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Aspects of Linguistic Organisation:
Evidence from Lexical Processing in L1-L2 Translation

Ph.D. in Applied Linguistics

University of Dublin, Trinity College
Centre for Language and Communication Studies
May 2001

Anne Herwig
DECLARATION

I hereby declare that this thesis is entirely my own work unless otherwise stated, and that references to other works have been duly acknowledged.

I further declare that this thesis has not been submitted as an exercise for the award of a degree at this or any other university, and I agree that the Library of Trinity College Dublin may lend or copy the thesis upon request.

Dublin, 20th May 2001

(Anne Herwig)
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The present study deals with the linguistic behaviour of second language learners in the performance of L1-L2 translation. It is concerned with aspects of productive processing in the light of the cognitive structures underlying language use. Its purpose is twofold: it sets out to develop a formal model of lexical knowledge organisation that is at the same time psycholinguistically explicit and neurolinguistically plausible, and it investigates a range of specific aspects of lexical organisation on the basis of L2 production data.

The first concern is advanced by integrating different theoretical perspectives and positions in a comprehensive, transparent production model oriented by neuro-cognitive functioning instead of trying to account for the descriptive categories of structural-linguistic analysis, the latter orientation being here seen as a major deficit of many processing models. The proposed model offers a framework for discussing various aspects of linguistic organisation, including the research questions governing the present thesis. These relate to three hypotheses concerning different dimensions of linguistic organisation.

Hypothesis 1 suggests that lexico-semantic knowledge is embedded in general conceptual knowledge, and that, conversely, conceptual structure is mirrored in semantic organisation and should be traceable in semantic processing activity.

Hypothesis 2 concerns the relationship of lexical and grammatical knowledge, suggesting that the major part of grammatical knowledge can be related to lexical information structure. More specifically, phrase structure and the process of phrasal construction are suggested to be widely determined by the information structure of predicative items.

Hypothesis 3 relates to plurilingual organisation and aspects of plurilingual processing. It suggests that the plurilingual lexicon is an integrated system characterised by the dynamic interaction of different languages in the mind, whose relationship is flexible and variable. Crosslinguistic consultation and influence in L2 production is seen as allowing for conclusions about plurilingual connectivity.

The three hypotheses were investigated on the basis of two sets of data obtained from a group of bilingual and from a group of multilingual informants. The bilingual group was considered relatively homogeneous, involving 30 advanced English speaking learners of German; the multilingual group consisted of one Norwegian-speaking and three English-speaking learners of German, Dutch, and Swedish, with varying degrees of proficiency across their second languages. Both groups participated in an empirical study involving
the composition of a story on the basis of a series of pictures in their mother tongue and a translation of the same story into their second language(s). The translation task additionally required them to provide concurrent think-aloud introspective data, which were tape-recorded and transcribed. The think-aloud protocols (TAPs) document (parts of) their linguistic processing activity, in particular enabling the researcher to trace the routes taken in lexical retrieval and search, and further evidencing grammatical processing in phrasal construction. The data were analysed with reference to the three hypotheses outlined above.

Hypothesis 1 was explored by tracing associative chains in cases of the unavailability of required target language items. Of particular interest was the subjects’ semantic search activity, which was found to be indicative of the conceptual frame associated with the semantic content of the source item.

The same data were revealing in relation to Hypothesis 3, elucidating the relationship between L1 and L2 vocabulary, i.e., types of lexical connectivity and associated mechanisms of lexical access. These were found to vary across the informants and within the informants across different lexical items. The data of the multilingual group were analysed with a specific focus on multilingual interaction in the form of deliberate and involuntary L3 consultation and transfer. The results suggested that in the case of closely related languages and in a situation where multiple languages are successively or simultaneously activated, language learners seem to have difficulties keeping the different languages apart, independent of their level of proficiency.

Hypothesis 2 was investigated by analysing grammatical errors and steps taken in L2 phrasal construction, as documented by the verbal protocols. Grammatical errors could be traced back to deficient lexical knowledge, in particular to incorrect information about predicative argument structure, often evidencing either crosslinguistic or intralinguistic transfer. As such they were also found indicative of intra- and crosslinguistic lexical connectivity. Predicative items suggested themselves as the pivot of phrase structure and phrasal construction. They tended to be activated first, followed by the phrase or sentence being built around them.
# CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>PART 1</strong></td>
<td><strong>THEORETICAL CONSIDERATIONS</strong></td>
<td>5</td>
</tr>
<tr>
<td><strong>CHAPTER 1</strong></td>
<td><strong>THE COGNITIVE EMBEDDING OF LANGUAGE</strong></td>
<td>6</td>
</tr>
<tr>
<td>0. General</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>1. Aspects of Cognition</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>1.1 Principles of Cognitive Organisation</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>1.2 The Language Faculty</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>1.2.1 A 'Language Module'?</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>1.2.2 Cognitive Foundations of Linguistic Organisation</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>2. Knowledge Organisation</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2.1 Memory</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>2.1.1 Substantive versus Operational and Implicit versus Explicit Memory</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>2.1.2 Long-Term versus Short-Term Memory</td>
<td></td>
<td>19</td>
</tr>
<tr>
<td>2.1.3 Physiological Aspects of Memory</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>2.2 Knowledge Representation in Memory</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>2.2.1 The Nature and Role of Representation</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>2.2.2 Categories and Concepts</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>2.2.3 Conceptual Structure and Lexico-Semantic Fields</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td>2.2.4 Lexical-Formal Structure</td>
<td></td>
<td>31</td>
</tr>
<tr>
<td>2.2.5 Conceptualising and Verbalising Emotions</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>2.2.5.1 Complex Conceptual Events</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>2.2.5.2 The Cognitive Structure of Emotions</td>
<td></td>
<td>33</td>
</tr>
<tr>
<td>2.2.5.3 Lexicalisation Patterns</td>
<td></td>
<td>37</td>
</tr>
<tr>
<td>2.2.5.4 Emotion across Languages</td>
<td></td>
<td>39</td>
</tr>
<tr>
<td>2.2.6 Conclusion</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>2.3 Language</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>2.3.1 Language as a Symbolic System</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>2.3.2 Language and Thought</td>
<td></td>
<td>43</td>
</tr>
<tr>
<td>2.3.3 Meaning</td>
<td></td>
<td>44</td>
</tr>
<tr>
<td>3. Conclusions</td>
<td></td>
<td>45</td>
</tr>
</tbody>
</table>
CHAPTER 2 THE MENTAL LEXICON IN SECOND LANGUAGE USE

0. General

1. The Organisation of the Mental Lexicon
   1.1 Lexical Knowledge
      1.1.1 The Realms of Lexical Knowledge
      1.1.2 Lexical Items: Representational Substance and Combinatorial Potential
         1.1.2.1 Approaches to Defining Lexical Entities
         1.1.2.2 Structural ‘Hardware’ and Valency
   1.2 Lexical Connectivity
      1.2.1 Lexical Networks
      1.2.2 Lexical Relations
   1.3 Lexical Processing in Language Production
      1.3.1 Lexical Selection
      1.3.2 Phrasal Construction
      1.3.3 Conclusions
   1.4 Summary

2. Plurilingual Lexical Organisation and Processing
   2.1 Bilingualism
      2.1.1 The Bilingual Mind
      2.1.2 The Bilingual Mental Lexicon
         2.1.2.1 L2 Lexical Knowledge
         2.1.2.2 Bilingual Network Organisation
         2.1.2.3 Bilingual Lexical Connectivity
      2.1.3 Lexical Asymmetries across Languages
      2.1.4 Language Processing in the Bilingual Lexicon
         2.1.4.1 General Prospect
         2.1.4.2 L2 Formulation
         2.1.4.3 Spreading Activation in Artificial Neural Networks
   2.2 Multilingualism
      2.2.1 Multilingual Lexical Organisation
      2.2.2 Multilingual Lexical Processing
   2.3 Summary

3. Conclusions
CHAPTER 3  TOWARDS AN INTEGRATIVE PERSPECTIVE ON LEXICAL ORGANISATION

0. General 93
1 A Neurolinguistic Perspective on Lexical Knowledge Representation and Processing 95
   1.1 Lexical Organisation 95
      1.1.1 Component Aspects of Lexical Knowledge 95
      1.1.2 Lexical Networks 96
   1.2 Lexical Selection in Language Production 100
   1.3 Plurilingual Organisation and Processing 102
   1.4 Conclusions 104
2 A Comprehensive Psychological Model of the Mental Lexicon 106
   2.1 Lexical Information Structure 106
      2.1.1 Lexical Items as Mental Models 106
      2.1.2 Structural Differences across Languages 112
   2.2 Lexical Information Structure and Phrasal Construction 113
      2.2.1 Formulation Mechanisms 113
      2.2.2 L2 Production 116
   2.3 A Psycholinguistic Perspective on Lexical Networks 119
      2.3.1 Multidimensional Connectivity of Lexical Items 119
      2.3.2 The Plurilingual Mental Lexicon 120
3 Conclusions 122

PART 2  EMPIRICAL RESEARCH

CHAPTER 4  METHODS OF INVESTIGATION 124

0. General 124
1. Sources of Evidence 124
   1.1 Production Errors 125
   1.2 Associative Chains 127
2. Data Elicitation Tasks 131
   2.1 Translation Tasks 132
   2.2 Think-Aloud Protocols 133
3. Conclusions 136
1.2.3.2 Situations 1

1.2.3.2.1 Overview of the Data 187

1.2.3.2.2 Conceptual Organisation and Lexical Selection 190

1.2.3.2.3 Lexical Confusion Due to Insufficient Contrasts 192

1.2.3.2.4 A Collective Mental Representation of Emotion Concepts and Terminology? 195

1.2.4 Summary 200

1.2.5 Multilingual Organisation 201

1.2.5.1 Overview of the Data 201

1.2.5.2 Multilingual Crosslinguistic Consultation 203

1.2.5.3 Conceptual-Semantic Structure 206

1.2.5.4 Multilingual Lexical Connectivity 206

1.2.5.5 Multilingual Confusion and Lexical Connectivity 207

1.2.5.6 Multilingual Connectivity at Two Cognitive Levels 209

1.2.5.7 Summary 210

2. Lexical Information Structure, Grammatical Knowledge, and Phrasal Construction 210

2.1 Production Errors and Lexical Frame Knowledge 211

2.1.1 Word Level Errors 211

2.1.1.1 Crosslinguistic Transfer 211

2.1.1.2 Intralinguistic Transfer 213

2.1.2 Phrase Level Errors 216

2.2 Phrasal Construction 219

2.3 Production Errors and Grammatical Frame Knowledge in Multilingualism 222

2.3.1 Overview of the Data 222

2.3.2 Third Language Interference 224

2.3.3 Crosslinguistic Influence of More than One Language 225

2.3.4 Factors of Language Mixing 225

2.4 Summary 226

3. Conclusions 227

CHAPTER 7 CONCLUSION

1. Purpose of the Study 229

2. Theoretical Considerations 229

3. Empirical Study 230

4. Summary and Research Outlook 234
Abbreviations Used in the Thesis

L1  Mother Tongue
L2  Second or Foreign Language
L3  Additional Foreign Language in Distinction to a Second Language under Investigation
Ln  Any Language Other than the Mother Tongue
TAP  Think-Aloud Protocol
"Humans behave like jugglers when they use the mental lexicon, in that they have to deal with semantic, syntactic and phonological information at the same time. We have not yet considered how all these ingredients are combined. Tracing the process involved in putting them together, therefore, is likely to shed light on the organization of the various components in the human word-store."

(Aitchison 1994:197)

The present study is concerned with the organisation of lexical knowledge and how it can be traced in lexical processing activity. The investigation will focus on how the perceived psychological reality of language behaviour relates to cognitive organization principles, and how this relationship can be modelled.

Current research on linguistic organisation and processing includes a range of relatively distinct, as yet not fully integrated approaches. The following are relevant for the present study in that they provide complementary perspectives, whose integration will be suggested to allow for a comprehensive view of linguistic competence and language use. Structural linguistic analysis categorises linguistic elements in the light of their informational content and defines a structural framework under the heading of linguistic ‘rules’, which describes conditions for their combination into larger stretches of language. Neurolinguistic research investigates the neuro-cognitive foundations of language use as relating to principles of knowledge representation and processing. Psycholinguistics is concerned with linguistic behaviour and tries to explain it in terms of underlying (psychological) knowledge structures and processing mechanisms, which some schools of thought tend to relate to the descriptive categories of structural analysis, often at the expense of neuro-cognitive plausibility (cf., e.g., Levelt 1989, and Meara’s (1999a) criticism of related models). Cognitive linguistics claims that a comprehensive and unified view of linguistic organization is characterised in terms of cognitive processing (Langacker 1987:1). The present study will follow this latter tenet and aim at describing lexical knowledge organization with reference to its cognitive foundations. It deals with the linguistic behaviour of second language learners in the performance of L1-L2 translation, and is concerned with aspects of productive processing in the light of the cognitive structures underlying language use. Its purpose is twofold: it sets out to develop a formal model of lexical knowledge organisation that is at the same time
psycholinguistically explicit and neurolinguistically plausible, and it investigates a range of specific aspects of lexical organisation on the basis of L2 production data.

The first concern is advanced by integrating different theoretical perspectives and positions in a comprehensive, transparent production model oriented by the principles of cognitive organization. The proposed model offers a framework for discussing various aspects of linguistic organisation, including the present research questions, which relate to different dimensions of lexical knowledge.

The discussion is centred on three hypotheses which will be discussed in the light of different perspectives on these issues as emerging from different theoretical positions. I will aim to link a range of (seemingly) contradictory viewpoints in the hope in this way to arrive at a relatively comprehensive, explanatory perspective. The three hypotheses advanced in this study are as follows.

Hypothesis 1 concerns the relationship of general conceptual and lexico-semantic structure. In the light of the principles of cognitive knowledge representation as propounded by cognitive psychology and cognitive semantics (cf., e.g., Barsalou 1992a; Jackendoff 1983), it is suggested that lexico-semantic knowledge is embedded in general conceptual knowledge, and that, conversely, conceptual structure is mirrored in semantic organisation and should be traceable in semantic processing activity.

Hypothesis 2 concerns the relationship between lexical and grammatical knowledge. It is suggested that grammatical information is immediately and inseparably connected with lexical information structure, without having an independent cognitive standing. This hypothesis is derived from the argument that morpho-syntactic knowledge relates to the distributional properties of lexical elements as associated with generalisations about their contextual behaviour (cf., e.g., Bybee 1988; Ellis 1997). Of particular interest will be the information structure of predicative items, which, it is argued, determines phrase structure.

