: Der Bursche vermietet das Boot an den Helden.
(The lad rents the boat to the hero.)

14 Dativ: Der Schreiber vermietet dem Paar das Fahrrad.
Präpositional: Der Schreiber vermietet das Fahrrad an das Paar.
(The scribe rents the bicycle to the couple.)

15 Dativ: Das Opfer verrät dem Meister die Wirkung.
Präpositional: Das Opfer verrät die Wirkung an den Meister.
(The victim betrays the effect to the master.)

16 Dativ: Der Bub verrät dem Papst den Beweis.
Präpositional: Der Bub verrät den Beweis an den Papst.
(The boy betrays the proof to the pope.)

17 Dativ: Der Schreiber liefert dem Gegner den Tee.
Präpositional: Der Schreiber liefert den Tee an den Gegner.
(The scribe delivers the tea to the opponent.)

18 Dativ: Der Typ liefert dem Onkel die Kartoffel.
Präpositional: Der Typ liefert die Kartoffel an den Onkel.
(The guy delivers the potato to the uncle.)

19 Dativ: Der Held meldet dem Schreiber den Beweis.
Präpositional: Der Held meldet den Beweis an den Schreiber.
(The hero reports the proof to the scribe.)

20 Dativ: Der Typ meldet dem Papst den Gewinn.
Präpositional: Der Typ meldet den Gewinn an den Papst.
(The guy reports the profit to the pope.)

21 Dativ: Der Meister schickt dem Gegner den Witz.
Präpositional: Der Meister schickt den Witz an den Gegner.
(The master sends the joke to the opponent.)

22 Dativ: Der Schriftsteller schickt dem Präsidenten den Stock.
Präpositional: Der Schriftsteller schickt den Stock an den Präsidenten.
(The writer sends the stick to the president.)

23 Dativ: Das Paar sendet dem Papst die Erzählung.
Präpositional: Das Paar sendet die Erzählung an den Papst.
(The couple sends the story to the pope.)

24 Dativ: Der Feind sendet dem Helden den Beweis.
Präpositional: Der Feind sendet den Beweis an den Helden.
(The enemy sends the proof to the hero.)

25 Dativ: Der Bürger übergibt dem Paar den Antrag.
Präpositional: Der Bürger übergibt den Antrag an das Paar.
(The citizen gives the application to the couple.)

26 Dativ: Der Papst übergibt dem Chef das Schild.
Präpositional: Der Papst übergibt das Schild an den Chef.
(The pope gives the sign to the boss.)

27 Dativ: Das Paar verkauft dem Grafen den Topf.
Präpositional: Das Paar verkauft den Topf an den Grafen.
(The couple sells the pot to the earl.)

28 Dativ: Der Bürger verkauft dem Gegner die Tasche.
Präpositional: Der Bürger verkauft die Tasche an den Gegner.
(The citizen sells the bag to the opponent.)

29 Dativ: Das Paar vermietet dem Gegner das Flugzeug.
Präpositional: Das Paar vermietet das Flugzeug an den Gegner.
(The couple rents the plane to the opponent.)

30 Dativ: Der Fürst vermietet dem Feind die Tasche.
Präpositional: Der Fürst vermietet die Tasche an den Feind.
(The prince rents the bag to the enemy.)

31 Dativ: Der Feind verrät dem Helden den Witz.
Präpositional: Der Feind verrät den Witz an den Helden.
(The enemy betrays the joke to the hero.)

32 Dativ: Der Onkel verrät dem Meister die Erkenntnis.
Präpositional: Der Onkel verrät die Erkenntnis an den Meister.
(The uncle betrays the insight to the master.)

33 Dativ: Der Onkel liefert dem Chef die Blume.
Präpositional: Der Onkel liefert die Blume an den Chef.
(The uncle delivers the flower to the boss.)

34 Dativ: Der Schreiber liefert dem Feind die Frucht.
Präpositional: Der Schreiber liefert die Frucht an den Feind.
(The scribe delivers the fruit to the enemy.)

35 Dativ: Der Bürger meldet dem Gegner den Gewinn.
Präpositional: Der Bürger meldet den Gewinn an den Gegner.
(The citizen reports the profit to the opponent.)

36 Dativ: Der Schreiber meldet dem Gegner die Wirkung.
Präpositional: Der Schreiber meldet die Wirkung an den Gegner.
(The scribe reports the effect to the opponent.)

37 Dativ: Der Fürst schickt dem Paar das Vermögen.
Präpositional: Der Fürst schickt das Vermögen an das Paar.
(The prince sends the fortune to the couple.)

38 Dativ: Der Onkel schickt dem Gegner die Karte.
Präpositional: Der Onkel schickt die Karte an den Gegner.
(The uncle sends the card to the opponent.)

39 Dativ: Der Fürst sendet dem Paar den Beweis.
Präpositional: Der Fürst sendet den Beweis an das Paar.
(The prince sends the proof to the couple.)

40 Dativ: Die Angestellte sendet dem Helden die Erzählung.
Präpositional: Die Angestellte sendet die Erzählung an den Helden.
(The employee (f.) sends the story to the hero.)

41 Dativ: Der Autor übergibt dem Chef das Gerät.
Präpositional: Der Autor übergibt das Gerät an den Chef.
(The author gives the device to the boss.)

42 Dativ: Der Graf übergibt dem Präsidenten den Antrag.
Präpositional: Der Graf übergibt den Antrag an den Präsidenten.
(The earl gives the application to the president.)

43 Dativ: Der Held verkauft dem Bürger den Zucker.
Präpositional: Der Held verkauft den Zucker an den Bürger.
(The hero sells sugar to the citizen.)

44 Dativ: Die Bekannte verkauft dem Meister den Hund.
Präpositional: Die Bekannte verkauft den Hund an den Meister.
(The acquaintance (f.) sells the dog to the master.)

45 Dativ: Das Paar vermietet dem Fürsten das Boot.
Präpositional: Das Paar vermietet das Boot an den Fürsten.
(The couple rents the boat to the prince.)

46 Dativ: Der Schreiber vermietet dem Helden die Tasche.
Präpositional: Der Schreiber vermietet die Tasche an den Helden.
(The scribe rents the bag to the hero.)

47 Dativ: Der Bub verrät dem Präsidenten den Gewinn.
Präpositional: Der Bub verrät den Gewinn an den Präsidenten.
(The boy reports the profit to the president.)

48 Dativ: Der Onkel verrät dem Helden den Beweis.
Präpositional: Der Onkel verrät den Beweis an den Helden.
(The uncle betrays the proof to the hero.)

49 Dativ: Der Meister liefert dem Onkel den Kaffee.
Präpositional: Der Meister liefert den Kaffee an den Onkel.
(The master delivers the coffee to the uncle.)

50 Dativ: Der Typ liefert dem Präsidenten das Brot.
Präpositional: Der Typ liefert das Brot an den Präsidenten.
(The guy delivers the bread to the president.)

51 Dativ: Das Opfer meldet dem Schreiber das Flugzeug.
Präpositional: Das Opfer meldet das Flugzeug an den Schreiber.
(The victim reports the plane to the scribe.)

52 Dativ: Der Typ meldet dem Fürsten die Erkenntnis.
Präpositional: Der Typ meldet die Erkenntnis an den Fürsten.
(The guy reports the insight to the prince.)

53 Dativ: Der Meister schickt dem Chef die Erzählung.
Präpositional: Der Meister schickt die Erzählung an den Chef.
(The master sends the story to the boss.)

54 Dativ: Der Schreiber schickt dem Buben die Decke.
Präpositional: Der Schreiber schickt die Decke an den Buben.
(The scribe sends the blanket to the boy.)

55 Dativ: Der Feind sendet dem Präsidenten die Karte.
Präpositional: Der Feind sendet die Karte an den Präsidenten.
(The enemy sends the card to the president.)

56 Dativ: Der Graf sendet dem Schreiber das Dokument.
Präpositional: Der Graf sendet das Dokument an den Schreiber.
(The earl sends the document to the scribe.)

57 Dativ: Der Fürst übergibt dem Paar den Hund.
Präpositional: Der Fürst übergibt den Hund an das Paar.
(The prince gives the dog to the couple.)

58 Dativ: Der Meister übergibt dem Gegner das Schild.
Präpositional: Der Meister übergibt das Schild an den Gegner.
(The master gives the sign to the opponent.)

59 Dativ: Der Graf verkauft dem Feind die Kerze.
Präpositional: Der Graf verkauft die Kerze an den Feind.
(The earl sells the candle to the enemy.)

60 Dativ: Der Onkel verkauft dem Paar den Stoff.
Präpositional: Der Onkel verkauft den Stoff an das Paar.
(The uncle sells the cloth to the couple.)

61 Dativ: Der Schreiber vermietet dem Burschen den Bauernhof.
Präpositional: Der Schreiber vermietet den Bauernhof an den Burschen.
(The scribe rents the farm to the lad.)

62 Dativ: Der Typ vermietet dem Onkel die Decke.
Präpositional: Der Typ vermietet die Decke an den Onkel.
(The guy rents the blanket to the uncle.)

63 Dativ: Das Opfer verrät dem Gegner die Information.
Präpositional: Das Opfer verrät die Information an den Gegner.
(The victim betrays the information to the opponent.)

64 Dativ: Der Bürger verrät dem Schreiber die Wirkung.
Präpositional: Der Bürger verrät die Wirkung an den Schreiber.
(The citizen betrays the effect to the scribe.)

C.3 Experiments 3 and 4

This list shows the experimental items created for the experiments reported in chapters 7 and 8 as canonical datives and shifted datives in the tenses of *Präsens* (Experiment 3) and *Perfekt* (Experiment 4). Approximate translations into English are given as PO constructions in present tense.

1 canonical: Der Schriftsteller bringt dem Grafen den Tee.
shifted: Der Schriftsteller bringt den Tee dem Grafen.
canonical, *Perfekt*: Der Schriftsteller hat dem Grafen den Tee gebracht.
shifted, *Perfekt*: Der Schriftsteller hat den Tee dem Grafen gebracht.
(The writer brings the tea to the earl.)

2 canonical: Das Paar bringt dem Helden die Kerze.
shifted: Das Paar bringt die Kerze dem Helden.
canonical, *Perfekt*: Das Paar hat dem Helden die Kerze gebracht.
shifted, *Perfekt*: Das Paar hat die Kerze dem Helden gebracht.
(The couple brings the candle to the hero.)

3 canonical: Der Chef erzählt dem Buben die Erkenntnis.
shifted: Der Chef erzählt die Erkenntnis dem Buben.
canonical, *Perfekt*: Der Chef hat dem Buben die Erkenntnis erzählt.
shifted, *Perfekt*: Der Chef hat die Erkenntnis dem Buben erzählt.
(The boss tells the insight to the boy.)

4 canonical: Das Opfer erzählt dem Onkel die Wirkung.
shifted: Das Opfer erzählt die Wirkung dem Onkel.
canonical, *Perfekt*: Das Opfer hat dem Onkel die Wirkung erzählt.
shifted, *Perfekt*: Das Opfer hat die Wirkung dem Onkel erzählt.
(The victim tells the effect to the uncle.)

5 canonical: Der Onkel reicht dem Feind die Blume.
shifted: Der Onkel reicht die Blume dem Feind.
canonical, *Perfekt*: Der Onkel hat dem Feind die Blume gereicht.
shifted, *Perfekt*: Der Onkel hat die Blume dem Feind gereicht.
(The uncle hands the flower to the enemy.)

6 canonical: Der Autor reicht dem Grafen den Stock.
shifted: Der Autor reicht den Stock dem Grafen.
canonical, *Perfekt*: Der Autor hat dem Grafen den Stock gereicht.
shifted, *Perfekt*: Der Autor hat den Stock dem Grafen gereicht.
(The author hands the stick to the earl.)

7 canonical: Der Bursche schenkt dem Papst die Blume.
shifted: Der Bursche schenkt die Blume dem Papst.
canonical, *Perfekt*: Der Bursche hat dem Papst die Blume geschenkt.
shifted, *Perfekt*: Der Bursche hat die Blume dem Papst geschenkt.
(The lad gives the flower to the pope (as a present).)

8 canonical: Der Fürst schenkt dem Schriftsteller die Karte.
shifted: Der Fürst schenkt die Karte dem Schriftsteller.
canonical, *Perfekt*: Der Fürst hat dem Schriftsteller die Karte geschenkt.
shifted, *Perfekt*: Der Fürst hat die Karte dem Schriftsteller geschenkt.
(The prince gives the card to the writer (as a present).)

9 canonical: Die Angestellte schickt dem Bürger die Erzählung.
shifted: Die Angestellte schickt die Erzählung dem Bürger.
canonical, *Perfekt*: Die Angestellte hat dem Bürger die Erzählung geschickt.
shifted, *Perfekt*: Die Angestellte hat die Erzählung dem Bürger geschickt.
(The employee (f.) sends the story to the citizen.)

10 canonical: Der Meister schickt dem Chef den Gewinn.
shifted: Der Meister schickt den Gewinn dem Chef.
canonical, *Perfekt*: Der Meister hat dem Chef den Gewinn geschickt.
shifted, *Perfekt*: Der Meister hat den Gewinn dem Chef geschickt.
(The master sends the profit to the boss.)

11 canonical: Der Onkel verkauft dem Burschen das Schwein.
shifted: Der Onkel verkauft das Schwein dem Burschen.
canonical, *Perfekt*: Der Onkel hat dem Burschen das Schwein verkauft.
shifted, *Perfekt*: Der Onkel hat das Schwein dem Burschen verkauft.
(The uncle sells the pig to the lad.)

12 canonical: Der Autor verkauft dem Fürsten das Gerät.
shifted: Der Autor verkauft das Gerät dem Fürsten.
canonical, *Perfekt*: Der Autor hat dem Fürsten das Gerät verkauft.
shifted, *Perfekt*: Der Autor hat das Gerät dem Fürsten verkauft.
(The author sells the device to the prince.)

13 canonical: Der Fürst verspricht dem Buben das Flugzeug.
shifted: Der Fürst verspricht das Flugzeug dem Buben.
canonical, *Perfekt*: Der Fürst hat dem Buben das Flugzeug versprochen.
shifted, *Perfekt*: Der Fürst hat das Flugzeug dem Buben versprochen.
(The prince promises the plane to the boy.)

14 canonical: Der Chef verspricht dem Bürger das Obst.
shifted: Der Chef verspricht das Obst dem Bürger.
canonical, *Perfekt*: Der Chef hat dem Bürger das Obst versprochen.
shifted, *Perfekt*: Der Chef hat das Obst dem Bürger versprochen.
(The boss promises the fruit to the citizens.)

15 canonical: Der Schreiber zeigt dem Buben das Brot.
shifted: Der Schreiber zeigt das Brot dem Buben.
canonical, *Perfekt*: Der Schreiber hat dem Buben das Brot gezeigt.
shifted, *Perfekt*: Der Schreiber hat das Brot dem Buben gezeigt.
(The scribe shows the bread to the boy.)

16 canonical: Der Schriftsteller zeigt dem Fürsten den Antrag.
shifted: Der Schriftsteller zeigt den Antrag dem Fürsten.
canonical, *Perfekt*: Der Schriftsteller hat dem Fürsten den Antrag gezeigt.
shifted, *Perfekt*: Der Schriftsteller hat den Antrag dem Fürsten gezeigt.
(The writer shows the application to the prince.)

17 canonical: Der Feind bringt dem Burschen den Beweis.
shifted: Der Feind bringt den Beweis dem Burschen.
canonical, *Perfekt*: Der Feind hat dem Burschen den Beweis gebracht.
shifted, *Perfekt*: Der Feind hat den Beweis dem Burschen gebracht.
(The enemy brings the proof to the lad.)

18 canonical: Der Autor bringt dem Meister das Fahrrad.
shifted: Der Autor bringt das Fahrrad dem Meister.
canonical, *Perfekt*: Der Autor hat dem Meister das Fahrrad gebracht.
shifted, *Perfekt*: Der Autor hat das Fahrrad dem Meister gebracht.
(The author brings the bike to the master.)

19 canonical: Der Präsident erzählt dem Burschen den Witz.
shifted: Der Präsident erzählt den Witz dem Burschen.
canonical, *Perfekt*: Der Präsident hat dem Burschen den Witz erzählt.
shifted, *Perfekt*: Der Präsident hat den Witz dem Burschen erzählt.
(The president tells the joke to the boy.)

20 canonical: Der Autor erzählt dem Gegner die Absicht.
shifted: Der Autor erzählt die Absicht dem Gegner.
canonical, *Perfekt*: Der Autor hat dem Gegner die Absicht erzählt.
shifted, *Perfekt*: Der Autor hat die Absicht dem Gegner erzählt.
(The author tells the intention to the opponent.)

21 canonical: Der Bursche reicht dem Fürsten den Kasten.
shifted: Der Bursche reicht den Kasten dem Fürsten.
canonical, *Perfekt*: Der Bursche hat dem Fürsten den Kasten gereicht.
shifted, *Perfekt*: Der Bursche hat den Kasten dem Fürsten gereicht.
(The lad hands the box to the prince.)

22 canonical: Der Präsident reicht dem Meister den Kuchen.
shifted: Der Präsident reicht den Kuchen dem Meister.
canonical, *Perfekt*: Der Präsident hat dem Meister den Kuchen gereicht.
shifted, *Perfekt*: Der Präsident hat den Kuchen dem Meister gereicht.
(The president hands the cake to the master.)