Hypothesis 3 relates to plurilingual organisation and aspects of plurilingual processing. It suggests that the plurilingual lexicon is an integrated system characterised by the dynamic interaction of different languages in the mind, whose relationship is flexible and variable and depends on a range of structural and psychological factors (cf., e.g., Singleton 1999; Williams/Hammarberg 1998).

All three hypotheses are expected to be traceable in productive processing in L1-L2 translation. In the light of the fact that multiple languages are thought to follow the same general organizational and procedural principles (cf., e.g., Fabbro/Paradis 1995; Perecman 1989), such data should provide information not only on
L2-specific questions, but also on general aspects of lexical organization. The data on which this thesis is based, were collected in an empirical study involving a group of 30 advanced English speaking learners of German with a similar level of L2 competence, and a group of one Norwegian-speaking and three English-speaking learners of German, Dutch, and Swedish, with varying degrees of proficiency across their second languages. The data elicitation task consisted in the composition of a story on the basis of a series of pictures in the subjects' mother tongue and a translation of the same story into their second language(s). The translation task additionally required them to provide concurrent think-aloud introspective data, which document (parts of) their linguistic processing activity, including routes taken in lexical retrieval and search and grammatical processing in phrasal construction. The data will be analysed with reference to the three hypotheses outlined above.

As has been indicated, it was expected that principles of conceptual-semantic organization would become visible in semantic processing activity. This hypothesis will be explored by scrutinising associative chains in terms of directions and routes taken in lexical search in cases of the unavailability of required target language items. Of particular interest will be the subjects' semantic search activity, which, following Zimmermann (e.g., 1994) can be indicative of the conceptual frame associated with the semantic content of the given source items.

Lexico-grammatical organisation will be investigated by analysing grammatical errors and steps taken in L2 phrasal construction. Grammatical errors will be scrutinised with a view to the insights they provide into lexical information structure. The steps taken in phrasal construction are expected to shed light on the interdependence of grammatical operations, or adaptations, and on predicative information structure.

Finally, plurilingual knowledge organization will be investigated in the light of crosslinguistic consultation and influence in L2 production. Of particular interest will be the relationship between L1 and L2 vocabulary, i.e., types of lexical connectivity and associated mechanisms of lexical access, which will be discussed with reference to Weinreich's (1953) categories of bilingual organization.

The multilingual data will be analysed with a specific focus on multilingual interaction in the form of deliberate and involuntary L3 consultation and transfer. Following the literature (cf., e.g., Möhle 1989), the activation of a third language in L2 use can be systematic, relating, for example, to psychological factors such as perceived linguistic distance, but it has also been found to involve a certain element of unpredictability. L3 interference
appears to be difficult to control and has been suggested to relate to system-inherent structural principles (cf., e.g., Meara 1999a). This part of the investigation will focus on the extent to which productive processing activity can shed light on the peculiarities of the multilingual as opposed to the bilingual mind.

**Organization of the Thesis**

The thesis is divided into two parts. Part 1 (Chapters 1, 2, and 3) approaches the issues under investigation in a theoretical perspective. Chapters 1 and 2 discuss a selection of literature relevant to lexical organisation structure. Chapter 1 scrutinises the cognitive foundations of linguistic competence, with a particular focus on lexical organization in relation to conceptual structure. Chapter 2 investigates the organisation of the mental lexicon and aspects of lexical processing in a primarily psycholinguistic perspective. Chapter 3 seeks to integrate the positions and findings of Chapter 1 and 2 into a comprehensive, explanatory model of lexical organisation.

Part 2 is concerned with the empirical investigation of the issues raised. Chapter 4 discusses a selection of methodological approaches to eliciting relevant data. Chapter 5 describes the development of the data collection, and Chapter 6 analyses the data in the light of the hypotheses and with reference to the lexical information structure model proposed in Chapter 3. The concluding chapter summarises the issues and results of the study and makes some suggestions in relation to possible future research directions.
The first part of the present study will aim to develop a comprehensive explanatory model of lexical organization, which is capable of accounting for psycholinguistic phenomena in the light of neurolinguistic reality. This objective requires an investigation of the cognitive foundations of language use, of the concerns and approaches of psycholinguistic research (which tends to be widely oriented by the categorisation principles of structural linguistic analysis), and an integration of the different perspectives. These aspects will be covered in Chapters 1-3. Chapter 1 will discuss the cognitive embedding of language, Chapter 2 will scrutinise issues of lexical organisation, and Chapter 3 will aim to develop an integrative perspective on lexical organisation. More specifically, Chapters 1-3 will elaborate on the research questions and hypotheses outlined in the Introduction.

Chapter 1 scrutinises the organization of conceptual structure and its relationship to lexico-semantic organization. In preparation for the discussion of the empirical data in Chapter 6, it will specifically focus on the organisation of emotion concepts. Examples of processing of emotion terminology will be given in Chapters 2 and 3 as part of the discussion of lexical processing.

Chapter 2 is concerned with the question of lexical information structure and the relationship of lexical and grammatical knowledge, in particular with regard to aspects of grammatical processing in phrasal construction. It will further discuss the structure of the plurilingual lexicon and aspects of plurilingual processing. Both issues are also topicalised in Chapter 3 and briefly touched upon in Chapter 1.

Chapter 3 will try to integrate the insights gained from the previous discussion in a psycholinguistic model of the mental lexicon which is oriented by cognitive linguistic plausibility rather than structural linguistic descriptiveness.
0. GENERAL

Chapter 1 will give an overview of the cognitive foundations of linguistic knowledge and language use. A basic insight into cognitive functioning is considered essential for a comprehensive understanding of language processing. A psychological perspective will ultimately have to make reference to neurolinguistic reality in order to be maximally relevant. I will begin with a brief introduction to general and language-associated cognitive organisation principles, followed by a scrutiny of the mechanisms of knowledge representation and processing. Of particular interest is here the relationship between conceptual structure and lexico-semantic organization. Hypothesis 1 suggests that these could relate to the same representational structures if they can be shown to be widely congruent. A specific focus will be on the cognitive organisation of emotions and emotion terminology, on which the later empirical study will principally focus. Finally, the status of language within the realms of cognition will be discussed.

1. ASPECTS OF COGNITION

1.1. Principles of Cognitive Organisation

The human constitution is built on holistic organisation, and so are its higher-order functions. Holism does here not imply a single, undifferentiated system, involved as a whole in all of its functions. What it means in this case is a hierarchy of more or less specialised processing systems, which are continuously integrated at higher levels to perform more general tasks (Gardener 1987: 265ff). Specialised units are usually bound to a single, continuous region, while integrative mechanisms operate across a wide area, connecting distinct, locally scattered units (cf. Hebb 1949).
The structure of an organism as a whole is reflected in the organisation of its operational centre, the brain. The brain is composed of a variety of subsystems of different nature and complexity, which perform a range of self-contained or coordinative functions associated with physical and mental activity (cf., e.g., Gazzaniga et al. 1998). Its organisation can be considered primarily modular, with so-called 'higher' functions emerging from the integration of basic ones (ibid.).

One of the brain's major realms is cognition. Cognition is defined as the ability to extract sense, order, and meaning from the information derived from the perceptual modalities (Slater 1990: 257). It is spread across various levels, comprising, on the one hand, basic, primarily unconnected processing systems and, on the other, their higher-order integrations (cf. Stein/Meredith 1993). These principles will be illustrated by different aspects of linguistic functioning throughout this chapter.

Processing within the cognitive apparatus relates to what is commonly called mind. Pinker (1997:24) defines mind as a description of what the brain does, i.e., the integration and further processing of information from sensorimotor experience into conceptual structure, giving rise to reason (Lakoff/Johnson 1999:77). These observations lead to the concept of an embodied mind (ibid.), or the notion of cognition as embodied action (Varela et al. 1991). This notion is seen as being basic for an understanding of linguistic organisation, which will be argued to avail to a considerable extent of the structures of general cognition.

The subdivision of the mind-brain into functional units is known as the modularity hypothesis. There is considerable controversy about the validity of the concept of modularity, following Fodor's (e.g., 1983, 1987, 1990) defining criteria. At the heart of the discussion lies Fodor's claim of 'informational encapsulation', an alleged separability of functions like visual perception or language comprehension from general cognition. On this view, modular processing relates to isolated systems performing operations that remain unaffected by external influence, such as general or contextual knowledge. Fodor (e.g., 1990:218f) supports his perspective for example with the argument of the processing speed and efficiency associated with reflexive behaviour.

This argumentation must be considered at best weak; Fodor's connection of reflexive behaviour and informational encapsulation is a convenient but unfounded equation. Ever since Pavlov's dog we know that reflexive behaviour can relate to automatised stimulus-response patterns grounded in complex cognitive operations which involve several domains of knowledge. The very fact that reflexive behaviour can be learnt and unlearnt upon variation of external stimuli shows that it is highly sensitive to external information. More
recent findings against Fodor's perspective involve examples from visual perception or linguistic processing. Three-dimensional perception, for instance, is today known as depending considerably on kinesthetic knowledge (cf., e.g., Eccles 1966:323; Johnson-Laird 1988a:96ff); and language processing has been shown to integrate situational information and generic knowledge (cf., e.g., Singleton 1998).

On the whole, conclusive evidence from various domains of human cognition appears to have made Fodor's position dubious. Perceptual input is today widely understood as being interpreted against the background of information gained from other modalities, and the different perceptual systems are also considered to be "radically penetrable by higher-order information" (ibid.:17). Only highly specialised functions, like primary vision (the identification of brightness and hue), can be considered examples of informational encapsulation (cf. Johnson-Laird 1988:96ff). Language processing as a highly complex function not only integrates situational and encyclopaedic knowledge; the processing of lexical meaning can be seen as happening within the very structures of perceptual and conceptual representation (cf., e.g., Damasio et al 1996; Gazzaniga et al. 1998). This hypothesis will receive focal attention later.

In order to arrive at a more differentiated understanding of complex systems, the Fodorian concept of modularity could be supplemented by the notion of domains as "set[s] of representations sustaining a specific area of knowledge", which may have modular parts to it and can be of varying complexity (Karmiloff-Smith 1992:6). Such a distinction is considered to be useful for the analysis of linguistic organisation. It facilitates a better understanding, for example, of aspects of lexical or grammatical processing, which involve a range of information structures and processing mechanisms at different cognitive levels (cf. Chapter 2).

A wider and biologically more plausible perspective on modularity emerges when it is set in relation to the processing principle of interactive activation, which refers to the forward and backward flow of information in the nervous system (cf., e.g., Aitchison 1994:206). Neurology tells us that the brain, and, indeed, the entire nervous system, is a network system consisting of neurons that are tightly interconnected via synapses and 'communicate' by means of electric impulses. Processing within and across cortical subsystems happens in the form of activation travelling along the synapses, exciting or inhibiting surrounding neurons (cf., e.g., Gazzaniga et al., 1998). It allows for the simultaneous, or parallel, processing of several information units. In relation to the question of modularity, Tanenhaus et al. (1987: 106) claim that "parallel processing systems that communicate by passing activation among hierarchically organised processing levels are not
incompatible with autonomous processing modules”, in which the latter control specific procedural operations (cf. also Dell and O’Seaghdha 1992). Interactive activation models appear to offer a conclusive account of the organisation and processing of linguistic knowledge, which integrates primarily unrelated and more or less independent cognitive functions into a system that carries out symbolic operations. The implications of this perspective will be scrutinised later. They relate to a cognitive perspective on symbolic structure as, for example, represented by Langacker (e.g., 1987, 1990). It regards linguistic symbolisation as a dynamic system consisting in the associative connection of representational structures at different cognitive levels (cf. below, section 2.3.1). In anticipation of the discussion of lexical knowledge organisation, it may be said that this entails that the so-called ‘mental lexicon’ does not resemble a ‘depot’ containing ‘boxes of knowledge material’ from which information can be extracted and moved around for usage. Instead, information and knowledge is seen as being represented in the form of locally bound neural activation patterns, and its processing as relating to energy flowing across these structures. I will briefly outline some basic aspects of cortical and neuronal functioning (adapted from Gazzaniga et al. 1998:24ff), in order to provide a picture of the playground of cognition and, more specifically, of language use.

Cognition takes place in a continuous network of neural connections, consisting of functionally specialised subdivisions, which are integrated to perform more complex operations. The nervous system is composed of billions of signalling units (neurons) and supportive cells. Neurons are the elementary units of structure and function. They consist of a cell body and axons, which end in thousands of synapses connecting to other cells. Activation happens in the form of electrical currents, which travel from the cell body down its axons up to the connected cells, where a similar outgoing process is excited. This enables a signal to continue through the system of neurons comprising a neuronal circuit, which is associated with a specific function.

Neuronal circuits are organised in highly specific interconnections between groups of neurons in subdivisions of the central nervous system. Different neuronal groups have different functional roles. These functions are often localised within discrete regions containing a few or many subdivisions, identifiable either anatomically or functionally, but usually by a combination of both. Brain areas are also interconnected to form higher-level circuits or systems that may be involved in complex behaviours such as motor control, visual perception, or cognitive processes such as memory, language, or attention.
The seat of sensorimotor activity and higher-order inferencing is the cerebral cortex. It has two broadly symmetrical hemispheres, which are complementary in function. Laterality is associated with different types of cognitive activity. The left hemisphere is traditionally associated with language processing, and the right hemisphere with more general functions. Nowadays, however, language processing is known also to involve right-hemisphere activity (cf. section 1.3.2 for a more detailed discussion). The two hemispheres are connected through a large area of neural fibres, which constantly exchange information. The cortex consists of modality-specific regions, which process isolated sensory or motor information, and of areas of higher-order function, which integrate information from the basic modalities into complex conceptualisations. Many aspects of language processing, such as coordinative operations, which will be discussed later, are associated with integrative activity of the so-called association cortex.

Since the 1980s, connectionism has tried to model cognitive processing in accordance with what is known about the neuro-physiological structures and processes underlying cognitive functioning (cf., e.g., Rummelhart et al. 1986). Psychological functioning is thus related to brain functioning. Connectionist schemes represent knowledge in the form of multi-layered networks consisting of neuron-like units, which are seen as imitating cortical architecture. Information is here represented in the form of activation patterns across a series of processing units. The excitation of these information structures relates to the processing of their respective information. It involves parallel and serial processes and a rapid spread of stimulation across the different sections of a network. Connectionist models are known as parallel distributed processing, spreading-activation, or interactive activation models, and have been applied to various cognitive functions, including several aspects of language processing. The present thesis will avail of the connectionist paradigm and model the representational structure of lexical knowledge in the form of network systems consisting of neuron-like units. Of course, such models involve a certain degree of abstraction from cognitive reality. Yet, they appear to be relatively faithful to the general principles of cognitive organization, and allow for a vivid illustration of lexical processing. These considerations will be discussed in more detail later.