23 canonical: Das Paar schenkt dem Präsidenten das Vermögen.
shifted: Das Paar schenkt das Vermögen dem Präsidenten.
canonical, *Perfekt*: Das Paar hat dem Präsidenten das Vermögen geschenkt.
shifted, *Perfekt*: Das Paar hat das Vermögen dem Präsidenten geschenkt.
(The couple gives the fortune to the president (as a present).)

24 canonical: Der Graf schenkt dem Schreiber das Schild.
shifted: Der Graf schenkt das Schild dem Schreiber.
canonical, *Perfekt*: Der Graf hat dem Schreiber das Schild geschenkt.
shifted, *Perfekt*: Der Graf hat das Schild dem Schreiber geschenkt.
(The earl gives the sign to the scribe (as a present).)

25 canonical: Der Papst schickt dem Buben den Apfel.
shifted: Der Papst schickt den Apfel dem Buben.
canonical, *Perfekt*: Der Papst hat dem Buben den Apfel geschickt.
shifted, *Perfekt*: Der Papst hat den Apfel dem Buben geschickt.
(The pope sends the apple to the boy.)

26 canonical: Der Autor schickt dem Bürger den Topf.
shifted: Der Autor schickt den Topf dem Bürger.
canonical, *Perfekt*: Der Autor hat dem Bürger den Topf geschickt.
shifted, *Perfekt*: Der Autor hat den Topf dem Bürger geschickt.
(The author sends the pot to the citizen.)

27 canonical: Der Held verkauft dem Bürger den Vogel.
shifted: Der Held verkauft den Vogel dem Bürger.
canonical, *Perfekt*: Der Held hat dem Bürger den Vogel verkauft.
shifted, *Perfekt*: Der Held hat den Vogel dem Bürger verkauft.
(The hero sells the bird to the citizen.)

28 canonical: Der Meister verkauft dem Fürsten die Tasche.
shifted: Der Meister verkauft die Tasche dem Fürsten.
canonical, *Perfekt*: Der Meister hat dem Fürsten die Tasche verkauft.
shifted, *Perfekt*: Der Meister hat die Tasche dem Fürsten verkauft.
(The master sells the bag to the prince.)

29 canonical: Die Bekannte verspricht dem Chef die Information.
shifted: Die Bekannte verspricht die Information dem Chef.
canonical, *Perfekt*: Die Bekannte hat dem Chef die Information versprochen.
shifted, *Perfekt*: Die Bekannte hat die Information dem Chef versprochen.
(The acquaintance (f.) promises the information to the boss.)

30 canonical: Das Paar verspricht dem Fürsten das Obst.
shifted: Das Paar verspricht das Obst dem Fürsten.
canonical, *Perfekt*: Das Paar hat dem Fürsten das Obst versprochen.
shifted, *Perfekt*: Das Paar hat das Obst dem Fürsten versprochen.
(The couple promises the fruit to the prince.)

31 canonical: Die Angestellte zeigt dem Burschen den Stoff.
shifted: Die Angestellte zeigt den Stoff dem Burschen.
canonical, *Perfekt*: Die Angestellte hat dem Burschen den Stoff gezeigt.
shifted, *Perfekt*: Die Angestellte hat den Stoff dem Burschen gezeigt.
(The employee (f.) shows the cloth to the lad.)

32 canonical: Die Bekannte zeigt dem Präsidenten das Dokument.
shifted: Die Bekannte zeigt das Dokument dem Präsidenten.
canonical, *Perfekt*: Die Bekannte hat dem Präsidenten das Dokument gezeigt.
shifted, *Perfekt*: Die Bekannte hat das Dokument dem Präsidenten gezeigt.
(The acquaintance (f.) shows the document to the president.)

33 canonical: Der Onkel bringt dem Burschen die Information.
shifted: Der Onkel bringt die Information dem Burschen.
canonical, *Perfekt*: Der Onkel hat dem Burschen die Information gebracht.
shifted, *Perfekt*: Der Onkel hat die Information dem Burschen gebracht.
(The uncle brings the information to the boy.)

34 canonical: Der Autor bringt dem Grafen das Holz.
shifted: Der Autor bringt das Holz dem Grafen.
canonical, *Perfekt*: Der Autor hat dem Grafen das Holz gebracht.
shifted, *Perfekt*: Der Autor hat das Holz dem Grafen gebracht.
(The author brings the wood to the earl.)

35 canonical: Die Tante erzählt dem Schreiber den Witz.
shifted: Die Tante erzählt den Witz dem Schreiber.
canonical, *Perfekt*: Die Tante hat dem Schreiber den Witz erzählt.
shifted, *Perfekt*: Die Tante hat den Witz dem Schreiber erzählt.
(The aunt tells the joke to the writer.)

36 canonical: Der Typ erzählt dem Onkel die Wahrheit.
shifted: Der Typ erzählt die Wahrheit dem Onkel.
canonical, *Perfekt*: Der Typ hat dem Onkel die Wahrheit erzählt.
shifted, *Perfekt*: Der Typ hat die Wahrheit dem Onkel erzählt.
(The guy tells the truth to the uncle.)

37 canonical: Der Onkel reicht dem Buben das Brot.
shifted: Der Onkel reicht das Brot dem Buben.
canonical, *Perfekt*: Der Onkel hat dem Buben das Brot gereicht.
shifted, *Perfekt*: Der Onkel hat das Brot dem Buben gereicht.
(The uncle hands the bread to the boy.)

38 canonical: Der Bursche reicht dem Grafen den Tee.
shifted: Der Bursche reicht den Tee dem Grafen.
canonical, *Perfekt*: Der Bursche hat dem Grafen den Tee gereicht.
shifted, *Perfekt*: Der Bursche hat den Tee dem Grafen gereicht.
(The lad hands the tea to the count.)

39 canonical: Die Tante schenkt dem Papst die Kartoffel.
shifted: Die Tante schenkt die Kartoffel dem Papst.
canonical, *Perfekt*: Die Tante hat dem Papst die Kartoffel geschenkt.
shifted, *Perfekt*: Die Tante hat die Kartoffel dem Papst geschenkt.
(The aunt gives the potato to the pope (as a present).)

40 canonical: Der Feind schenkt dem Meister den Stock.
shifted: Der Feind schenkt den Stock dem Meister.
canonical, *Perfekt*: Der Feind hat dem Meister den Stock geschenkt.
shifted, *Perfekt*: Der Feind hat den Stock dem Meister geschenkt.
(The enemy gives the stick to the master (as a present).)

41 canonical: Der Präsident schickt dem Meister den Witz.
shifted: Der Präsident schickt den Witz dem Meister.
canonical, *Perfekt*: Der Präsident hat dem Meister den Witz geschickt.
shifted, *Perfekt*: Der Präsident hat den Witz dem Meister geschickt.
(The president sends the joke to the master.)

42 canonical: Die Angestellte schickt dem Grafen den Zucker.
shifted: Die Angestellte schickt den Zucker dem Grafen.
canonical, *Perfekt*: Die Angestellte hat dem Grafen den Zucker geschickt.
shifted, *Perfekt*: Die Angestellte hat den Zucker dem Grafen geschickt.
(The employee (f.) sends the sugar to the earl.)

43 canonical: Der Bursche verkauft dem Helden den Ring.
shifted: Der Bursche verkauft den Ring dem Helden.
canonical, *Perfekt*: Der Bursche hat dem Helden den Ring verkauft.
shifted, *Perfekt*: Der Bursche hat den Ring dem Helden verkauft.
(The lad sells the ring to the hero.)

44 canonical: Der Schreiber verkauft dem Papst das Glas.
shifted: Der Schreiber verkauft das Glas dem Papst.
canonical, *Perfekt*: Der Schreiber hat dem Papst das Glas verkauft.
shifted, *Perfekt*: Der Schreiber hat das Glas dem Papst verkauft.
(The scribe sells the glass to the pope.)

45 canonical: Das Paar verspricht dem Schriftsteller den Kuchen.
shifted: Das Paar verspricht den Kuchen dem Schriftsteller.
canonical, *Perfekt*: Das Paar hat dem Schriftsteller den Kuchen versprochen.
shifted, *Perfekt*: Das Paar hat den Kuchen dem Schriftsteller versprochen.
(The couple promises the cake to the writer.)

46 canonical: Der Chef verspricht dem Burschen das Schwein.
shifted: Der Chef verspricht das Schwein dem Burschen.
canonical, *Perfekt*: Der Chef hat dem Burschen das Schwein versprochen.
shifted, *Perfekt*: Der Chef hat das Schwein dem Burschen versprochen.
(The boss promises the pig to the lad.)