Following this general overview of cognitive functioning, I will now take a more specific look at the status of language in the cognitive system.
1.2. The Language Faculty

1.2.1. A 'Language Module'?

Human language is perhaps nature's highest achievement in terms of knowledge organisation and communication. Referred to as the *language faculty* (Saussure 1972), there have been diverse speculations about its cognitive status. Based on acquisitional arguments supportive of its own developmental 'programme', the Chomskyan tradition views it as an independent 'mental organ' in the sense of an innate aptitude, which is developed into "a system of habits, dispositions and abilities" in the course of a human life (Chomsky 1990:638).

This is not the place to discuss the question of innateness, which is not primarily relevant for the present study, in much detail. More important is the modularity debate, which was already touched upon in the previous section. For similar reasons that Fodor's (e.g., 1983, 1987, 1990) modularity hypothesis was rejected (cf. above), Chomsky's delineation, which includes a separateness of the language system from general cognition, must be considered implausible. Recent neurolinguistic research offers convincing evidence for the position that language use consists in the integration and specific harnessing of the structures of general cognition, perhaps also including a few language-specific functional mechanisms (cf., e.g., Damasio et al. 1996; Gazzaniga et al. 1998). It is seen as relating to sensory, motor, and conceptual processing, mediated by the activity of certain intermediate units (ibid.). Such units could be interpreted as operational mechanisms coordinating the flow of activation at different levels of representation (cf. discussion in section 1.2.2). These latter functions might or might not relate to a set of innate parameters, which are flexible with regard to their values for specific languages. Parameter-setting theories (cf., e.g., Hyams 1986) suggest that such parameters provide a framework of possibilities, which is specified for the peculiarities of a language in the course of its acquisition. They are thought to be responsible for certain universal principles of grammatical organisation. In this view, the language faculty could be seen as a specific ability relating to certain inborn operational mechanisms which coordinate general cognitive functions in a specific way. Such a perspective, psycholinguistically plausible as it may be in the light of linguistic universals and acquisitional developments, must be considered highly speculative, as long as there is no supportive neurolinguistic evidence for it. After
all, it is conceivable that the mechanisms coordinating language use will turn out also to perform other cognitive operations.

Pinker (1997) offers a functional definition of specialised cognitive mechanisms, such as the language processing system, which he calls mental modules. He claims that

"the mind ... is not a single organ, but a system of organs which we can think of as psychological faculties or mental modules. ... [It] has to be built out of specialised parts because it has to solve specialised problems. ... The circuitry underlying a psychological module might be distributed across the brain in a spatially haphazard manner. And mental modules need not be tightly sealed off from one another communicating only through a few narrow pipelines. Modules are defined by the special things they do with the information available to them, not necessarily by the kinds of information they have available". (ibid.:30)

If the notion of modularity were to be retained in connection with linguistic ability, Pinker's definition would appear to be the most suitable, as it avoids Fodor's neuro-physiologically untenable constraints. However, since the term 'language module' is encumbered by a Fodorian connotation, it seems wise to avoid the terminological debate and stay with the expression language faculty, which was coined by Saussure as "the general faculty of constructing a language" (1972:10).

So what exactly are the cognitive foundations of language use? The following section will approach this question.

1.2.2. Cognitive Foundations of Linguistic Organisation

It is a commonplace that language processing involves several component processes at different cognitive levels, associated with particular aspects of linguistic knowledge, and a complex interaction between them (cf., e.g., Barsalou 1992a; Bierwisch 1983; Carroll 1999; Gazzaniga et al. 1998). Neurolinguistic studies have linked many of these processes to specific neural activity in the brain, which has led to conclusions about the location of certain representational structures and operational units.
The left cerebral hemisphere is traditionally seen as being predominantly responsible for language processing. Highly specialised neural circuitries, including regions like Broca's and Wernicke's area (cf. below), have here been singled out as being involved in specific linguistic tasks or types of knowledge representation (cf., e.g., Carroll 1999; Gazzaniga 1998; McCarthy/Warrington 1990). The right hemisphere, has more recently been shown to be involved in linguistic activity, as well, and, indeed, in performing relatively complex tasks. Pragmatic aspects of language and resolving lexical ambiguity, for example, appear to be the domain of the right hemisphere (ibid.).

Cortical regions with a prominent role in language processing are, for example, Broca's and Wernicke's area. They were first discovered about a century ago in the wake of aphasia studies, which established that different types of linguistic impairment can be related to damage of representational or operational structures, or of the connections between them (cf. McCarthy/Warrington 1990:13). These latter insights go back to Wernicke (e.g., 1874) and Lichtheim (e.g., 1885), who were also the first to distinguish different types of knowledge representation (which they called 'images'), for different aspects of linguistic knowledge (Gazzaniga et al. 1998:306). They posited a triangular relationship between conceptual, auditory and motor knowledge (for articulation) of words. These aspects are today still regarded as the basic dimensions of lexical knowledge (cf. Chapter 2 and 3). Contemporary studies additionally emphasise the distinction between spoken and written language and their associated representational structures (e.g., Caramazza 1997; Miller 1996; Rapp/Caramazza 1995).

The complexity of linguistic organisation was extensively investigated by Weigl (cf., e.g., Weigl et al. 1981), who, in over 50 years of language disorder studies, collected a rich corpus of psycholinguistic evidence for the close interaction and interdependence of the various functional domains of language processing. Weigl demonstrated that information storage and processing are in principle two separable things: many cases of selective impairment of various functions were shown to be problems of access to the information in demand rather than being caused by defective representational structures. Weigl developed a method of experimentally rehabilitating seemingly lost performance in aphasics by reactivating, or 'deblocking' disturbed linguistic pathways. His method

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1 Their concrete functions, however, which have long been associated with sensory memory for words (Wernicke's area), and motor memory for words as well as grammatical processing (Broca's area), has more recently been questioned. For a detailed discussion cf. Gazzaniga et al. 1998:305 and 314.
"is based ... upon the successive linking of certain performances of intact functions with the corresponding performances of disturbed functions ... a deblocking effect is produced when the access to a certain performance, which is blocked on one or more channels, is made available through one or more intact channels." (Weigl 1981:285)

In concrete terms, an impairment of word finding, for instance, can be (temporarily) overcome by prestimulating the required structure, for example by a word comprehension task (ibid.). Weigl's findings allowed him to reconstruct a complex system of linguistic structures and functions and reveal their interrelatedness.

Of particular interest for the present study are questions of lexical processing, in particular lexical retrieval, and the cognitive structures and operational mechanisms it involves. In connection with lexical retrieval, the relationship of general conceptual and lexico-semantic knowledge and the process of mapping meaning and form of lexical items is interesting. Further relevant are principles of grammatical organisation, although little appears to be known about their cognitive foundations.

Recent neurolinguistic studies have been able to specify regions of conceptual-semantic knowledge representation. Neuronal circuits engaged in processing perceptual and/or functional knowledge associated with the nature of certain concepts, have been linked to related word-semantic processing tasks. Evidence comes from so-called Position Emission Tomography (PET) scans, which measure metabolic activity in the brain as an indication of neuronal activity. Naming experiments relating tools and animals, for example, show a dominant activation of premotor areas associated with hand movements relating to the use of tools, in contrast to a dominant activation of visual areas associated with the visual identification of animals (Gazzaniga et al. 1998:292). This suggests that semantic knowledge, at least of concrete words, is fundamentally grounded in the sensorimotor qualities associated with corresponding reference objects, i.e., it appears to be embedded in the representational structures of general conceptual knowledge.

Further insights into the representational structure of lexico-semantic knowledge come from model-theoretic approaches to identifying the cognitive mechanisms involved in lexical processing. Artificial neural models representing perceptual or motor knowledge have been shown to be capable of performing both conceptual and linguistic operations. Regier (1996) developed a model for learning spatial-relations terms, which demonstrates that neural structures serving perceptual functions are also capable of performing associated
conceptual functions. An example of this would be the computation of orientational aspects of spatial concepts which rely on bodily orientation, for instance relating to prepositions like *above* or *behind*. Bailey (1997) and Narayanan (1997a,b) demonstrated that neural circuitries responsible for motor control are similarly capable of conceptual work ranging from the semantic representation of verbs of hand motion and the characterisation of the conceptual structure of linguistic aspect to metaphoric projections allowing for abstract inferences about international economics (cited in Lakoff/Johnson 1999). Although, as Lakoff and Johnson point out (ibid.:42), these findings cannot be taken as evidence that the neural circuitry of the human brain does actually carry out both kinds of tasks, they nevertheless support the plausibility of the neurolinguistic hypothesis of a fundamental involvement of the basic sensorimotor centres in higher-level operations, such as lexico-semantic representation.

Damasio and her colleagues (1996) carried out an elaborate neurophysiological (PET) investigation of the neuronal basis of lexical access. They recruited neurological patients with brain lesions and a control group of healthy individuals, who participated in a series of naming experiments involving human faces, animals and tools. The results of the study support the above-cited perspective that semantic knowledge is associated with the sensorimotor aspects inherent in the conceptual description of the respective objects (ibid.:504). Their findings, however, go beyond this insight. Damasio and her colleagues were able to single out regions in higher-order association corticies which could "play an intermediary or mediational role in lexical retrieval" (ibid.:503). These microcircuits are located in the proximity of sectors processing multiple sensorimotor signals associated with certain kinds of conceptual knowledge (ibid.:504). Nevertheless, they are not thought of as constituent structures of conceptual representation, but are instead regarded as processing units, specifically recruited in the course of language acquisition (ibid.). Damasio et al. (ibid.) suggest that they do not correspond to "rigid 'modules' or hardwired 'centres', because we see their structure and operation as being acquired and modified by learning". They see this interpretation supported by the fact that there are individual differences in the location of these units within certain key regions (ibid.:505). The specification of these key regions, on the other hand, could be interpreted as indicating a predisposition for developing the function in question, i.e., for establishing an operational system that connects conceptual structures with primarily unrelated perceptual (lexical-formal) structures and controls their interaction.
Insights of a similar kind come from Paradis (e.g., 1997). Based on aphasia studies in which neurological patients exhibit a complete loss of language in the presence of well-controlled conceptual processing, he proposes two distinct levels of representation for conceptual and lexico-semantic knowledge. Semantic knowledge is here equated with the information that relates conceptual representations and lexical forms, which is in line with Damasio et al.'s (1996) hypothesis that the processing of conceptual and formal word knowledge is mediated by specific intermediate meaning-related units. A difficulty encountered in Paradis' model relates to his use of terminology. In a cognitive linguistic perspective, 'semantic knowledge' is associated with lexical meaning in the sense of conceptual content (e.g., Jackendoff 1983; Langacker 1987, 1997), while here 'semantic representation' refers to more abstract information in the sense of semantic constraints needed to relate conceptual content and lexical form. This is seen as harbouring the danger of inferring that the conceptual content associated with lexical forms is distinct from general conceptual representation. In the present thesis, 'semantic' or 'lexico-semantic' will be used in a cognitive linguistic understanding, in the sense of conceptual structures associated with a lexical form. Following Damasio et al.'s (1996) perspective, intermediate meaning-related information units will be regarded as mediatory processing mechanisms which coordinate the activation of conceptual and formal representational structures.

Further electrophysiological experiments have been able to link semantic and syntactic processing to distinct cortical structures on the basis of "clearly defined electrical activity" generated in those regions (Gazzaniga et al. 1998:320). Other than that, little seems to be known about the 'hard facts' of grammatical operations. However, these findings could tentatively be interpreted as indicating that the processes in question are operated by specific procedural mechanisms, similar to the way mediatory units are involved in lexical retrieval. It thus appears that the activation of the representational structures of lexical knowledge involves the activity of specific 'linking' units, perhaps in the sense of 'switchboard's, which set their information in relation to each other and coordinate the flow of energy in the system. Owing to their activity, lexical elements would be activated in the right sequence in language production, and lexical sequences are conceptually decoded in comprehension.

As suggested earlier, the localisation of function could be considered an indication of a predisposed mechanism for mapping conceptual structure with lexical expressions. Such a perspective would be close to the Chomskyan position in the sense of assuming that grammatical organisation could relate to some sort of
innate propensity which provides an operational framework for verbalising conceptual knowledge. As opposed to Chomsky’s understanding, however, it is not seen as implying that syntax is the fundamental scaffolding of language use, or even an independent structural system. It might, on the contrary, suggest that grammatical knowledge should be regarded as inherent in lexical knowledge, relating to information about the contextual behaviour of lexical items in the sense of distributional properties emerging from their communicative use (cf., e.g., Ellis 1997). Grammatical competence would then be seen as the ability to arrive at generalisations about the contextual behaviour of lexical items and to apply these generalisations in language use. On this view, procedural operations relate immediately to the information derived from the lexical items selected for production or received in comprehension. These operations would involve the coordinative activity of specific mediatory units which map conceptual and formal information. This apprehension assigns the major part of linguistic knowledge to lexical information structure. It sustains the notion that the lexicon should be regarded as the central dimension of linguistic knowledge, a position favoured in recent lexicological research (cf., e.g., Singleton 1999), which will be scrutinised from a psycholinguistic point of view in Chapter 2.

Aspects of Plurilingual Organisation

In relation to plurilingual cortical organisation, “it has proven difficult to determine conclusively whether different languages share the same neural substrate” (Klein et al. 1995:31). Selective impairment of different languages suggests at least a partial independence of the subsystems of two languages, while language mixing hints at interconnectivity. The general tenor of the debate appears to be that, on the whole, multiple languages follow the same organisation principles. It appears to be a question of proficiency and degree of automation, whether the use of different languages relates to a predominant activity of different cortical areas in L2 processing (Cook 1992; Klein et al. 1995). Recent neurolinguistic research suggests that additional activity measured in wide areas of the brain during L2 as opposed to L1 processing, may hint at a higher degree of attention and reflective processing involved in the use of a lesser or non-automatised system (McCrone 1999). This explanation appears to be more plausible than assuming that multiple languages should each avail of their own specific neural substrate. The latter assumption may apply for certain language-
specific information units, such as an explicit knowledge of (L2) grammatical rules. With regard to the representational substance of lexical knowledge (i.e., conceptual-semantic and formal word knowledge), however, its suggested embedding in general cognitive structure entails that multiple languages are necessarily stored in the same cortical regions. This argument will be discussed in more detail later.