47 canonical: Der Bub zeigt dem Papst das Boot.
shifted: Der Bub zeigt das Boot dem Papst.
canonical, *Perfekt*: Der Bub hat dem Papst das Boot gezeigt.
shifted, *Perfekt*: Der Bub hat das Boot dem Papst gezeigt.
(The boy shows the boat to the pope.)

48 canonical: Das Opfer zeigt dem Meister das Dokument.
shifted: Das Opfer zeigt das Dokument dem Meister.
canonical, *Perfekt*: Das Opfer hat dem Meister das Dokument gezeigt.
shifted, *Perfekt*: Das Opfer hat das Dokument dem Meister gezeigt.
(The victim shows the document to the master.)

49 canonical: Die Bekannte bringt dem Meister den Kuchen.
shifted: Die Bekannte bringt den Kuchen dem Meister.
canonical, *Perfekt*: Die Bekannte hat dem Meister den Kuchen gebracht.
shifted, *Perfekt*: Die Bekannte hat den Kuchen dem Meister gebracht.
(The acquaintance (f.) brings the cake to the master.)

50 canonical: Der Chef bringt dem Gegner den Ring.
shifted: Der Chef bringt den Ring dem Gegner.
canonical, *Perfekt*: Der Chef hat dem Gegner den Ring gebracht.
shifted, *Perfekt*: Der Chef hat den Ring dem Gegner gebracht.
(The boss brings the ring to the enemy.)

51 canonical: Der Präsident erzählt dem Meister die Absicht.
shifted: Der Präsident erzählt die Absicht dem Meister.
canonical, *Perfekt*: Der Präsident hat dem Meister die Absicht erzählt.
shifted, *Perfekt*: Der Präsident hat die Absicht dem Meister erzählt.
(The president tells the intention to the master.)

52 canonical: Das Opfer erzählt dem Schriftsteller die Information.
shifted: Das Opfer erzählt die Information dem Schriftsteller.
canonical, *Perfekt*: Das Opfer hat dem Schriftsteller die Information erzählt.
shifted, *Perfekt*: Das Opfer hat die Information dem Schriftsteller erzählt.
(The victim tells the information to the writer.)

53 canonical: Der Papst reicht dem Onkel den Topf.
shifted: Der Papst reicht den Topf dem Onkel.
canonical, *Perfekt*: Der Papst hat dem Onkel den Topf gereicht.
shifted, *Perfekt*: Der Papst hat den Topf dem Onkel gereicht.
(The pope hands the pot to the uncle.)

54 canonical: Der Schreiber reicht dem Helden den Kaffee.
shifted: Der Schreiber reicht den Kaffee dem Helden.
canonical, *Perfekt*: Der Schreiber hat dem Helden den Kaffee gereicht.
shifted, *Perfekt*: Der Schreiber hat den Kaffee dem Helden gereicht.
(The scribe hands the coffee to the hero.)

55 canonical: Der Graf schenkt dem Buben den Hund.
shifted: Der Graf schenkt den Hund dem Buben.
canonical, *Perfekt*: Der Graf hat dem Buben den Hund geschenkt.
shifted, *Perfekt*: Der Graf hat den Hund dem Buben geschenkt.
(The earl gives the dog to the boy (as a present).)

56 canonical: Der Onkel schenkt dem Helden den Vogel.
shifted: Der Onkel schenkt den Vogel dem Helden.
canonical, *Perfekt*: Der Onkel hat dem Helden den Vogel geschenkt.
shifted, *Perfekt*: Der Onkel hat den Vogel dem Helden geschenkt.
(The uncle gives the bird to the hero (as a present).)

57 canonical: Der Onkel schickt dem Burschen den Apfel.
shifted: Der Onkel schickt den Apfel dem Burschen.
canonical, *Perfekt*: Der Onkel hat dem Burschen den Apfel geschickt.
shifted, *Perfekt*: Der Onkel hat den Apfel dem Burschen geschickt.
(The uncle sends the apple to the lad.)

58 canonical: Der Chef schickt dem Papst das Dokument.
shifted: Der Chef schickt das Dokument dem Papst.
canonical, *Perfekt*: Der Chef hat dem Papst das Dokument geschickt.
shifted, *Perfekt*: Der Chef hat das Dokument dem Papst geschickt.
(The boss sends the document to the pope.)

59 canonical: Der Bürger verkauft dem Fürsten die Decke.
shifted: Der Bürger verkauft die Decke dem Fürsten.
canonical, *Perfekt*: Der Bürger hat dem Fürsten die Decke verkauft.
shifted, *Perfekt*: Der Bürger hat die Decke dem Fürsten verkauft.
(The citizen sells the blanket to the prince.)

60 canonical: Der Meister verkauft dem Schriftsteller die Frucht.
shifted: Der Meister verkauft die Frucht dem Schriftsteller.
canonical, *Perfekt*: Der Meister hat dem Schriftsteller die Frucht verkauft.
shifted, *Perfekt*: Der Meister hat die Frucht dem Schriftsteller verkauft.
(The master sells the fruit to the writer.)

61 canonical: Der Fürst verspricht dem Meister das Obst.
shifted: Der Fürst verspricht das Obst dem Meister.
canonical, *Perfekt*: Der Fürst hat dem Meister das Obst versprochen.
shifted, *Perfekt*: Der Fürst hat das Obst dem Meister versprochen.
(The prince promises the fruit to the master.)

62 canonical: Der Graf verspricht dem Onkel das Vermögen.
shifted: Der Graf verspricht das Vermögen dem Onkel.
canonical, *Perfekt*: Der Graf hat dem Onkel das Vermögen versprochen.
shifted, *Perfekt*: Der Graf hat das Vermögen dem Onkel versprochen.
(The earl promises the fortune to the uncle.)

63 canonical: Der Held zeigt dem Grafen den Antrag.
shifted: Der Held zeigt den Antrag dem Grafen.
canonical, *Perfekt*: Der Held hat dem Grafen den Antrag gezeigt.
shifted, *Perfekt*: Der Held hat den Antrag dem Grafen gezeigt.
(The hero shows the application to the count.)

64 canonical: Der Bürger zeigt dem Paar den Bauernhof.
shifted: Der Bürger zeigt den Bauernhof dem Paar.
canonical, *Perfekt*: Der Bürger hat dem Paar den Bauernhof gezeigt.
shifted, *Perfekt*: Der Bürger hat den Bauernhof dem Paar gezeigt.
(The citizen shows the farm to the couple.)

APPENDIX D

Fillers

D.1 Experiment 1

The following lists the fillers items for Experiment 1 (Chapter 5), with approximate translations into English.

Single word fillers:

beroemd
(famous)
blauw
(blue)
bruin
(brown)
crimineel
(criminal)
eenvoudig
(simple, stupid)
geel
(yellow)
groen
(green)
groot
(big)
jong
(young)
klein
(small)
kort
(short, small)
lang
(tall, long)
licht
(light)
makkelijk
(easy)
moeilijk
(difficult)
mogelijk
(possible)
nieuw
(new)
oud
(old)
rood
(red)
simpel
(simple)
verslagen
(beaten)
wit
(white)
zwaar
(heavy)
zwart
(black)

Noun phrase fillers:

een rauwe dag
(a rough day)

een blauw deel
(a blue part)

een recent deel
(a recent part)
een enorme gedachte
(an enormous thought)
een recente gedachte
(a recent thought)
de saaie gedachte
(the boring thought)
de waarde gedachte
(a worthy thought)
het enorme gezicht
(the enormous face)
het huidige gezicht
(the current face)
een nat gezicht
(a wet face)
een publiekelijk gezicht
(a public face)
een rood gezicht
(a red face)
de gele grond
(the yellow ground)
een openbaare grond
(a public spot)
de ruige grond
(the rough ground)
een nat haar
(a wet hair)
een dappere hand
(a brave hand)
een grappige hand
(a funny hand)
een natte hand
(a wet hand)
de ruige hand
(the rough hand)
een harde herinnering
(a difficult memory)
een mooie herinnering
(a beautiful memory)
een publiekelijke herinnering
(a public memory)
de wrede herinnering
(the crule memory)
de zware herinnering
(the heavy memory)
een aardig huis
(a friendly house)
een eenvoudig huis
(a simple house)
een groen huis
(a green house)
het vreemde huis
(the strange house)
een groot idee
(a big idea)
een huidig idee
(a current idea)
het huidige idee
(the idea of today)
een publiekelijk idee
(a public idea)
een dunne invloed
(a thin influence)
een edele invloed
(a noble influence)
een rode invloed
(a red influence)
een ruw jaar
(a rough year)
het zware jaar
(the difficult year)
de blinde kracht
(the blind force)
een eerlijke kracht
(an honest force)
een gemeene kracht
(a common power)
de oude kracht
(the old force)
een ruige kracht
(a rough power)
een taaie kracht
(an unyielding force)
een bleke macht
(a bleak power)
de eenvoudige macht
(the simple power)