In summary of the discussion of the cognitive foundations of linguistic organisation, we can conclude that language can be described as a holistic cognitive function, which is spread across several cortical regions and relies on the joint operation of both cerebral hemispheres. Basic formal and conceptual-semantic lexical knowledge appears to be fundamentally shaped by the sensorimotor system. Lexical and grammatical processing seems to involve the activity of specific coordinative mechanisms, which initiate and control linguistic operations, presumably on the basis of information about the combinatorial potential of lexical items, which relates to their distributional properties (cf. further discussion in Chapter 2). Multiple languages are seen as being commonly embedded in general cognitive structure, and subserved by the same organisational principles. The processing of non-native languages, however, can involve additional cognitive activity for attention and reflective processing and explicit metalinguistic knowledge. A question that seems to suggest itself it here is how an individual can actually manage to process different languages relatively independently. This question will be addressed later.

2. KNOWLEDGE ORGANISATION

2.1 Memory

Memory is a general label for different forms of acquisition, retention, and utilisation of information, skills, and knowledge (Tulving 1990:222). This range of functions is reflected in the number of approaches to classifying memory. The following classification is an attempt to structure the different aspects of memory and knowledge representation in a way relevant to language use.
A fundamental differentiation between types of knowledge and memory relates to the distinction between knowing that and knowing how. "Knowing that is commonly called declarative knowledge, knowing how procedural knowledge" (Dechert 1984:215). Declarative knowledge as abstracted knowledge of facts is associated with substantive memory, while procedural knowledge, relating to skills and procedures, is associated with operational memory (ibid.). Linguistic knowledge involves both declarative, or substantive, and procedural, or operational aspects: the knowledge of form and meaning of lexical items on the one hand, and the ability to combine them into larger stretches of language on the other. A related approach to classifying memory is associated with the notions of explicit and implicit memory. Explicit memory is associated with consciously accessible knowledge, i.e., declarative knowledge, while implicit memory is associated with non-conscious effects of previous experience on behaviour (cf., e.g., Gazzaniga et al. 1998:256-7; Schacter 1993:387). Implicit knowledge is often mentioned in connection with the automatic performance of practical skills, and it is also associated with cognitive mechanisms, such as linguistic processing. Automatic processing, however, does not necessarily relate to inherently operational knowledge. It can be based on declarative knowledge, the application of which gives rise to procedural operations, which can become automatised (cf. Parkin 1990:39). An example of this development relates to mediated L2 learning, which involves a declarative stage, in which words and grammatical rules are explicitly learned, and a procedural stage, in which the knowledge of rules is transformed into the ability to construct sentences. In other words, "proceduralisation converts abstract knowledge into practical skill" (Dechert 1984:216).

Long term memory refers to information retained from the psychological past, while short term memory is concerned with the psychological present (Eysenck 1990:215).

Long term memory, as the name suggests, refers to relatively durable knowledge, which can be either explicit or implicit. Implicit long-term memory relates to a lasting command of cognitive or practical skills. Explicit long
term memory is often divided into semantic and episodic memory (e.g., Tulving 1990: 222-3). Following this classification, semantic\(^2\) memory relates to substantive knowledge and is concerned with encyclopaedic (or generic) information, also referred to as 'knowledge-of-the-world', which consists of "weighted averages of past experience" (Baddeley 1993:18). Episodic memory refers to the retention of specific episodes or events from the personal past, involving both substantive and procedural knowledge. Baddeley considers semantic and episodic knowledge retrieval to be two aspects of the same system, in which more general cues activate generic knowledge while highly specific cues trigger the recollection of a specific episode, involving "a process analogous in some way to re-experiencing the event" (ibid.). Retrieval from semantic memory then relates to the activation of static representational structures, while recalling an episode can be described as a dynamic operation which involves the sequential (re-)activation of a series of events, within the representational structures of semantic memory. In the context of language use, episodic memory relates, for example, to formulaic sequences.

Short term memory is used to refer to currently processed information, derived from both situational input and knowledge retrieved from long-term memory. It is further broken down into sensory and working memory. Sensory memory refers to the brief (up to one second long) initial representation of incoming sensory information, from which only a fraction is retained for further processing (Barsalou 1992a:94f). This further processing is associated with the activities of working memory, which, in connection with performing a complex task, such as problem-solving, can integrate several information components from different input modalities (cf., e.g., Baddeley 1986, 1993, 1995). Working memory operates on the basis of situational input, against the background of retrieved, i.e., activated long term knowledge (Barsalou 1992a:112f). An example from linguistic processing that springs to mind would be language comprehension, where information (lexical meaning, a communicative intention) is extracted from a perceived sequence of sounds or letters on the basis of memorised lexical knowledge.

\(^2\) It should be noted that semantic knowledge in this context is not restricted to the notion of lexico-semantic as opposed to lexical-formal knowledge. It refers more generally to any kind of representational substance, including, for example, that of lexical forms.
2.1.3 Physiological Aspects of Memory

The distinction between different types of memory and processing may appear to suggest that they involve separate storage spaces, that similar types of information can be represented in different corners of the brain, and that knowledge processing involves the ‘transportation’ of information units from one place to another. Such a view is, of course, untenable. The brain does not consist of separate storage and processing spaces; instead, the processing of information happens within the representational structures of a specific type of knowledge (cf. above). Information is represented in the form of neural activation patterns, and its processing relates to the activation of those representational structures. As was argued above, cognitive processing is also thought to involve the activity of certain coordinative units, which operate the activation of the representational structures.

Memorisation, i.e., the storing of information, is associated with strengthened synaptic connections within the neural network (cf., e.g., Barsalou 1992a; Gazzaniga et al. 1998; Eccles 1989). The long duration of synaptic strengthening, which is thought to follow upon intense and/or repeated stimulation, is known as 'long-term potential', and is regarded as the neural basis of memory (e.g., Eccles 1989:150). Following this understanding, long term memory could be described as a persistent but, unless activated, dormant structural system, while short term memory consists in reverberating circuits of electrical activity, which gradually fade away unless they are reactivated (cf., e.g., Barsalou 1992a:112ff). The retrieval of information from long term memory relates to the activation of neural patterns within the substrate of memorised knowledge (ibid.:102).

New, i.e., unfamiliar incoming information, on the other hand, would activate non-memorised neural structures. The unreflected application of knowledge structures relates to automatised behavioural patterns, or reflexes. In the linguistic domain, automatic processing is particularly obvious in formulaic language use. In sum, different types of memory are seen as relating to the same cellular basis for one and the same conceptual content, but involving different processing mechanisms and different synaptic conditions.

Irrelevant to the present discussion but highly interesting and of far-reaching implications is the question of whether memories are indeed physical traces stored within the brain, or whether they are entities of a different nature, which are only retrieved in an interaction of mind and brain, with the cortical structures providing the basis for their reactivation. For a further discussion of this question cf., e.g., Sheldrake 1984.
Following this outline of memory organisation as associated with different aspects of linguistic knowledge representation and processing, I will now scrutinise the cognitive structures of lexical, in particular semantic knowledge representation.

2.2. Knowledge Representation in Memory

2.2.1 The Nature and Role of Representation

In very general terms, a re-presentation stands as an equivalent of something else, on the basis of either similarity or convention. Palmer (1978: 270ff) distinguishes between extrinsic representations, which bear no resemblance to their reference objects, and intrinsic representations, which resemble them. Following Gärdenfors (1996:24), most cognitive operations are based on intrinsic representation, while a symbolic system like language avails of extrinsic representation. This position needs to be modified in the light of the nature of symbolic structure. Symbolic systems - like language - comprise two different levels of representation, a conceptual-semantic one which would be considered intrinsic, and an extrinsic, lexical-formal one. The latter relates to a relatively straightforward, arbitrary assignment of a representational sign to a conceptual content. This dimension and the nature of symbolic structure in general will be discussed in more detail later. I will here focus on the principles of substantive or conceptual knowledge representation, as relevant for lexical semantics.

It was suggested that intrinsic knowledge resembles its reference object. This statement, however, is not meant to imply that the brain constructs picture-like images of the world, an inner reproduction of external reality. The representation of conceptual knowledge necessarily involves a certain degree of alienation, or abstraction, since it avails of a medium of representation, which has properties of its own to which the original information is being adapted (Bickerton 1990:19). The representational system of cognitive operations is the nervous system, where information is captured in the form of neural activation patterns, by way of "establishing systematic correspondences between subsets of its structure and subsets of structure in the physical environment" (Barsalou 1992a:55). Cognitive representation operates at different levels of
abstraction, each of which selects from and adds to the properties of the original. Even the most immediate sensory perception must be seen as an interpretative process shaped by the propensities of the sensory organs (cf. Bickerton 1990:16ff). The percepts derived from sensory input are projected onto higher cortical areas, which can be envisaged as maps with distinct regions representing the different senses. At different levels they are integrated into increasingly complex and increasingly abstract concepts, leading to a multi-faceted picture of an entity or situation (cf. Stein/Meridith 1993:83). Such representations are the realms of cognition: They create an *inner environment* (cf. Dennet 1978), or, in Eccles (1966:332) words, a "private perceptual world", which we tend to regard as a manifestation of the external world when our experiences are shared by other observers. Representation in memory, then, is our way of knowing the world and both the basis for communication and a result of it.

The following example may serve to illustrate the above explanations (for a similar analysis cf. Multhaup 1995: 227f).

The cognitive representation of horses

Picture a horse standing in a field. How do we identify the perceived object? The sensory organs transform received stimuli into neuroelectrical impulses and project them onto specific associated cortical areas. The organism isolates different kinds of information in that it receives and represents them separately: we can perceive the horse visually, acoustically, olfactorily, haptically, and - less likely - gustatorily. Each of these modalities transfers information potentially relevant to the identification of a horse. By coordinating these impressions, we arrive at a complex image of the perceived object.

How do we know the object is a horse? This, we can only decide when we already have a (systematic) knowledge of the qualities, or attributes, of horses. The brain compares the incoming activation pattern to a memorised one and identifies it on the basis of similarity. In the light of the above explanations about memory organisation, this means that if the present activation pattern sufficiently overlaps with or is embedded in a

\footnote{For a detailed discussion of conceptual structure, its neural foundations and conceptual operations cf. the following section.}
memorised one, the perceived object will be categorised as something familiar, in this case as a horse. It is only by virtue of language, though, that we classify it as a 'horse'.

Modelling knowledge organisation

How can the principles of cognitive representation be illustrated? Cognitive representation and information processing has been modelled in two ways: by means of symbolic systems and within a connectionist paradigm (Eysenck/Keane 1995:203ff).

In systems built on symbol manipulation, representation takes the form of images or propositions. These are seen as being processed serially, controlled by a set of abstract, detached rules. This symbolic approach, which has also been applied to language use, has been criticised for two major deficits: The nature of the posited symbolic representations has not been described satisfactorily, and the suggested operations are often judged as being too complicated (ibid.) Furthermore, the question of the neuro-cognitive structure of their alleged controlling rules has not been given much attention.

Connectionist models, which have become increasingly popular since Rummelhart et al.'s (1986) seminal publication Parallel Distributed Processing, appear to be more promising in all three respects. As outlined above, they represent information in the form of networks of neuron-like units which are seen as resembling cortical structure. The different knowledge components of a given conceptual content are here distributed across a number of distinct, shunt circuitries, and become integrated through simultaneous activation. Information processing is seen as relating to activation spreading in the system. This array allows for the perspective of coordinative mechanisms controlling the spread of activation in the network – which, however, is also assigned to controlling rules by certain models of language processing (e.g. processing models associated with Levelt's (1989) Speaking model). These conflicting positions will receive further attention in Chapter 2.

Connectionist models are here considered also to be suitable to account for processing within symbolic systems. This requires a modification of the perspective on symbolic structure. If symbols are not regarded as demarcated information units, but as representational structures across two distinct cognitive levels (cf.
section 2.3.1), their processing can be described with reference to the coordinated activation of these structures.

In order to describe processing within the lexical system, the nature of its representational structures needs to be scrutinised. I will begin with a discussion of the organisation of conceptual knowledge.

2.2.2 Categories and Concepts

In section 2.1.2. mention was made of the notion that long term memory is divided up into structured encyclopaedic knowledge and memorised episodes, while working memory builds on situational knowledge, derived from incoming perceptual information and retrieved generic knowledge. How do the different systems interact, and how do they relate to linguistic knowledge representation and processing? In order to address these questions, we first need to investigate how the mind structures conceptual knowledge.

A widely accepted concept is that of categories as classification units of encyclopaedic knowledge (cf., e.g., Barsalou 1989, 1992a, b, 1993; Harnad 1987; Lakoff 1987; Lakoff/Johnson 1999; Mervis/Rosch 1981; Rosch 1978). Notions of categorisation come in different flavours, for example, as exemplar models (e.g., Brooks 1978; Jacoby/Brooks 1984), or prototype models (e.g., Rosch 1978), as well as more comprehensive models, which integrate different approaches (e.g., Barsalou 1992a; Lakoff 1987; Lakoff/Johnson 1999).

Categorisation is closely related to the notion of conceptualisation², which has likewise been approached from different angles. I will here outline one possible understanding of categorisation theory, based on Barsalou's specific definition of the relationship between categories and concepts (e.g., Barsalou 1989, 1992a, b, 1993).

Categories, also referred to as conceptual fields (Barsalou 1992a:61ff), provide a framework of structured knowledge, preserving experience and making it useful for future situations. They reduce the diversity of the perceived world by treating certain entities as equivalent on the basis of family resemblance (cf., e.g., Wittgenstein 1958; Rosch/Mervis 1975). They collect and structure all known aspects of an object, by

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² Conceptualisation is a term widely used for various different cognitive activities in connection with memory and knowledge processing. I will here use it to refer to the processes involved in categorisation and concept development, as defined in this section.

³ I will use the term ‘object’ in stylistic variation of ‘entity’, with both terms generically referring to concrete and abstract things alike.
establishing a set of intersecting dimensions of definition and creating a conceptual space within which all known and conceivable exemplars of the object can be placed. A category is shaped by a so-called conceptual frame, which provides a scaffolding of attributes associated with a given entity and the relations that hold between them (Minsky 1975). It can be seen as an abstract representation of the entirety of the qualities associated with this entity, which is often represented in a person's mind by a prototypical or idealised exemplar (cf., e.g., Barsalou 1992a,b; Rosch 1978; Mervis/Rosch 1981; Lakoff 1987; Lakoff/Johnson 1999).

While frames capture static events, "the dynamic, changing character of events over space and time" demands more sophisticated representations, which can be found in scripts, schemata, or mental models (Barsalou 1992a:164). These follow the same structural principles as frames, but their relations are more complex. An example of more complex conceptual events will be discussed in section 2.2.4. I will here concentrate on conceptual frames as shaping our categorial knowledge of real-world objects.