een huidige macht
(a power of today)
een moedige macht
(a brave force)
een nobele macht
(a noble power)
de rare macht
(the rare power)
een lange moeder
(a tall mother)
een stoere moeder
(a tough mother)
het bleke oog
(the bleak eye)
een nieuw oog
(a new eye)
het publiekelijke oog
(the public eye)
een rood oog
(a red eye)
een saai oog
(a boring eye)
het vreselijke oog
(the terrible eye)
de aardige oom
(the friendly uncle)
de grote oom
(the big uncle)
een nieuwe oom
(a new uncle)
een zware oom
(a heavy uncle)
de eerlijke oorzaak
(the honest cause)
een elementaire oorzaak
(an elementary reason)
een mooie oorzaak
(a beautiful reason)
de aardige plaats
(the friendly place)
een grappige plaats
(a funny place)
de onevene plaats
(the rough spot)
een openbaare plaats
(a public place)
een blinde poging
(a blind attempt)
een leuke poging
(a nice attempt)
de mooie poging
(the beautiful attempt)
een nieuwe poging
(a new attempt)
een rare poging
(a strange attempt)
een wrede poging
(a fierce attempt)
de grote schouder
(the big shoulder)
een harde schouder
(a hard shoulder)
de ouderwetse schouder
(the old-fashioned shoulder)
de dappere staat
(the brave nation)
de jonge staat
(the young nation)
de moedige staat
(the courageous country)
de enorme stem
(the enormous voice)
een leuke stem
(a nice voice)
een grote stilte
(a great silence)
de wrede tijd
(the cruel time)
een grootse vader
(a posh father)
een leuke vader
(a nice father)
een mooie vader
(a beautiful father)
een nieuwe vader
(a new father)
een oude vader
(an old father)

een recente vader
(a recent father)
de wrede vader
(the cruel father)
de aardige verandering
(the friendly change)
een edele verandering
(a noble change)
een heilige verandering
(a holy change)
de onevene verandering
(an uneven change)
een grappige vorm
(a funny shape)
een groene vorm
(a green shape)
een recente vorm
(a recent shape)
de blinde vrouw
(the blind woman)
een eenvoudige vrouw
(a simple woman)
een saaie vrouw
(a boring woman)
de wrede vrouw
(the cruel woman)
de eenvoudige waarheid
(the simple truth)
de grappige waarheid
(the funny truth)
een grote waarheid
(a great truth)
de vreselijke waarheid
(the terrible truth)
de eenvoudige weg
(the simple path)
de grappige weg
(the funny path)
de mooie weg
(the beautiful way)
de ouderwetse weg
(the old-fashioned path)
de ruige weg
(the rough path)
de groene wereld
(the green world)
een rauwe wereld
(a rough world)
een dunne wetenschap
(a thin science)
de edele wetenschap
(the noble science)
de huidige wetenschap
(the science of today)
het eenvoudige woord
(the simple word)
een groot woord
(a big word)
het nieuwe woord
(the new word)
het rode woord
(the red word)
de stoere zuster
(the tough sister)
een vreselijke zuster
(a terrible sister)

D.2 Experiments 2-4

The following lists the filler items for Experiments 2–4 (Chapters 6–8). Intransitive sentence fillers are shown in the *Präsens* tense (Experiments 2 and 3) and in the *Perfekt* tense (Experiment 4). Approximate translations are always given in the present tense.

Randomized items for practice session

das grüne Auto
(the green car)
das langsame Auto
(the slow car)
die lange Geschichte
(the long story)
der dicke Hund
(the fat dog)
das müde Lächeln
(the tired smile)
das große Problem
(the big problem)
die kurze Rede
(the short speech)
das alte Schloss
(the old castle)
die aufgeregte Tante
(the excited aunt)
der seltsame Tisch
(the strange table)
das kalte Wetter
(the cold weather)

Präsens: Der Fürst gähnt.
Perfekt: Der Fürst hat gegähnt.
(The prince yawns.)
Präsens: Der Pinguin gähnt.
Perfekt: Der Pinguin hat gegähnt.
(The penguin yawns.)

Präsens: Die Bekannte hustet.
Perfekt: Die Bekannte hat gehustet.
(The acquaintance (f.) coughs.)
Präsens: Das Herz schlägt laut.
Perfekt: Das Herz hat laut geschlagen.
(The heart beats loudly.)
Präsens: Der Fürst schwankt plötzlich.
Perfekt: Der Fürst ist plötzlich geschwankt.
(The prince sways suddenly.)
Präsens: Der Baum wächst langsam.
Perfekt: Der Baum ist langsam gewachsen.
(The tree grows slowly.)

Präsens: Der Graf erlegt den Fuchs.
Perfekt: Der Graf hat den Fuchs erlegt.
(The earl kills the fox.)
Präsens: Das Auto parkt neben der Kirche.
Perfekt: Das Auto hat neben der Kirche geparkt.
(The car parks next to the church.)
Präsens: Die Angestellte schwitzt im Büro.
Perfekt: Die Angestellte hat im Büro geschwitzt.
(The employee (f.) sweats in the office.)
Präsens: Die Mutter steht in der Küche.
Perfekt: Die Mutter ist in der Küche gestanden.
(The mother stands in the kitchen.)
Präsens: Der Onkel stellt die Frage.
Perfekt: Der Onkel hat die Frage gestellt.
(The uncle asks the question.)

Noun phrase fillers

das seltene Problem
(the rare problem)
der kleine Junge
(the little boy)
die dicke Frau
(the fat woman)

der junge Freund
(the young friend)
die öffentliche Meinung
(the public opinion)
der rote Wagen
(the red car)

der gelbe Wagen
(the yellow car)
der echte Flügel
(the real grand piano)
das schwierige Buch
(the difficult book)

die junge Frau
(the young woman)
der schwierige Kurs
(the difficult class)
das leichte Geld
(the easy money)
das eigenartige Haus
(the strange house)
der alte Herr
(the old gentleman)
das blaue Auge
(the blue eye)
die rote Haut
(the red skin)
das dicke Bein
(the thick leg)
der blaue Wagen
(the blue car)
das kleine Küken
(the little chick)
der dicke Vater
(the fat father)
das kleine Pferd
(the small horse)
der echte Mittelpunkt
(the real centre)
der dicke Bauer
(the fat farmer)
das einfache Beispiel
(the simple example)
das gelbe Kleid
(the yellow dress)
das eigenartige Volk
(the strange people)
die öffentliche Aufmerksamkeit
(the public attention)
die blaue Farbe
(the blue colour)
der alte Fehler
(the old mistake)
das blaue Kleid
(the blue dress)
das dünne Bein
(the thin leg)
die schwere Arbeit
(the hard work)
der schwere Nachteil
(the severe disadvantage)
die dünne Frau
(the thin woman)
die einfache Mehrheit
(the simple majority)
das große Herz
(the big heart)
die leichte Arbeit
(the easy work)
der dicke Junge
(the fat boy)
die große Frau
(the tall woman)
das leichte Buch
(the easy book)
die seltene Kunst
(the rare art)
das schwere Buch
(the heavy book)
das grüne Auge
(the green eye)
der nette Mensch
(the nice person)
das kleine Mädchen
(the little girl)
das rote Dach
(the red roof)
die rote Farbe
(the red colour)
der dicke Strich
(the thick line)
das seltene Glück
(the unusual luck)
der schwere Gedanke
(the heavy thought)
der junge Vater
(the young father)
das junge Volk
(the young people)
der echte König
(the real king)
die grüne Schildkröte
(the green turtle)
der einfache Fall
(the easy case)
das kleine Glück
(the minor happiness)
das nette Angebot
(the nice offer)
der junge Doktor
(the young doctor)
die leichte Frage
(the easy question)
der schöne Vorschlag
(the beautiful suggestion)
die gelbe Farbe
(the yellow colour)
der seltene Fall
(the rare case)
die alte Zeitung
(the old newspaper)
der dicke König
(the fat king)
die junge Mutter
(the young mother)
die eigenartige Frage
(the strange question)
das alte Haus
(the old house)
der echte Spaß
(the real pleasure)
der seltene Spaß
(the rare pleasure)
die seltsame Arbeit
(the strange work)
der lustige Zusammenhang
(the funny connection)
der seltsame Tanz
(the unusual dance)
die alte Frau
(the old woman)
die alte Tracht
(the old dress)
die dünne Kleidung
(the thin clothing)