Traditionally, the properties of objects have been presented in the form of feature lists, whose major disadvantage is that they fail to represent conceptual relations between features (Barsalou 1993:37). Frames, on the other hand, are composed of interrelated attribute-value sets, "variables into which go the specific input values of a given instance" (Johnson-Laird 1988b:107), or 'default values' if there are no specific input values in a given situation (Collins/Smith 1990:67). They thus provide the flexibility to accommodate a family of similar items within a stable framework of defining dimensions. Lakoff and Johnson employ the concept of 'categories as containers' with fuzzy boundaries and graded structures, allowing for different degrees of membership (e.g., Lakoff/Johnson 1999:20). Graded structure and graded membership refers to the idea of 'typicality' or 'goodness of exemplar' (Barsalou 1992a:31ff). It means that not all objects belonging to the same category represent this category equally well. Categories are often centred around prototypes, which display "the set of the most frequent values across categories" (Barsalou, 1992b:47), usually averaged property specifications. Category membership depends on sufficient similarity to a central member and its associated qualities, as well as on sufficient distinction from members of a contrast category (cf., e.g., Mervis/Rosch 1981). Typicality fades towards the periphery, which leads to "vague boundaries and fuzzy edges" (Lakoff 1972:183). Examples of fuzzy membership and merging conceptual fields would be whales, often considered fish, or corals thought of as plants.
Categories are primarily based on *perceived world structure*, i.e. assimilated information shaped by the constraints of the species-specific sensorimotor system (Lakoff/Johnson 1999:19; Rosch 1978:29). They are, however, also shaped by society, with conceptualisation depending on "the category system already existent in the culture at a given time" (Rosch 1987:29; cf. also Barsalou 1989). Categorisation is a necessary requirement for communication, and is in turn influenced by language use. The central role of language in categorisation will be discussed later.

"A person's representation of a category in a particular occasion" is what Barsalou (1993:29) refers to as a *concept*, "a temporary construction in working memory, derived from a larger body of knowledge in long term memory". On this account, concepts can be defined as situational instantiations of a category, whose variability reflects the flexibility of the underlying conceptual frame. Barsalou (1989:93) points out that a person possesses a tremendous amount of loosely organised knowledge for a category in long term memory, of which

"only a very small subset is ever active on a given occasion. ... Although certain core information may occur in most subsets for a category, much of the information in a subset is either context-dependent or reflects recent experience".

Additionally, memorised episodes can contribute significantly to an individual's categorial knowledge of an entity.

In summary, categories as shaped by conceptual frames can be said to "capture constancy and variability across exemplars and time" (Barsalou 1992:67), and, we may add, across individuals and within individuals across time. An example may serve to illustrate the above explanations.

**Conceptualising horses**

I will use as an example our knowledge of horses, i.e., the defining criteria that classify a perceived object as a horse. Horses are real-life physical objects, primarily identified on the basis of their physical appearance.

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7 Note that the term *concept* is only used in this specific understanding in the context of categorial knowledge and conceptualisation. Elsewhere it is used in a wider, more commonly used sense, i.e., referring to conceptual entities in general.
This includes, most prominently, anatomy, size, and colour. Horses are also associated with typical behavioural patterns relating, for example, to locomotion, feeding, or propagation. Physical appearance and behaviour are the basic attributes, whose value-specifications determine whether or not an entity is classified as a horse. They establish a definitional frame and allow for a certain degree of variation among exemplars by virtue of flexible value-specifications (e.g., horses can have different colours, vary in size, or move in different fashions).

Talking about horses, we may highlight further aspects, such as race, age, or sex. These are secondary attributes, which relate to specific correlations between certain basic qualities (sex, for example, relates to physiological properties and associated functional and behavioural qualities). At this level of description, basic qualifying criteria are considered in a new light and given particular prominence.

A third level of interpretation sets horses and their qualities in relation to man's own need and ends. Defining horses for utility involves a re-interpretation of both primary and secondary attributes, creating non-natural categories (e.g., riding horse, trotter, hunter).

Figure 1.1 may serve to elucidate the above explanations. It displays the three levels of interpretation, including a selection of basic values, and the relations that hold between them. It illustrates the hierarchy among the different qualities associated with horses and their interrelation, and at the same time establishes our conceptual understanding of horses as a self-contained framework of knowledge, which accommodates a wide range of category members and excludes non-members.

Figure 1.1 Conceptual frame of the category HORSE
In sum, a delineation of categorial knowledge with reference to conceptual frames has two major advantages: it allows for an integration of different levels of description, and it is suitable to elucidate the complex relations that hold between different object properties. I will later avail of this format to illustrate the multidimensionality of lexical information structure.

2.2.3 Conceptual Structure and Lexico-Semantic Fields

Lexico-semantic fields follow similar organisation principles to conceptual structure. A general term, horse, represents the entire category, accommodating all conceivable exemplars of horses. It is supplemented by lexicalisations of certain prominent subcategories, which highlight specific attributes or values at different levels of interpretation. At the basic level, distinctions are made, for example, between horses of different colours and sizes (e.g., piebald, pony). At the secondary level, types of horses are singled out with reference to their race, age, and sex (e.g., mustang, foal, mare). The focus on functionality at the tertiary level highlights either behavioural qualities (e.g., trotter), or primarily 'unhorsy' aspects (e.g., 'hunter'), which represent a perspective with man rather than horse in the centre. As displayed in figure 1.2, different lexico-semantic levels offer a hierarchy of descriptive viewpoints similar to the conceptual array.

![Figure 1.2 Members of the category HORSE](image-url)
An important difference between the conceptual category and the associated lexico-semantic field is that only a fraction of conceivable concepts is lexicalised (cf. Barsalou 1992b:63; Bierwisch 1983:64). Why are lexical fields fragmentary? The principle of cognitive economy demands that only important distinctions are specifically marked (cf., e.g., Rosch 1978; Werner 1989, 1991). Where certain values are not considered noteworthy, they are consequently not labelled. Different languages may foreground different peculiarities. English, for example, has lexicalised the distinction between male and female foals (colt - filly), while German has not.

The semantic field associated with the category HORSE is, of course, not restricted to names for types of horses. It also contains lexicalisations of the various values and value-specifications of 'horsy' properties and other things associated with horses, a selection of which is displayed in figure 1.3. It becomes obvious that the core item of a semantic network gathers together words from distant lexical fields under a single heading, in a similar way to the way in which a conceptual category combines primarily unrelated perceptual and conceptual domains. These items are thus not just 'somehow related', but depict constituent aspects of our conceptual knowledge of HORSE.

![Diagram of semantic field associated with the category HORSE](image)

Figure 1.3 Semantic field associated with the category HORSE

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8 For the sake of lucidity, I will formally distinguish conceptual entities, lexical forms, lexical items (words as unified entities), and real-life objects in the following way: Concepts will be capitalised, lexical forms will be printed in bold script, lexical items in italic script, and reference objects in normal font.
The discussion shows that there is a high degree of correspondence between general conceptual and lexico-semantic structure (word meaning). Their parallel configuration suggests that they not only reflect each other, but that, indeed, semantic knowledge can be equated with, or rather, regarded as embedded in conceptual knowledge (cf. Jackendoff 1983, 1988, 1990). This perspective is supported by the earlier-cited neurolinguistic findings concerning the connection between sensorimotor and lexico-semantic processing. On this account, it is obvious that sensorimotor knowledge as the foundation of certain aspects of conceptual knowledge should also be the basis of certain aspects of lexico-semantic representation. If word meaning can be explained with reference to conceptual knowledge, a study of lexico-semantic organisation, for example by investigating lexical (semantic) associations, should vice versa be able to shed light on conceptual structure. This perspective relates to Hypothesis 1 and will be tested in Chapter 6, by scrutinising the processing of emotion terms and other semantic items.

To round off the discussion of the cognitive foundations of linguistic knowledge, a final word may be spared for the structure of lexical forms.

2.2.4 Lexical-Formal Structure

The knowledge of word forms appears to be a relatively straightforward issue. It is taken to be represented in the form of auditory and visual memory traces and associated motor activation patterns for spoken and written production (cf., e.g., Barsalou 1993; Carramazza 1997; Langacker 1987). On closer scrutiny, this organisational structure, which may at first sight look comparably simple, turns out to be relatively complex, indeed, owing to its procedural dimension. As opposed to semantic knowledge, which was said to involve the parallel connection of several representational structures associated with a conceptual content, lexical-formal knowledge consists in sounds or letters connected in series. Strings of formal units stored and retrieved whole are known as formulaic sequences (cf., e.g., Perkins/Wray 2000; Wray 1999). They relate to lexical expressions of varying complexity, ranging from morphemes to multiword expressions associated with a distinct conceptual content (ibid.). The internal structure of formulaic sequences is not an issue of the present
study. For the sake of transparency and with the justification that they are processed whole, they will be treated as formal units. This simplification renders it possible to represent lexical forms as constituent units (nodes) of lexical networks. Similar to the above semantic networks, lexical items can be related to each other in formal fields. Here, closely associated items relate to overlapping activation patterns in the sense of shared structures at different points of the formulaic sequence. Formal connectivity will be discussed in more detail in Chapter 2.

I will conclude the discussion of knowledge representation in memory with a look at the conceptual domain of emotions and its lexicalisation patterns. The processing of emotion terms will constitute the main focus of the later data analysis.

### 2.2.5 Conceptualising and Verbalising Emotions

Emotions differ from simple objects in that their conceptual structure is more complex. They are cognitive relations in the sense that they mediate between simple cognitive events, which is reflected in the syntactic status of their lexicalisations as predictive items. Their cognitive status will be discussed in this section.

#### 2.2.5.1 Complex Cognitive Events

"There is clearly more to human knowledge than attribute-like information about single concepts and hierarchies of these concepts\(^9\). ... It is more plausible to assume that there are more complex forms of conceptual organisation, that concepts are related to one another in ways that reflect the temporal and causal structure of the world" (Eysenck/Keane 1995:261).

Such relations range from relatively simple to highly complex ones. Their organisational structure is sometimes accommodated for in an extended frame model, but more often they are treated as conceptual

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\(^9\) Note that concept is here used in a general sense again, not restricted to situational category instantiations.
events in their own right, and are variably referred to as schemata, scripts, or mental models. A relatively
general definition (Cohen 1990:316, on schemata) posits that they

"consist of constructed groups of concepts which constitute the generic knowledge about events,
scenarios, actions, or objects that has been acquired from past experience. ... A schema consists of
relations together with slots, or variables, which can be filled with optional values."

In other words, they follow much the same organisational principles as frames in the above delineation.
Complex conceptual configurations diverge from simple events in that they consist of two or more primarily
independent, or autonomous events, which are set in relation to each other. Such relations can be temporal or
atemporal, and they are conceptually dependent on the events they interconnect (cf. Langacker 1987). The
conceptual frame (or schema, or script) for relations, thus, contains not only property defining attributes, but
also 'slots' for the events they connect. The conceptual structure of relations can be of diverse nature, which
is reflected in different lexicalisation patterns. Major differences are, for example, reflected in different
grammatical categories, minor differences in more subtle grammatical distinctions, such as the argument
structure of predicative items. I will here scrutinise a specific type of conceptual relation and its lexicalisation
patterns. Emotions, which may at first sight appear to be autonomous cognitive events, reveal on closer
scrutiny that they cannot be conceptualised independently of an experiencer, nor, usually, of a causing event.
Correspondingly, their conceptual and lexicalisation structure is relatively complex.

2.2.5.2 The Cognitive Structure of Emotions

Emotions as basic conceptual domains (Langacker 1987:151) may at first sight appear to have a relatively
simple cognitive structure. On closer scrutiny, however, it becomes clear that they cannot be accounted for
adequately without reference to their experiencer and his evaluation of a certain event or situation. This view
is supported by their lexicalisation structures, which give evidence of a range of possible different
perspectives on one and the same emotional state, depending on the grammatical category chosen to
express this state (cf. below). Emotions are also interesting in that they can be conceptualised differently
across cultures, which is reflected in diverging lexicalisation patterns. This issue will be discussed in more
detail in Chapter 2.

The study of emotions is a wide area, which has been approached from various angles. This is not the place
to present a detailed overview of emotional research, so I will restrict myself to the discussion of a few aspects
relevant to lexical issues. "Feelings are the meeting place of mind, body and behaviour" (Johnson-Laird
1988:380). Emotions belong to the wider domain of internal states, or feelings, but as opposed to bodily
sensations, such as pain, emotions are mental states, originated from the cognitive interpretation of a
physiological state (e.g., Schachter/Singer 1962; Johnson-Laird 1988). As such, they are highly complex biopsychological events with a physiological as well as mental dimension. They are associated with autonomous bodily reactions, such as typical facial expressions, differences in heart rate, skin temperature, or muscle
tension (cf., e.g., Johnson-Laird 1988:372). James (1884:189, quoted from Ortony 1988:4f) summarises the
multidimensionality of emotions as having "a distinct bodily expression" in which "a wave of bodily disturbance
of some kind accompanies the perception of the interesting sights or sounds, or the passage of the exciting
train of ideas. Surprise, curiosity, rapture, fear, anger, lust, greed, and the like, become then the names of the
mental states with which the person is possessed".

Current research has singled out five basic emotions, or emotion categories, namely HAPPINESS,
SADNESS, ANGER, FEAR, and DISGUST\(^\text{10}\), which can take a variety of shapes, depending, for example, on
their intensity or the object they are directed at (Johnson-Laird 1988:379). They can be defined along the lines
of a number of classifying dimensions, the most basic of which would be the positive-negative continuum
(Langacker 1987:151). It is striking that only one of the basic emotions is positive and four are negative. The
reason for this may become clear if we consider that emotions originated as a social function, "predispose[ing]
the individual to certain sorts of [communicative] behaviour" (Johnson-Laird 1988:371). Most of this
communicative behaviour was developed to secure survival through interaction. Positive emotions, i.e.,
species of happiness, could be characterised as reflecting a positive state of mind resulting from contentment
with the present circumstances. Such situations do not, from a biological viewpoint, require much
communication; therefore, the organism does not need to be endowed with specific behaviour-guiding
mechanisms for different states of happiness. Negative emotions, on the other hand, could be described as

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\(^{10}\) Following the above convention, emotions as conceptual entities are capitalised.
reactions to different kinds of threatening situation, which demand differentiated behavioural patterns; it makes intuitive sense that these should be controlled by innate response mechanisms, in order to ensure prompt and appropriate responses. Following Johnson-Laird (ibid.), the four negative states can tentatively be distinguished in the following way: ANGER can be seen as a precursor to aggressive behaviour, FEAR to submissive behaviour or flight, and DISGUST as a precursor to rejection. SADNESS determines an inner withdrawal to overcome a loss. Despite this variety of reactions, all negative emotions are thought to relate to essentially the same state of arousal, i.e., they are emotions of the same valency (cf., e.g., Bamberg 1997b; Schachter/Singer 1962). They are differentiated from one another only by the experiencer’s perceptions and beliefs about the context and her position with regard to it (ibid.).

In addition to the basic emotions, SURPRISE is an interesting inner state. It could be characterised as a pre-emotional reaction to something unexpected, and "can play a part in the genesis of any emotion" (Johnson-Laird 1988:372). SHOCK as a more violent variant of surprise is described by Wierzbicka (1992:565) as a state of confusion, which leaves the experiencer lost for words, thoughts, and actions. Contrary to SURPRISE, which is a primarily neutral reaction, its cause is always something experienced as negative. Consequently, SHOCK is a precursor to negative emotions. Similar to other members of a category, emotion concepts have been found to overlap to a considerable extent (cf., e.g., Wierzbicka 1992; Bamberg 1997b). They can be contrasted, for example, with reference to semantic primitives, or by scrutinising their usage contexts. Wierzbicka (1992:558ff) defines a series of emotions, or rather, their lexical expressions, in reaction to bad experiences, by homing in on semantic primitives. This enables her to structure the continuum of emotion concepts, and at the same time contrast the meaning of related terms and trace their underlying similarities. SHOCK, for example, as described above, is characterised by the inability to react, and can give way to a range of aversive emotional states ranging from DISMAY to ANGER after the shocking event has been conceptually evaluated. DISMAY involves a particular strong element of rejection along with passiveness, while ANGER has an air of active aggressiveness. Another example would be species of the category SADNESS, including, for example, DISTRESS and also SADNESS in a more restricted sense. While SADNESS portrays a present state of mind in reaction to a past event, DISTRESS includes an anxious outlook to the future. It may even be regarded as a variant of FEAR, foregrounding concern about possible consequences, rather than the upsetting effect of the experience. The examples show that emotions are
highly differentiated concepts, but that their boundaries are anything but clearcut. Depending on the perspective taken on a given event, i.e., the evaluation of it, an experiencer (or onlooker) may develop rather different emotions about it.

The results of Wierzbicka’s corpus linguistic analysis are supported by Bamberg’s (1997a) investigation of verbalisation patterns in children’s narratives. Bamberg focuses on the use of opposing terms, such as anger and fear, or even happiness and sadness in the description of one and the same situation. He discovered that this verbal behaviour does not reflect the simultaneous experiencing of two more or less distinct feeling states, "but that it is the product of the linguistic ability to view a situation for two discursive purposes" (ibid.:219).

"What at first sight looked to be a description of an internal state of the protagonist, turned out on closer scrutiny the expression of a particular perspective" on the given situation (ibid.:214). This finding relates not only to the use of emotion terms in a narrower sense, but also to the use of adverbials, such as suddenly, or unexpectedly to express surprise or scaredness in a character (ibid.).

Interpreted from a slightly different angle, it seems that the fact that emotional situations do allow for different perspectives could be seen as an indication of the overlap of emotion concepts. ANGER and FEAR may be considered a pithy example of the phenomenon of having ‘mixed feelings’ about something: a person may experience a certain situation in a way that it arouses both ANGER in her, for example with a given offender, and a FEAR of possible consequences. A foregrounding of either ANGER or FEAR in the very situation, could then be seen as indicating the experiencer’s temporal orientation more than the overall quality of her inner state.

Support for a common conceptual basis of ANGER and FEAR (and, indeed, SADNESS), comes from a very different field of research, namely from an etymological perspective and cross-linguistic comparison of the associated lexical expressions angry/anger, anxious/anxiety, and anguish. They commonly relate to a set of Romance and Germanic etymous of similar meaning. Latin angere (‘to choke, suppress’) and the related form angustus (‘narrow, tight’) relate to the concomitant physical reaction of a tight throat with any one of the three emotional states. Similarly, Old Norse angra (‘grieve) and angr (‘grief’) relate to [o]ngr (‘narrow’). The Germanic form is also retained in the Germanic languages, for example, in German eng (‘narrow’) and Angst (‘fear’). Both the Romance and the Germanic etymon are thought to be derived from the Indogermanic root
*"angh-*, meaning 'narrow, to narrow down, to tie'. The common origin of *anger, anguish* and *anxious* can also be seen in the obsolete use of *anger* denoting distress. (Sources: Kluge 1995; Onions et al. 1967)

In conclusion, the investigation of the foundations of emotion concepts has depicted them as highly complex cognitive structures with considerably more variables than may be obvious at first sight. They are bound up in a continuous domain, definable along a number of quality dimensions which can be delineated in terms of semantic primitives. The conceptual field of emotions appears to bear some resemblance with the colour spectrum, in that its concepts merge into each other, and more so in that 'opposite' emotions (such as *FEAR* and *ANGER*) like 'opposite' colours (such as green and red) might be more appropriately regarded as complementary rather than antagonistic. An important aspect of emotional conceptualisation appears to be the perspective taken in respect of evaluating and/or reporting on a given situation or experience.

The following section investigates the different ways in which emotions are lexicalised, using as an example expressions for fear.

### 2.2.5.3 Lexicalisation Patterns

To explain the lexicalisation patterns of emotions, I will use the example of *FEAR*. *FEAR* could very generally be described as a negative emotional state caused by a situation perceived as threatening, whereby the intensity of this feeling can vary considerably. It is accompanied by specific bodily reactions ranging from a fearful facial expression via sweating to an increased heart rate or blood pressure. Resulting behavioural patterns in the natural world include species of avoidance, such as flight, ‘freezing’, or submission (Johnson-Laird 1988:373), which usually become manifest in the form of more moderate and subtle responses in human behaviour. The variety of descriptive viewpoints on a person in *FEAR* is reflected in the variety of verbalisation possibilities for her feeling. Two overall perspectives can be distinguished: her experience can be described with reference either to her internal state, or to her outwardly observable physiological or

11 The asterisk here denotes a reconstructed form.
behavioural reactions. Accordingly, different linguistic means will be employed to express the situation. In more abstract terms, we may say that the perspective taken on a scene is important to both semantic and grammatical structure (Langacker 1987:120). This hypothesis will be scrutinised in what follows.

One of the most striking features of the emotional domain is its extremely rich lexicalisation. Several different shades of FEAR, for example, which relate to the intensity of the feeling and to other variables, are identified lexically (e.g., APPREHENSION, ANXIETY, WORRY, FRIGHT, TERROR, or PANIC, to name just a few). This clearly indicates the significance of the domain for human interaction. More interesting in relation to the present study, however, is a different aspect of emotion terminology. The terminology associated with emotional states or reactions is spread across all semantic word classes, ranging from nouns and verbs to adjectives and adverbials (cf. Langacker 1987:189). Each type of category denotes a particular perspective on an emotional state. Adjectives, like afraid or anxious identify the feeling as a qualitative state of the experiencer, while nouns like fear or anxiety appear to view it in a more abstract way, almost as a disembodied entity. Verbs, like worry or fear seem to emphasise the development of the feeling, accentuating its persistence over time. A participle like worried could be described as combining the qualities of verb and adjectives, characterising the inner state of a worried individual as a persistent quality.

The examples show that the lexico-semantic field of fear is a rich inventory of expressions not only for different species of FEAR, but also for different ways of viewing these species. Beside these immediate lexicalisations of the conceptual category, a second set of lexical items, again covering all major grammatical categories, are associated with FEAR. It includes expressions depicting physiological reactions like wide(ned) eyes or shivering, non-verbal behaviour like cowering, and peculiarities in verbal behaviour like whispering or stammering. The lexico-semantic field could now be illustrated as in figure 1.4, as a network of connections organised around the relatively general item fear, with lexicalisations of the emotional state as central members, and lexicalisations of bodily expressions of fear distributed towards the periphery.
In sum, the conceptual complexity of emotions as exemplified by the notion of FEAR is documented by a rich inventory of referring expressions, which reflects the structure of the domain in a similar way to the way in which the vocabulary associated with HORSE represents the internal structure of its conceptual frame.

2.2.5.4 Emotion across Languages

Crosslinguistic and cross-cultural studies suggest that the conceptualisation of emotions is socio-culturally shaped (cf., e.g., Kitayama/Markus 1994; Rintell 1990; Wierzbicka 1994 and 1999). Consequently, lexicalisation varies. Many emotion terms do not have exact translation equivalents, owing to the fact that they relate to culture-specific emotion scripts (ibid.). In the context of second language learning, the acquisition of emotion vocabulary therefore requires conceptual restructuring, which only takes place gradually (cf., e.g., Grabois 1999; Pavlenko 1999, 2000). Grabois' word association study suggests acculturation as a crucial variable of native-like lexical choice. His findings are confirmed by Dewaele and Pavlenko's (2000) investigation of the use of emotion vocabulary in L2 discourse. Dewaele and Pavlenko were able to single out cultural competence as an important factor of range and frequency of emotion words in interlanguage (others being L2 proficiency and, to a certain extent, gender). The lower an individual's L2 cultural competence is, the more likely his lexical choice will be influenced by L1 conceptualisation and associated lexicalisation patterns.
The present study will investigate L2 'emotion competence' in the light of lexical processing in L1-L2 translation. The question here will be whether lexical-structural differences, as a reflection of conceptualisation differences, pose a learning problem, which could become evident in a transfer of L1 verbalisation patterns in L2 use.

2.2.6 Conclusion

Following this relatively extensive trip into the neuropsychology of conceptual structure and its lexicalisation patterns, which has been able to provide us with a hypothesis about the organisation of lexico-semantic knowledge, I will now move to discussing the symbolic character of language and its relation to thought and meaning.

2.3 Language

To round off the discussion of knowledge organisation, I will briefly consider the status of language within the realms of cognition, and identify its function in human affairs with reference to its cognitive foundations.

2.3.1 Language as a symbolic system

"A language is a system of signs representing ideas" (Saussure, 1972:15).

Almost a century later, Saussure's thoughts on language have not lost their vigour. Modern linguistics has returned to simple, yet convincing notions like the above, confirming and elaborating on many other of Saussure's postulates. Even though much of the terminology has changed or undergone a shift in meaning, Saussures's approach to integrating psychological, physiological, physical and social aspects into a comprehensive description and evaluation of the phenomenon of language has resisted the ravages of time.
One of Saussure's most important assertions relates to viewing language as a symbolic system. Although generally recognised, this fundamental notion has never received much attention before the arrival of cognitive linguistics. And even since, ignorance of its implications for linguistic organisation has led to a series of unrealistic models of language processing. The shortcomings of models which ignore the cognitive structure of symbolic systems relate most notably and paradoxically to so-called models of symbol manipulation, which delineate representation in the system in the form of images or propositions (cf. above; Eysenck/Keane 1995:203). This has evoked the impression that the idea of symbolic structure is incompatible with a connectionist perspective (ibid.). Contrary to that, I would argue that 'symbol manipulation' can well be described within a connectionist paradigm, if the cognitive foundations of symbolic structure are taken account of. I will therefore briefly discuss the general principles of linguistic symbolisation.

Cognitive linguistics views linguistic units as bipolar structures consisting of a semantic and a formal pole and the association that holds between them (cf., e.g., Langacker 1987, 1990). Lexical forms are seen as representing conceptual contents, or cognitive events, which, in turn, are regarded as representations or interpretations of the perceived external world (cf., e.g., Langacker 1987; Lakoff 1987; Lakoff/Johnson 1999).

It follows that "language does not link up directly with the real or metaphysical world" (Fauconnier 1988:62), but "relates to the world through the agency of the mind" (Johnson-Laird 1988b:115).

It was suggested above that our knowledge of the world is derived by a series of mapping operations, which first break down the continuum of qualities of the external world through selective sensory reception, and then re-integrate the atomistic impressions into increasingly complex and again continuous conceptual representations. This "nebulous world of thought", as Saussure (1972:110) calls it, "chaotic by nature, is made precise by the process of segmentation". Saussure here refers to the segmentation of conceptual structure, which relates to the notion of categorisation, and to assigning lexical forms to conceptual substructures, i.e., the process of lexicalisation. This mechanism gives rise to the symbolic system of language, which could be described as a 'unified duality' of conceptual and formal structure (ibid.:101). Saussure emphasises that thoughts are neither transformed into matter, nor sounds into ideas (ibid.). Instead, language "creates a new and parallel world" (Bickerton 1990:46) in the form of a system of signs, which obtain their representational value from the association with cognitive images of the world. The associational relation between concepts
and signals is an arbitrary link, coined by a given speech community. Linguistic symbolisation is thus a
dynamic social product.

It is essential to note that "language as such has no discernible unit" (Saussure 1972:101). Conceptual
content and linguistic form do not merge into a compound structure substantially different from its component
elements. Accordingly, linguistic processing does not involve the manipulation of lexical 'symbols' in the sense
of demarcated units of knowledge. Instead, it involves operations at two distinct cognitive levels, whose
coordination gives rise to language. These arguments need to be borne in mind when developing models of
language use, and I will return to them in the later discussion of lexical selection.

The organisational principles of symbolic structure hold for individual lexical items as well as for larger
stretches of language: lexical sequences symbolise specific combinations of cognitive events and their
interweaving. Complex conceptual structures are represented by complex lexical expressions, which range
from basic phrases to involved periods. Their structure is organised by the grammar of a language, which is
an abstract description of the way lexical items interact, based on their combinatorial potential (for a detailed
discussion cf. Chapter 2 and 3). Cognitive grammar regards it as a continuation of lexical structure, "symbolic
in nature, consisting of the conventional symbolisation of semantic structure" (Langacker 1987:2). Grammar is
taken to involve "the syntagmatic combination of morphemes and larger expressions to form progressively
more elaborate symbolic structures" (ibid.:82). It follows that "there is no meaningful distinction between
grammar and the lexicon" (ibid.:2), a notion that will be scrutinised in Chapter 2. Although cognitive grammar
does not specify how exactly the brain is thought to represent and operate grammatical knowledge, i.e., the
combination of lexical elements into meaningful stretches of language, it becomes clear that grammatical
processing must ultimately be analysed with reference to lexical knowledge.

In summary, a way of trying to capture the nature of language is by viewing it as a symbolic system, which
builds up a world parallel to the one conceptually represented in our mind, which, in turn, is a representation
of the external world. Language creates a level of representation that interprets the inner environment
cognitively, which could be seen as an attempt of the human mind to understand both external and internal
world better. By breaking down the conceptual continuum into discernible units, it becomes more accessible
and negotiable for both thought and communication.
2.3.2 Language and thought

A long-standing question has been the relationship between language and thought. This is not the place to give a full account of the debate; however, some brief remarks on the issue may provide further insight into the nature of languages and their interrelation.