der echte Nutzen
(the real use)
der eigenartige Vorschlag
(the strange suggestion)
die kleine Schwester
(the little sister)
das öffentliche Eigentum
(the public property)
der dünne Strich
(the thin line)
der grüne Baum
(the green tree)
die lustige Fähigkeit
(the funny ability)
das rote Kleid
(the red dress)
der seltsame Zusammenhang
(the strange concetion)
die schwierige Arbeit
(the difficult work)
das rote Haar
(the red hair)
das grüne Blatt
(the green leaf)
das gelbe Blatt
(the yellow leaf)
der junge König
(the young king)
der lustige Effekt
(the funny effect)
die nette Frage
(the nice question)
das seltsame Gesetz
(the strange law)
der grüne Garten
(the green garden)
das kleine Haus
(the small house)
der leichte Tanz
(the simple dance)
der eigenartige Fehler
(the strange mistake)
die leichte Aufgabe
(the easy task)

der lustige Unterricht
(the funny lesson)
der nette Zufall
(the nice coincidence)
die einfache Frage
(the easy question)
die große Küche
(the big kitchen)
das dünne Haar
(the thin hair)
die seltsame Ehre
(the strange honour)
der kleine Berg
(the small mountain)
die neue Form
(the new shape)
das grüne Kleid
(the green dress)
der seltene Gedanke
(the strange thought)
das seltsame Ereignis
(the strange event)
die lustige Rede
(the funny speech)
das alte Jahr
(the old year)
der dicke Nebel
(the thick fog)
der alte Streit
(the old quarrel)
der öffentliche Vortrag
(the public speech)
der eigenartige Unterricht
(the strange lesson)
der öffentliche Raum
(the public space)
die gelbe Haut
(the yellow skin)
das schwere Haar
(the heavy hair)
der dünne Nebel
(the thin mist)
das schwere Kabel
(the heavy cable)

die nette Gelegenheit
(the nice occasion)
der rote Mund
(the red mouth)
die eigenartige Jahreszeit
(the strange season)
die seltene Farbe
(the unusual colour)
das seltsame Blatt
(the strange leaf)
die schwierige Pflicht
(the difficult obligation)
die seltsame Feststellung
(the strange observation)
das einfache Lied
(the simple song)
die neue Sache
(the new thing)
das junge Glück
(the young happiness)
der nette Wunsch
(the nice wish)
die lustige Begegnung
(the funny encounter)
die schöne Schwester
(the beautiful sister)
der lustige Tanz
(the funny dance)
die öffentliche Veranstaltung
(the public performance)
die schwierige Tat
(the difficult action)
das eigenartige Ereignis
(the strange event)
der einfache Gedanke
(the simple thought)
das schwierige Handwerk
(the diffcult craft)
der nette Versuch
(the nice attempt)
die leichte Spannung
(the slight tension)
die einfache Aufgabe
(the simple task)

die junge Mode
(the young fashion)
die eigenartige Feststellung
(the strange observation)
die schwierige Maßnahme
(the difficult procedure)
das seltene Wesen
(the rare creature)
die alte Frage
(the old question)
das schöne Motiv
(the beautiful motive)
der seltsame Effekt
(the strange effect)
das öffentliche Urteil
(the public verdict)
das neue Zeitalter
(the new age)
das seltene Maß
(the rare measure)
der schwere Fels
(the heavy rock)
das leichte Bedürfnis
(the slight need)
das alte Problem
(the old problem)
das kleine Kino
(the small cinema)
die schwierige Auswahl
(the difficult choice)
die nette Idee
(the nice idea)
der seltene Zustand
(the rare condition)
das schöne Auge
(the beautiful eye)

das große Büro
(the big office)
das große Kino
(the big cinema)
der große Fuß
(the big foot)
die seltene Ehre
(the rare honour)
das kleine Fenster
(the small window)
der nette Grundsatz
(the nice principle)
der schwere Schaden
(the serious damage)
der leichte Mangel
(the slight flaw)
die einfache Wahl
(the easy choice)
die einfache berlegung
(the simple consideration)
die neue Beschreibung
(the new description)
die große Sache
(the big thing)
die schöne Arbeit
(the beautiful work)
der alte Schuh
(the old shoe)
der neue Morgen
(the new morning)
das einfache Angebot
(the simple offer)
der schöne Film
(the beautiful movie)
der kleine Vorteil
(the small advantage)

die neue Bezeichnung
(the new label)
das neue Fenster
(the new window)
der große Baum
(the big tree)
das große Erlebnis
(the great experience)
das große Zimmer
(the big room)
das neue Kleid
(the new dress)
das schöne Zimmer
(the beautiful room)
der neue Schluss
(the new end)
der kleine Stein
(the small stone)
das schöne Angebot
(the beautiful offer)
die große Bedeutung
(the great meaning)
die schöne Veränderung
(the beautiful change)
das neue Motiv
(the new motive)
der große Wert
(the great value)
der kleine Zufall
(the small coincidence)
die neue Verpflichtung
(the new obligation)

Short intransitive fillers

Präsens: Die Probe endet.
Perfekt: Die Probe hat geendet.
(The practice ends.)

Präsens: Der Weg endet.
Perfekt: Der Weg hat geendet.
(The path ends.)

Präsens: Der Vortrag endet.
Perfekt: Der Vortrag hat geendet.
(The talk ends.)
Präsens: Der Unterricht endet.
Perfekt: Der Unterricht hat geendet.
(The lesson ends.)
Präsens: Der Krieg endet.
Perfekt: Der Krieg hat geendet.
(The war ends.)
Präsens: Das Jahr endet.
Perfekt: Das Jahr hat geendet.
(The year ends.)
Präsens: Die Tante lacht.
Perfekt: Die Tante hat gelacht.
(The aunt laughs.)
Präsens: Die Schwester lacht.
Perfekt: Die Schwester hat gelacht.
(The sister laughs.)
Präsens: Der Herr lacht.
Perfekt: Der Herr hat gelacht.
(The gentleman laughs.)
Präsens: Das Volk lacht.
Perfekt: Das Volk hat gelacht.
(The people laugh.)
Präsens: Die Tante redet.
Perfekt: Die Tante hat geredet.
(The aunt talks.)
Präsens: Der Sohn redet.
Perfekt: Der Sohn hat geredet.
(The son talks.)
Präsens: Der König redet.
Perfekt: Der König hat geredet.
(The king talks.)
Präsens: Der Doktor redet.
Perfekt: Der Doktor hat geredet.
(The doctor talks.)
Präsens: Die Angestellte rennt.
Perfekt: Die Angestellte ist gerannt.
(The employee (f). runs.)
Präsens: Der König rennt.
Perfekt: Der König ist gerannt.
(The king runs.)
Präsens: Der Hase rennt.
Perfekt: Der Hase ist gerannt.
(The hare runs.)
Präsens: Der Freund rennt.
Perfekt: Der Freund ist gerannt.
(The friend runs.)
Präsens: Die Mutter schläft.
Perfekt: Die Mutter hat geschlafen.
(The mother sleeps.)
Präsens: Die Kuh schläft.
Perfekt: Die Kuh hat geschlafen.
(The cow sleeps.)
Präsens: Der König schläft.
Perfekt: Der König hat geschlafen.
(The king sleeps.)
Präsens: Der Herr schläft.
Perfekt: Der Herr hat geschlafen.
(The gentleman sleeps.)
Präsens: Der Bruder schläft.
Perfekt: Der Bruder hat geschlafen.
(The brother sleeps.)
Präsens: Der Wert sinkt.
Perfekt: Der Wert ist gesunken.
(The value drops.)
Präsens: Der Kurs sinkt.
Perfekt: Der Kurs ist gesunken.
(The exchange rate drops.)
Präsens: Das Schiff sinkt.
Perfekt: Das Schiff ist gesunken.
(The ship sinks.)
Präsens: Die Steuer steigt.
Perfekt: Die Steuer ist gestiegen.
(The tax increases.)
Präsens: Die Spannung steigt.
Perfekt: Die Spannung ist gestiegen.
(The tension increases.)
Präsens: Das Vertrauen steigt.
Perfekt: Das Vertrauen ist gestiegen.
(The trust increases.)
Präsens: Die Tante tanzt.
Perfekt: Die Tante hat getanzt.
(The aunt dances.)
Präsens: Die Mutter tanzt.
Perfekt: Die Mutter hat getanzt.
(The mother dances.)
Präsens: Der Sohn tanzt.
Perfekt: Der Sohn hat getanzt.
(The son dances.)

Präsens: Der Doktor tanzt.
Perfekt: Der Doktor hat getanzt.
(The doctor dances.)
Präsens: Die Mutter wartet.
Perfekt: Die Mutter hat gewartet.
(The mother waits.)
Präsens: Die Dame wartet.
Perfekt: Die Dame hat gewartet.
(The lady waits.)
Präsens: Der König wartet.
Perfekt: Der König hat gewartet.
(The king waits.)
Präsens: Der Herr wartet.
Perfekt: Der Herr hat gewartet.
(The gentleman waits.)
Präsens: Die Tante weint.
Perfekt: Die Tante hat geweint.
(The aunt cries.)
Präsens: Der Junge weint.
Perfekt: Der Junge hat geweint.
(The boy cries.)
Präsens: Der Bauer weint.
Perfekt: Der Bauer hat geweint.
(The farmer cries.)
Präsens: Das Volk weint.
Perfekt: Das Volk hat geweint.
(The people cry.)