To begin with, it is necessary to define what is understood by 'thought'. A common sense approach might be to equate thought with 'thinking in language', but this is only part of the story. Thought is often used synonymously with cognitive activity in general, including perceptual and conceptual processing, memory, attention, mental imagery, and emotions, and is as such not only alinguistic but even at least 95% unconscious (Lakoff/Johnson 1999).

Perhaps the most influential theory about the relationship between language and thought is the Sapir-Whorf Hypothesis, which states that thinking is strongly influenced by language (Eysenck/Keane 1995:352; Harris 1990:202). An extreme and relatively unlikely position within this hypothesis is that language determines thought. A more moderate view, which has been investigated in connection with memory and perception holds that thought is to a certain degree shaped by language. (Eysenck/Keane 1995:352). Evidence comes, for example, from colour perception, which is to a large extent determined by the innate colour discrimination system of the eyes (Berlin/Kay 1969). Additionally, however, socio-linguistic colour classification, i.e., which shades are lexicalised in a language, appears to influence people's ability to perceptually distinguish hue (Motluk 1999:7). In a similar way, emotional conceptualisation appears to be culturally influenced (cf. above).

The fact that different languages carve up the conceptual continuum in different ways means that second language learners have to learn to 'think differently', in order to acquire a new language. They must free themselves from their familiar conceptualisation of the world, as reflected in the structure of their mother tongue, and aim at acquiring new ideas along with new words and new linguistic organisation principles (cf., e.g., Cohen 1998). This requirement of conceptual restructuring is perhaps the biggest challenge in language learning and a frequent source of error.
2.3.3 Meaning

The question of the nature of language is inherently linked with the question of meaning. In cognitive science, meaning is viewed as "a mental phenomenon that must eventually be described with reference to cognitive processing" (Langacker 1987:97). By defining meaning as the counterpart of a sound pattern, Saussure (1972:112) is in line with Langacker (e.g., 1987:5, 1992:2), who equates it with conceptualisation or Jackendoff (1988:83) who talks about "mental information structure".

Similar to the relationship between categories and concepts, we can distinguish two types of meaning, which I will call linguistic meaning and speaker meaning. Linguistic meaning refers to the property of linguistic forms to convey information about "the projected world, i.e., the world as organised by our collective mind" (Santambrogio/Violi 1988:18). It can be equated with lexico-semantic structure, i.e., the categorial knowledge associated with lexical items. Speaker meaning, then, consists in individual conceptualisation. It arises dynamically, with linguistic expressions no longer primarily representing categorial knowledge, but situationally developed concepts and a specific communicative intention. In the light of the previously discussed notion of language as a symbolic system, it needs to be emphasised that "words have no meaning in themselves. They only get "meaning" through the user" (Richards 1991:140; cf. also Ogden/Richards 1923).

Ogden and Richard's (1923) semantic triangle (cf. figure 1.5) is a simple but expressive way of modelling the triadic character of the meaning relation. It illustrates the relation between thought and symbol (symbolic sign), and thought and referent (reference object), elucidating that "symbol and referent are not connected directly, only indirectly round the two sides of the triangle" (Richards 1991:140).

![Ogden and Richards' Semantic Triangle](adapted from Richards 1991:140)

The simplicity of this model may falsely imply "that a unique lexical form is associated with a corresponding unique concept, which fails to take account of cases of synonymy, where more than one word is associated with a single meaning, and polysemy, where a single form is associated with a multiplicity of meanings."
It also leaves out of consideration that lexical meaning can take different shades depending on the context an item appears in. These questions will be addressed in Chapter 2.

In summary of this brief discussion of the nature of meaning, we may follow the tenets of cognitive semantics by concluding that, most importantly, "meanings are in the head" (Gärdenfors 1998:21).

3. CONCLUSIONS

Chapter 1 has provided an overview of the cognitive structures and mechanisms relevant for language use and for defining the status of language within the cognitive system. It was argued that linguistic competence cannot be separated from general cognition, and that linguistic processing must ultimately be described with reference to the cognitive structures that give rise to it. Of central interest were principles of cognitive knowledge representation, in particular of conceptual structure, which was found to be highly congruent with lexico-semantic organization. It was argued that this perspective is suggestive of the relationship of conceptual and semantic structure, in the sense that semantic knowledge seems to be embedded in conceptual knowledge. This perspective relates to Hypothesis 1, which infers that conceptual structure should then be traceable through analysing lexico-semantic processing. This hypothesis will be tested in an empirical study investigating semantic search activity in L1-L2 translation. The present study will specifically focus on the processing of emotion concepts. In order to prepare the data analysis, Chapter 1 introduced the conceptualisation and lexicalisation of emotions. It finally discussed the status of language in human cognition, highlighting its symbolic nature, which is associated with the bipolar structure of lexical elements. This notion is seen as being important for the design of language organization and processing models.

Perhaps not all of the aspects discussed are equally relevant for the central issues of the present study. However, in order to arrive at a comprehensive understanding of language use, it is considered important to be aware of and familiar with all major aspects of its cognitive foundations. Otherwise, as will be argued later, linguistic organization is easily described in a one-sided manner, for example built on the perceived psychological reality of linguistic behaviour and/or too exclusively on a structural description of language.
The discussion has led to a range of hypotheses about lexical organization as emerging from the cognitive foundations of linguistic knowledge. I will conclude this Chapter with a brief summary of the main organisational principles put forward, which will then be set in relation to a psycholinguistic perspective on the mental lexicon:

(1.) Neurolinguistic findings suggest that form and meaning of lexical items correspond to primarily independent neural activation patterns at different cognitive levels, which are associatively linked.

(2.) This entails that formally or semantically similar items relate to overlapping activation patterns and are therefore readily associated. This relationship can be modelled in the form of lexical networks.

(3.) In the light of the organisation of semantic knowledge, cognitive linguistics suggests that lexical meaning is embedded in general conceptual knowledge. Vice versa, lexico-semantic organisation can be seen as reflective of conceptual structure.

(4.) From a neurolinguistic viewpoint, lexical processing operates within and across the representational structures of lexical knowledge, presumably following the principle of spreading activation. Lexical and grammatical operations are thought to be controlled by specific procedural mechanisms, which mediate between the different representational levels and coordinate the activation of the representational structures. Little, however, is known about the structure of these mechanisms. They appear to operate on the basis of information about the relations that hold between lexical structures.

(5.) Also based on neurolinguistic data, different languages are thought to be represented in the same cortical regions following the same general principles of representation and processing. Differences in metabolic activity in the brain between L1 and L2 processing are not seen as suggesting that different languages occupy different cortical regions; instead, L2 processing often deviates from L1 processing in that it tends to be less automatised, involving more attention and the application of explicit grammatical knowledge.

Following this overview of the cognitive foundations of language use, I will now turn to the psycholinguistic approach towards modelling lexical and linguistic knowledge, and discuss how it links in with the above findings.
Chapter 2 will investigate the organization of the mental lexicon from a psycholinguistic viewpoint, addressing the information structure of lexical knowledge and the organization of multiple languages in the mind. It will discuss productive processing with reference to lexical knowledge organization, focussing on mechanisms of lexical selection on the background of lexical connectivity, and on aspects of phrasal construction in the light of the informational content of semantic items. Hypothesis 2 suggests that grammatical knowledge can be related to lexical information, and, more specifically, that phrasal structure is governed by the argument structure of predicative items, which determine morpho-syntactic processes at the sentence level. It will be argued that grammatical processing is lexically driven without the necessity of an independent, abstract grammatical rule system. Concerning plurilingual organization, the relationship between two or more languages and their elements and the consequences for L2 processing will be discussed. Hypothesis 3 suggests that multiple languages constitute an integrated dynamic system characterised by flexibility and different forms and degrees of interaction. Chapter 2 will consider some of the structural and psychological foundations of this hypothesis.

1. THE MENTAL LEXICON

1.1 Lexical knowledge

1.1.1 The Realms of Lexical Knowledge

The mental lexicon, as Singleton (1999:3) observes, has received considerable attention over the past twenty or so years, and is now widely regarded as that domain of language where the various dimensions of linguistic knowledge meet. As such, it may be considered the basic framework of language structure and use, a role
that has often been assigned to grammar, in particular in the Chomskyan tradition (cf. Carroll 1999; Singleton 1999).

One of the first grammarians to recognise the pivotal significance of lexical knowledge and to place the lexical item at the centre of linguistic competence were Bresnan and Kaplan (e.g., Bresnan 2001; Kaplan and Bresnan 1982), whose lexical-functional grammar assigns not only semantic and formal properties but also information about grammatical behaviour to the domain of the lexicon. While structuralists like Lyons (e.g., 1995) still posit a clear distinction between grammar and lexicon, along with a mutual dependence, cognitive grammarians, as for example represented by Langacker (e.g., 1987, 1990), regard lexis and grammar as "a continuum of symbolic structures", claiming that grammar does not constitute an autonomous formal level of representation, and, indeed, cannot be separated from the lexicon at all (Langacker 1990:2). Investigations of acquisitional mechanisms suggest that "syntax acquisition reduces to vocabulary acquisition – the analysis of how words work in sequence" (Ellis 1997:50; cf. also Bybee 1988). On this account, 'grammar' relates to the structural regularities of word sequence chunks, with distributional properties of words giving rise to generalisations about their sequential position relative to other words (Ellis 1997:45ff). This positional information also correlates with semantic similarities, allowing for the allocation of words to particular classes, which can be defined in terms of syntactic categories (ibid:49). Further support for this position comes from the Collins Cobuild Project (cf., e.g., Sinclair 1991), a corpus linguistic study of the correlation between word meaning and grammatical behaviour. Ellis (1997:49) sums up its major results as providing evidence for the notion that syntax cannot be separated from either lexis or semantics, and "that language is best described as being collocational streams where patterns flow into each other". He concludes that so-called grammatical 'rules' are no more than the description and heuristics of science with no independent standing or causal role for linguistic operations (ibid:54). Grammatical competence could instead be described as the ability to analyse and construct sequences of words on the basis of their meaning and associated generalisations about their contextual behaviour. This ability, as was suggested in Chapter 1, appears to be linked to a specific kind of procedural, or operational knowledge, which coordinates conceptual-semantic and lexical-formal knowledge at word and sentence level.

In sum, lexical knowledge goes beyond properties of words in isolation, including information on their combinatorial potential. A comprehensive description of the lexicon, therefore, needs to take account not only
of formal and semantic knowledge, as commonly acknowledged, but also of aspects of grammatical knowledge.

So what exactly do we understand by 'mental lexicon'?

Cognitive linguistics regards it as a collection of lexical forms which symbolise static or dynamic conceptual events and the relations that hold between them (cf., e.g., Langacker 1987, 1990). On this account, the mental lexicon is organised in a complex way which can only be explained with reference to the information structure of its elements, i.e., the different dimensions of knowledge they comprise.

A psycholinguistic perspective defines the mental lexicon it as that part of our long-term memory in which our knowledge of words with all its different aspects is stored (cf. Möhle 1994:39; Raupach 1994:21). Following this definition, Raupach (ibid.) describes it as the interface of specific sensory impressions and motor patterns (relating to language input and output, respectively) on the one hand, and mentally represented knowledge structures, which to him comprise semantic and grammatical information, on the other.

The following section will take a closer look at the different domains of knowledge assigned to the lexicon and the resulting organisational principles that hold between its elements. In conclusion to the above discussion it may be suggested that in the light of the variety of information assigned to the lexicon, it would be sensible to avoid the term 'mental lexicon' as much as possible, in order to escape the danger of conceptualising a 'box of knowledge'. The term 'lexical knowledge' appears to be more appropriate to capture the diversity of information contained, and in particular allows for an integration of its dynamic dimension, i.e., the fact that lexical knowledge and lexical processing are inseparably linked (cf., e.g., Raupach1994). Lexical knowledge, as represented by the information structure of lexical items, includes representational structures (semantic, formal, and output patterns) as core dimensions, and combinatorial (collocational and colligational) information as wider aspects. The following section will scrutinise how these dimensions are thought to combine in the notion of 'lexical items'.
1.1.2 Lexical items: representational substance and combinatorial potential

1.1.2.1 Approaches to Defining Lexical Items

Like the mental lexicon as a whole, the nature of its elements is difficult to delineate. Commonly referred to as ‘words’, lexical entities have received different labels depending on their definition in a given theoretical framework (cf. Singleton 1999:10ff). Following Lutjeharms (1994:149), "The concept "word" is a construct, which – apart from the meaning – includes many other aspects such as phonological and graphic form, morphology, word class, syntactic and semantic valency".

Some important notions in relation to lexical elements are content (or semantic) words versus function (or grammatical) words, and free or unbound versus bound morphemes. The former opposition characterises words "which are considered to have substantial meaning even outside of context", in contradistinction to "those considered to have little or no independent meaning" and instead "a largely grammatical role" (Singleton 1999:11; cf. also Langacker 1987). Lyons’ (1995) distinction between full and empty word forms may be related to a cognitive perspective by describing ‘empty’ words as elements lacking a discrete semantic pole in the sense of an independent representational structure, instead relating to specific types of relations between semantic elements, often to mere syntagmatic connections, as, for example, in the case of postpositions or inflectional suffixes (cf. Langacker 1987:243). Possible implications of this distinction for lexical organisation and processing will be discussed later.

Both content and function words belong to the category of free or unbound morphemes, in distinction to bound morphemes, i.e., various types of affixes. Bound morphemes have a similar status to function words (cf., e.g., the possessive aspect conveyed by the genitive suffix –s and the preposition of, as in ‘Peter’s book’ and ‘the book of Peter’), and the two groups are sometimes jointly labelled functors or grammatical items (cf., e.g., Bickerton 1990:54). For the purpose of this thesis, I will avail of the distinction between semantic items and grammatical items or functors, although this classification admittedly involves a number of problems, such as a fuzzy boundary between the two groups (cf., e.g., Langacker 1987:242f). These questions are of minor relevance for the present study, though, and will therefore not be discussed in much detail here. Instead, I will proceed with the question of the nature of lexical elements, their informational structure and organisational
principles: what are the identificational criteria for an entity to qualify as a 'lexical item', what distinguishes semantic from grammatical items, and what are the implications for the organisation of the mental lexicon?