Long intransitive fillers

Präsens: Die Veranstaltung endet im Streit.
Perfekt: Die Veranstaltung hat im Streit geendet.
(The performance ends in a row.)
Präsens: Die Strecke endet im Park.
Perfekt: Die Strecke hat im Park geendet.
(The route ends in the park.)
Präsens: Die Saison endet am Samstag.
Perfekt: Die Saison hat am Samstag geendet.
(The season ends on Saturday.)
Präsens: Die Nacht endet rasch.
Perfekt: Die Nacht hat rasch geendet.
(The night ends quickly.)
Präsens: Die Maßnahme endet bald.
Perfekt: Die Maßnahme hat bald geendet.
(The procedure ends soon.)
Präsens: Der Zustand endet bald.
Perfekt: Der Zustand hat bald geendet.
(The condition ends soon.)
Präsens: Die Mutter lacht im Garten.
Perfekt: Die Mutter hat im Garten gelacht.
(The mother laughs in the garden.)
Präsens: Die Frau lacht ständig.
Perfekt: Die Frau hat ständig gelacht.
(The woman laughs continuously.)

Präsens: Der Sohn lacht auf der Straße.
Perfekt: Der Sohn hat auf der Straße gelacht.
(The son laughs in the street.)
Präsens: Der Bauer lacht auf dem Feld.
Perfekt: Der Bauer hat auf dem Feld gelacht.
(The farmer laughs in the field.)
Präsens: Die Dame redet viel.
Perfekt: Die Dame hat viel geredet.
(The lady talks a lot.)
Präsens: Der Vater redet viel.
Perfekt: Der Vater hat viel geredet.
(The father talks a lot.)
Präsens: Der Herr redet im Saal.
Perfekt: Der Herr hat im Saal geredet.
(The gentleman talks in the hall.)
Präsens: Das Mädel redet im Garten.
Perfekt: Das Mädel hat im Garten geredet.
(The girl talks in the garden.)
Präsens: Die Schwester rennt im Park.
Perfekt: Die Schwester ist im Park gerannt.
(The sister runs in the park.)
Präsens: Der Junge rennt lange.
Perfekt: Der Junge ist lange gerannt.
(The boy runs for a long time.)
Präsens: Der Doktor rennt rasch.
Perfekt: Der Doktor ist rasch gerannt.
(The doctor runs quickly.)
Präsens: Das Pferd rennt nächste Woche.
Perfekt: Das Pferd ist vergangene Woche gerannt.
(The horse runs next week.)
Präsens: Die Tante schläft um Mitternacht.
Perfekt: Die Tante hat um Mitternacht geschlafen.
(The aunt sleeps at midnight.)
Präsens: Die Dame schläft im Park.
Perfekt: Die Dame hat im Park geschlafen.
(The lady sleeps in the park.)
Präsens: Der Vater schläft im Garten.
Perfekt: Der Vater hat im Garten geschlafen.
(The father sleeps in the garden.)
Präsens: Der Junge schläft auf dem Feld.
Perfekt: Der Junge hat auf dem Feld geschlafen.
(The boy sleeps in the field.)
Präsens: Das Mädchen schläft oft.
Perfekt: Das Mädchen hat oft geschlafen.
(The girl sleeps often.)

Präsens: Die Qualität sinkt ständig.
Perfekt: Die Qualität ist ständig gesunken.
(The quality drops continuously.)
Präsens: Die Nachfrage sinkt rasch.
Perfekt: Die Nachfrage ist rasch gesunken.
(The demand drops quickly.)
Präsens: Das Interesse sinkt plötzlich.
Perfekt: Das Interesse ist plötzlich gesunken.
(The interest drops suddenly.)
Präsens: Die Bedeutung steigt rasch.
Perfekt: Die Bedeutung ist rasch gestiegen.
(The importance increases quickly.)
Präsens: Der Bedarf steigt ständig.
Perfekt: Der Bedarf ist ständig gestiegen.
(The demand increases continuously.)
Präsens: Der Abstand steigt plötzlich.
Perfekt: Der Abstand ist plötzlich gestiegen.
(The distance increases suddenly.)
Präsens: Die Dame tanzt auf dem Feld.
Perfekt: Die Dame hat auf dem Feld getanzt.
(The lady dances in the field.)
Präsens: Die Angestellte tanzt im Büro.
Perfekt: Die Angestellte hat im Büro getanzt.
(The employee (f.) dances in the office.)
Präsens: Der Bruder tanzt auf der Party.
Perfekt: Der Bruder hat auf der Party getanzt.
(The brother dances at the party.)
Präsens: Das Mädchen tanzt viel.
Perfekt: Das Mädchen hat viel getanzt.
(The girl dances a lot.)
Präsens: Die Tante wartet lange.
Perfekt: Die Tante hat lange gewartet.
(The aunt waits for a long time.)
Präsens: Die Kuh wartet auf dem Feld.
Perfekt: Die Kuh hat auf dem Feld gewartet.
(The cow waits in the field.)
Präsens: Die Angestellte wartet im Büro.
Perfekt: Die Angestellte hat im Büro gewartet.
(The employee (f.) waits in the office.)
Präsens: Der Doktor wartet auf der Straße.
Perfekt: Der Doktor hat auf der Straße gewartet.
(The doctor waits in the street)
Präsens: Die Dame weint viel.
Perfekt: Die Dame hat viel geweint.
(The lady cries a lot.)

Präsens: Der Sohn weint ständig.
Perfekt: Der Sohn hat ständig geweint.
(The son cries continuously.)
Präsens: Der König weint um Mitternacht.
Perfekt: Der König hat um Mitternacht geweint.
(The king cries at midnight.)
Präsens: Das Mädel weint auf der Straße.
Perfekt: Das Mädel hat auf der Straße geweint.
(The girl cries in the street.)

APPENDIX E

Participant Instructions

E.1 Experiment 1

Participant instruction screens in Experiment 1 (three screens — in the following, each horizontal line represents the beginning of a new screen):

There are two parts to this experiment:

- repeating Dutch sentences
- translating from Dutch to English

In each of the parts, you will have to perform only one of these tasks. However, there is no fixed order; parts follow each other in a random fashion.

For each of the tasks, the screen will briefly display a word, phrase, or sentence. Please repeat or translate them, speaking out loud. If you cannot find a good translation, just use the best equivalent that you can think of.

After speaking, press the SPACE BAR to proceed to the next item.
If you do not press the SPACE BAR, you will hear a beep after some time. The next item is then displayed automatically.
If you have any questions, please ask them now. Press ENTER when you are ready to start.

E.2 Experiments 2–4

Participant instruction screens in Experiments 2–4 (English version):

In this Experiment, you are going to:

- repeat German sentences and phrases
- translate other German sentences and phrases into English

The two tasks occur separately - i.e., in one part of the experiment you will only have to repeat sentences, and in the other you will only have to translate.
A screen will tell you before each part of the experiment what you should do next. Screen borders will have different colours, too: grey to translAte, red to REpeat.

If you cannot find "the" translation at times, it will be perfectly sufficient to use a more general term, covering the content only roughly.
If you happen to miss a part of a sentence or phrase, then repeat or translate only as much as you can remember.

Whenever you are done repeating or translating, press the SPACE BAR to continue to the next item.
If you fail to press the SPACE BAR, you will hear a beep after some time, warning you that a new item is about to be shown.
A short practice sequence will now allow you to acquaint yourself with the procedure.
— please press ENTER —

Appendix F

Participant Questionnaire

The following questionnaire was answered by all participants after experimental main sessions. The version shown here is genericized; "NL" and "NNL" replace the names of the languages specific to the experiment.

(All information from this questionnaire will be kept strictly confidential.)

Language Background:

1 Age:
2 Sex: F / M
3 Place of birth:
4 Occupation (if student, also subject of studies):
5 Which varieties of NL and NNL do you feel best acquainted with? Be as specific as you like.
6 What is your native language:
7 Do you speak any other languages (apart from NL and NNL)? At which age did you start to learn them? And how would you rate your overall knowledge of each on a scale from 1 (rather bad) to 7 (rather good)?
8 Counting only stays of 4 weeks or more, how much time have you spent in places where another than your native language is spoken? Please indicate time and language or country.
9 Do you have any experience in interpreting or translating between any two languages that you speak? Please specify.
10 At what age did you first start to learn NNL?

11 On a scale from 1 (rather bad) to 7 (rather good), what level do you think you have attained in NNL?

Speaking	1	2	3	4	5	6	7
Listening	1	2	3	4	5	6	7
Reading	1	2	3	4	5	6	7
Writing	1	2	3	4	5	6	7

12 In your opinion, what has helped you most to attain this level? School? Films? Music? A stay abroad? Something else?

13 On average over the last three months before today, you have actively spoken NNL at least…

◯ 1× a day
◯ 3× a week
◯ 1× a week
◯ 1× a fortnight
◯ 1× a month
◯ 1×
◯ not

14 Is there any other language-related information that you would consider important or interesting that is not covered by any of the previous questions? If so, please write it down here:

APPENDIX G

Predictors

This appendix chapter provides the result tables for each experiment with the significance of t-values for predictors' regression coefficients through a 2-stage Least Squares method, as outlined in Chapter 5.3.6.

Notice that the columns of the following tables give also an indication of the analyses to which factors apply.

In Analyses of Variance, factors may be applicable in analyses by-participant or by-item. Excluded predictors would commonly result in within-factors, leading to a wider spread of data and a loss of power from the analysis of the main factors. Moreover, the relevance of the resulting effects may be questionable.

In Linear Mixed Effects models, factors may be applicable in models for the repeating task, for the translation task, or both tasks. Here, excluded factors are either constant in their data set or cannot be reasonably applied to it.

A last concern that needs to be mentioned at this point is the relation between information about participants and tasks. All factors that relate to participants measure a dimension of their L2 proficiency. For this reason, Least Squares have been applied only to data from tasks that involve L2 (see, however, van Hell & Dijkstra, 2002).

G.1 Experiment 1

Seven potential predictors were taken into consideration, including the two fixed factors of *task* and *source* construction. A factor that reflected the *sequential* order of the two experiment blocks was introduced to reflect the possibility that responses were less reliable during the first experimental block irrespective of task, as participants were still acquainting themselves with the experimental situation. Three factors were extracted from participant questionnaires: *learning age*, i.e. the time since first encounter with L2, skill *self rating*, and the degree of *recent exposure* that had been reported. One factor was included for additional information about items, namely *verb frequency*.

G.1.1 Reliability of production

Table G.1: *Experiment 1: predictor* t*-significance for production*

factor	per participant	per item
task	***	***
source construction	***	***
sequence	**	-
learning age	.	n.a.
self rating	-	n.a.
recent exposure	-	n.a.
verb frequency	n.a.	***

G.1.2 Latency

The factor *sequence* could not plausibly be included in predictor analyses for Experiment 1.

Table G.2: *Experiment 1: predictor* t*-significance for latency*

factor	participant	item
task	***	***
source	**	***
learning age	-	n.a.
self rating	-	n.a.
recent exposure	**	n.a.
verb frequency	n.a.	-

G.2 Experiment 2a

All participant-specific predictors in this experiment refer to their bilingualism; all relevant ts have been calculated on data only from tasks that involved use of L2 (conservative approach, but see van Hell & Dijkstra, 2002).

G.2.1 *Reliability of production*

Table G.3: *Experiment 2a: predictor t-significance for production*

factor	per participant	per item
task	***	***
source construction	-	-
task order	-	-
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	*	n.a.
self-rating	-	n.a.
test score	-	n.a.
verb frequency	n.a.	***
NP1 frequency	n.a.	.

G.2.2 *Choice of construction*

Table G.4: *Experiment 2a: predictor t-significance for construction*

factor	per participant	per item
source construction	***	***
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	-	n.a.
verb frequency	n.a.	.
NP1 frequency	n.a.	-

G.2.3 Latency

Table G.5: *Experiment 2a: predictor t-significance for latency*

factor	repeating	translation	both
task	n.a.	n.a.	***
source construction	-	.	.
copy argument order	n.a.	*	.
trial order	-	-	-
task order	***	-	***
learning age	n.a.	-	n.a.
immersion time	n.a.	***	n.a.
recent exposure	n.a.	**	n.a.
self-rating	n.a.	-	n.a.
test score	n.a.	*	n.a.
verb frequency	-	-	-
NP1 frequency	-	-	.

G.3 Experiment 2b

G.3.1 Reliability of production

Table G.6: *Experiment 2b: predictor t-significance for production*

factor	per participant	per item
task	-	-
source construction	-	-
task order	***	***
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	*	n.a.
verb frequency	n.a.	***
NP1 frequency	n.a.	-

G.3.2 Choice of construction

Table G.7: *Experiment 2b: predictor t-significance for construction*

factor	per participant	per item
source construction	.	**
learning age	-	n.a.
immersion time	.	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	.	n.a.
verb frequency	n.a.	-
NP1 frequency	n.a.	.

G.3.3 Latency

Table G.8: *Experiment 2b: predictor t-significance for latency*

factor	repeating	translation	both
task	n.a.	n.a.	***
source construction	-	-	-
copy argument order	n.a.	-	-
trial order	**	-	*
task order	-	.	-
learning age	***	-	***
immersion time	***	***	***
recent exposure	***	**	-
self-rating	***	***	***
test score	***	*	***
verb frequency	-	.	-
NP1 frequency	-	-	-

G.4 Experiment 3a

All participant-specific predictors in this experiment refer to their bilingualism; all relevant ts have been calculated on data only from tasks that involved use of L2 (conservative approach, but see van Hell & Dijkstra, 2002).

G.4.1 Reliability of production

Table G.9: *Experiment 3a: predictor t-significance for production*

factor	per participant	per item
task	-	-
source construction	*	***
task order	-	-
learning age	**	n.a.
immersion time	*	n.a.
recent exposure	const.	n.a.
self-rating	-	n.a.
test score	n.a.	n.a.
verb frequency	n.a.	-
NP1 frequency	n.a.	.

G.4.2 Choice of construction

Table G.10: *Experiment 3a: predictor t-significance for construction*

factor	per participant	per item
source construction	-	**
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	const.	n.a.
self-rating	-	n.a.
test score	n.a.	n.a.
verb frequency	n.a.	-
NP1 frequency	n.a.	-

G.4.3 Latency

Table G.11: *Experiment 3a: predictor t-significance for latency*

factor	repeating	translation	both
task	n.a.	n.a.	***
source construction	-	.	-
copy argument order	n.a.	.	-
trial order	-	-	-
task order	**	***	-
learning age	n.a.	***	n.a.
immersion time	n.a.	***	n.a.
recent exposure	n.a.	const.	n.a.
self-rating	n.a.	-	n.a.
test score	n.a.	n.a.	n.a.
verb frequency	-	-	-
NP1 frequency	-	-	-

G.5 Experiment 3b

G.5.1 Reliability of production

Table G.12: *Experiment 3b: predictor t-significance for production*

factor	per participant	per item
task	**	***
source construction	.	***
task order	**	.
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	*	n.a.
test score	**	n.a.
verb frequency	n.a.	.
NP1 frequency	n.a.	-

G.5.2 Choice of construction

Table G.13: *Experiment 3b: predictor t-significance for construction*

factor	per participant	per item
source construction	-	*
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	-	n.a.
verb frequency	n.a.	-
NP1 frequency	n.a.	-

G.5.3 Latency

Table G.14: *Experiment 3b: predictor t-significance for latency*

factor	repeating	translation	both
task	n.a.	n.a.	***
source construction	-	-	-
copy argument order	n.a.	-	-
trial order	-	-	-
task order	-	-	-
learning age	**	-	**
immersion time	-	-	-
recent exposure	-	***	***
self-rating	*	*	**
test score	-	.	*
verb frequency	-	-	-
NP1 frequency	-	-	-

G.6 Experiment 4

All participant-specific predictors in this experiment refer to their bilingualism; all relevant ts have been calculated on data only from tasks that involved use of L2 (conservative approach, but see van Hell & Dijkstra, 2002).

G.6.1 *Reliability of production*

Table G.15: *Experiment 4: predictor t-significance for production*

factor	per participant	per item
task	***	***
source construction	-	-
task order	-	.
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	*	n.a.
verb frequency	n.a.	-
NP1 frequency	n.a.	-

G.6.2 *Choice of construction*

Table G.16: *Experiment 4: predictor t-significance for construction*

factor	per participant	per item
source construction	-	-
learning age	-	n.a.
immersion time	-	n.a.
recent exposure	-	n.a.
self-rating	-	n.a.
test score	-	n.a.
verb frequency	n.a.	**
NP1 frequency	n.a.	-

G.6.3 Latency

Table G.17: *Experiment 4: predictor t-significance for latency*

factor	repeating	translation	both
task	n.a.	n.a.	***
source construction	-	-	-
copy argument order	n.a.	-	-
trial order	-	**	*
task order	**	***	***
learning age	n.a.	-	n.a.
immersion time	n.a.	***	n.a.
recent exposure	n.a.	-	n.a.
self-rating	n.a.	***	n.a.
test score	n.a.	***	n.a.
verb frequency	-	-	-
NP1 frequency	-	-	-

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