The first question to be answered concerns the units of knowledge stored in the mental lexicon. Stemberger and MacWhinney (1988) and Bybee (1988) suggest that the lexicon contains three basic types of lexical units: the basic form of free morphemes, bound morphemes, and irregular inflected forms. High-frequency regularly inflected forms are thought to be stored as separate units, as well, but in general, inflected forms are seen as on-line productions built on an internalised knowledge of the combination of basic forms and affixes. This combinatorial knowledge is traditionally referred to as *inflectional rules*. Bybee, however, proposes a model which considers inflectional knowledge as being part of the representational structure of lexical items. Similar to Ellis (1997), she rejects an existence of morphological 'rules' as separate information units. She considers "morphological and morpho-phonemic rules ... [as] patterns that emerge from the intrinsic organisation of the lexicon" (ibid.:125), whose storage units are taken to be morphemes of various types. Morphological knowledge is here seen as a complex interweaving of representational substance and combinatorial aspects, the latter involving the mediation of coordinative mechanisms:

"The morphological facts of natural language are described in terms of independently necessary mechanisms of lexical storage: the ability to register frequency of individual items and patterns" (ibid).

Bybee characterises lexical items on the basis of their conceptual and formal structure and their relations with other items as emerging from this structure, whereby "relations among words are set up according to shared features" (ibid:126). She posits that semantic parameters are chief among the organisational patterns connecting morphemes: "Morphemes are connected via the semantic field they belong in ..., by the scripts they belong in ..., and many others" (ibid:125). Similarly, connections emerge from shared formal properties, such as initial and final segments, stress pattern, or syllable structure (ibid.; cf. also Raupach 1994). As a result, the degree of relatedness among words and the strength of lexical links can vary, depending on the number and type of shared features. With regard to the status and processing of lexical forms, Bybee (1988:131,139) suggests that use or disuse, i.e., word frequency, has a bearing on lexical strength, and, consequently, on lexical access. Questions of lexical connectivity will be discussed in more detail in section

1 Note that Stemberger/MacWhinney’s and Bybee’s terminology diverges slightly from the terminology used
1.2. In sum, in Bybee's argumentation, two hypotheses are crucial for the present discussion: the first relates to the question of the building blocks of the mental lexicon, which are considered to be primarily morphemes, but which are also seen as including a range of more complex forms; the second concerns the combination of lexical elements. Here, Bybee (ibid: 140) concludes with the observation that:

"The most important difference between this theory and the previous theories is that in this theory the generalizations that in other theories are called "rules" are here part of the representations. They arise out of the organisation of phonetic and semantic substance of a language, and they have no existence independent of the substance that brings them to life."

Bybee's argumentation agrees with Ellis' (1997) hypothesis of grammatical rules as generalisations of lexical distribution patterns. Her theory also supports the perspective that lexical elements should be modelled as highly complex entities, whose information structure goes beyond their representational substance. She does not, however, clearly distinguish between the notions of 'words' and 'morphemes', or discuss the possible implications that differing semantic qualities of different types of lexical elements may have on their organisation.

It was suggested that many grammatical items have an entirely functionalised status. Their use can depend solely on the grammatical construction determined by relational, in particular predicative items, as, for example, in the case of particular verbs demanding a gerund construction and the suffixation of -ing. It appears that suffixes like -ing have a status different from that of semantic elements in that they lack an independent semantic quality. Concerning their organization in the lexicon, it therefore appears plausible to assume that they are bound up in the lexical web primarily on the basis of grammatical-formal connections. This hypothesis will be discussed in more detail later. It does not, however, apply to all grammatical items in the same way. Not all functors allow for an unequivocal classification. Prepositions, for example, can have a distinct semantic quality depending on their context of use. Functors with a distinct semantic quality, like prepositions or conjunctions, are bound up in networks of items in the same category, where their meaning can – at least rudimentarily – be derived from their opposition to each other. They can be regarded as lying on a continuum with what Langacker (1987:242) calls "notionally definable" relational items, such as verbs, here.
adjectives and adverbs. Their status in the mental lexicon is perhaps the most difficult to define. I will concentrate my further discussion on semantic items, since the present study is primarily concerned with their processing. The processing of functors is seen as being dependent on the semantic items they qualify or connect. This hypothesis will be discussed in connection with phrasal construction.

Resuming the discussion of the identificational criteria for entities to qualify as lexical items, a formal aspect needs to be taken account of. Lexical items, in particular when referred to as 'words', are often identified in orthographic terms, as "a sequence of letters bounded on either side by a blank space" (Singleton 1999:11f). This approach not only poses difficulty for pictographic writing systems or agglutinative languages, it also leaves out of consideration complex semantic elements, i.e., multi-word expressions whose meaning can be more or less dissociated from that of their component parts (ibid:13), and which therefore claim unit status. Such elements include most notably lexical compounds (e.g., 'black box'), but also fixed expressions of various kinds (e.g., 'go to hell'). In sum, the elements of the mental lexicon are items of varying complexity and nature. They are considered to have unit status, if they have a distinct lexical form and an associated meaning or function. Semantic items differ from grammatical items in that they can be processed independently.

1.1.2.2 Structural 'Hardware' and Valency

I will now consider the information structure of lexical items in more detail. As was argued above, lexical items are multi-dimensional entities consisting of representational and combinatorial information. Their structural 'hardware' includes conceptual, perceptual and motor patterns. Semantic and formal pole together constitute a basic symbolic unit. This relationship has been discussed in sufficient detail earlier. A third representational structure relates to language output, referred to by Langacker (1987) as motor image. According to Langacker (ibid:112), motor images are autonomous events equivalent to those eliciting motor activity, in this case language output. They could be described as the representational patterns of (written or spoken) articulation, which may or may not be activated to trigger efferent (i.e., effective, or outgoing) neural activity. With regard to spoken language, it has been suggested that perception and production are inseparably linked. The Motor
Theory of Speech Perception posits that the speech organs receive articulatory stimulation during perception (e.g., Liberman 1985), which implies an immediate connection between the auditory and the articulatory system. Intimately linked as the two systems may be, neurolinguistic evidence about selective impairment of spoken output favours the view that articulation relies on a primarily distinct mechanism. A pithy example is presented by Critchley (1973), who reports on a recovered aphasic who describes his failure to articulate the words he wanted to use, instead producing other elements without being able to control his speech. As concerns writing, it appears to be unanimously accepted that “the hand-eye channel is fundamentally discontinuous”, presumably because it is not primarily specialised for language use as the speech processing system (Garman 1990:105). Not only is there no counter-evidence for this position, it also makes intuitive sense, since neither visual perception nor manual activity is immediately specialised for language use like the speech processing system. In sum, motor images are thought to be important for the proper characterisation of lexical information structure (cf. Langacker 1987:112). However, not being involved in speech planning or comprehension, but relevant only for articulation, they are perhaps best considered a secondary dimension of lexical knowledge.

The remainder of this section will focus on the combinatorial potential of lexical items, i.e., the information structures that allow them to combine with other elements into larger stretches of language.

The combinatorial potential of lexical items relates to their valency structure (cf. Lutjeharms 1994; Langacker 1987) and the related notions of collocation and colligation (cf., e.g., Singleton 1999). Valency refers to the potential of words, in particular semantic items, to combine with other items into more complex structures. In the light of the bipolar structure of lexical symbols, Langacker (1987:156) gives a more differentiated definition:

"Valence relations involve the integration of two or more component structures to form a composite structure. They depend on correspondences established between substructures within the component elements, at both the semantic and the phonological [formal] poles".

Semantic valency relates to the notional deep structure of an item, which in turn is reflected in the syntactic valency of its surface structure (Lutjeharms 1994:150).
Related to the concept of valency are the notions of *collocation* and *colligation*. *Collocation* refers to "the way in which words 'keep company' with each other" (Singleton 1999:20) at the level of meaning, i.e., to semantic relationships. Singleton (ibid:22) points out "that collocational patterns are ... highly informative about lexical meaning and usage", although he rejects Firth's (1957) extreme position "that the meaning of a word essentially is the sum of its linguistic environments" (Singleton 1999:22). A more moderate view is offered by Meara (1996:47) who, on the basis of word association tests, suggests that the entirety of lexical associations triggered by a stimulus item contributes to the meaning of that item. His data show that such associations can be of highly diverse nature, including paradigmatic, syntagmatic, situational, or emotional connections (ibid.).

Different kinds of word associations and collocations reflect different perspectives on an item, highlighting different semantic qualities in different contexts.

However, not only the nature of collocating entities, also their constellation in a given conceptual configuration modifies their semantic role, and, in turn, syntactic structure (e.g., whether 'Peter is afraid of the dog', or 'the dog is afraid of Peter', is decisive for word order). Lexical meaning and collocational environment are thus closely connected, and so is the syntactic structure for expressing specific relations. This takes us back to the beginning of this chapter, which discussed the relationship between lexicon and grammar and the degree of integration of the two domains. Following Sinclair (1991:137), lexical and grammatical choice are inseparably linked. It entails that language production begins with the selection of a set of lexical (semantic) items which lay out the structural framework for phrasal construction (cf. also, e.g., Aitchison 1989; Cook/Newson 1996).

This framework is seen as including aspects of word order, morphological adaptation, and functor specification, which depend on the combinatorial properties of the semantic items selected to express a given conceptual content. The syntactic structure both expresses and depends on the relationship between the given cognitive events, whereby relational, in particular predicative items, (i.e., verbs and relational nominals,) by virtue of their valency, or argument structure, provide a scaffolding of possible grammatical constructions (cf. Langacker 1987). They determine the range of possible arguments and their sequential arrangement, and they also govern functor specification. Morphological specification, in particular inflectional adaptation, additionally depends on the formal structure of the item to be modified (e.g., whether a genitive in German is marked by the suffix -s or differently depends on the basic form of the noun to be modified). The mechanisms of phrasal construction will be discussed in more detail later.
The above discussion has tried to explain how the different dimensions of lexical knowledge merge in the informational structure of lexical items. It has been argued that none of them has an independent standing, but that they are interdependent and interact in complex ways. I will now proceed with a look at lexical organisation in the light of the structural 'hardware', i.e., the representational substance of lexical items.

1.2 Lexical Connectivity

This section will outline the basic principles of lexical connectivity, which have already been touched upon in Chapter 1. I will here discuss the general idea of lexical network organisation and consider the relations that hold within lexical networks.

1.2.1 Lexical Networks

It is a commonplace that lexical competence does not consist in the knowledge of word lists but in a complex network of associations between lexical items. The words of a language are organised in contradistinction to each other, with those "having something in common ... associated together in memory" (Saussure 1972:121). This organizational principle is examined in lexical field theory, which goes back to the early years of the last century (e.g., Trier 1931). Lexical or semantic field theory describes the subdivisions of a lexical network as "a lexical field - that is, a set of lexemes or labels [i.e., lexical forms] which is applied to some content domain [conceptual field]", whereby the given lexemes are organised "by relations of affinity and contrast" (Feder Kittay/Lehrer 1992:3). Items within a semantic field are tightly connected, while links across fields are fewer and weaker (Aitchison, 1994:228). It is often added that the nature of links between words can be either semantic or form-based or a combination of both. This statement is certainly valid if one regards words as unified entities. However, taking into account the dual nature of lexical items, it appears more appropriate to suggest that those different links relate to connections at two different levels of representation,
and thus to two distinct networks, a semantic and a formal one (ibid:229; cf. also Harris/Coltheart 1986). I will distinguish the different networks as lexico-semantic and lexical-formal, respectively.

As was discussed in Chapter 1, neurolinguistic studies involving brain-damaged subjects, which evidence a selective impairment of specific linguistic abilities, furnish support for the hypothesis that language processing involves several distinct brain mechanisms, among them separate representational structures for lexico-semantic and lexical-formal knowledge (cf., e.g., Carroll 1999; Damasio et al. 1996; Raupach 1994). Describing these as 'networks' is, of course, to be understood as an analogy, an abstraction of physiological reality. As the discussion of conceptual structure (cf. Chapter 1) showed, the 'nodes' of a semantic network correspond to more or less scattered, partly overlapping neural activation patterns, whose often minimal differences mark the peculiarities of a concept in distinction to a related one. Similarly, and, perhaps, more obviously, formal similarity lies in a partial congruence of perceptual patterns. Illustrating this kind of organisation as 'networks of interconnected nodes', appears to be a suitable metaphor for linguistic description. How, then, can the internal structure of lexical networks be delineated? This question is most adequately approached with reference to the nature of the relations that hold within lexical networks. These will be outlined in the next section.

1.2.1.2 Lexical Relations

In order to describe and illustrate the nature of lexical relations, I will return to the example of the category HORSE introduced in Chapter 1.

Beginning with semantic relations, it was suggested that the organizational structure of the lexico-semantic network containing types of horses resembles the organisation of the associated conceptual subcategories, whereby more general words correspond to relatively simple conceptual configurations, and specific terms to more complex and abstract ones. The more complex and abstract a concept is, the more levels of representation it spreads across, and the narrower is the meaning of its referring expression. The semantic

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2 Strictly speaking, at the formal level two networks need to be distinguished, namely a phonological and an orthographic one. I will take this distinction as understood, and for the sake of simplicity and transparency subsume them under formal networks, refer to their respective elements as lexical forms, and, accordingly, to formal processing.
hierarchy has traditionally been described in terms of superordinateness (horse) and hyponymy, subordinate items, which in turn are classified as co-hyponyms (e.g., piebald - chestnut), (close) synonyms (horse - nag), or antonyms (mare - stallion), if they belong to the same subcategory (cf., e.g., Lyons 1995; Saeed 1997).

In Chapter 1, it was also demonstrated that the semantic field associated with horse goes beyond words for category members, including the terminology of the various values and value specifications of the attributes of horse. They are part of the semantic network, based on associations which can be classified as being either natural, conventional, situational, or personal (emotional). The connection of horse and brown or grey, for example, relates to naturally occurring colours; that of horse and saddle is conventional; horse and steak, in our parts, is an unusual and at best situationally motivated association; and an association of horse and holidays would be personal (or emotional).

A further observation concerns the nature of the elements of semantic networks. Although a truism, it should be emphasised that semantic networks contain semantic items only. Many functors, whether grammatical words or affixes, become associated only in the context of phrasal construction, i.e., when verbalising complex cognitive events which demand the syntagmatic connection of two or more semantic items. Functors are regarded as being connected to semantic items on the basis of grammatical-formal associations. This aspect will receive further attention in Chapter 3.

Other formal associations relate to the formal structure of lexical items. As discussed above, words are not only bound up in semantic but also in formal networks. These do not have a hierarchical structure, and the representational substance of its members is not spread across several cognitive levels. Instead, acoustic and visual word memory lies within the basic domain of the two modalities. Affinity and contrast are purely perceptual qualities: similar sounding or looking elements, relate to overlapping activation patterns on a perceptual continuum, while perceptually dissimilar items are regarded as distant. In other words, formal similarity relates to shared partial structures, such as initial, medial, or final sounds or syllables, and the overall prosodic pattern (cf., e.g., Aitchison 1994; Garman 1990). Horse, for example is thus associated with horn, house, and course alike, and even relatively complex forms like alligator and gladiator can be mentally connected. A range of specific relations that hold between members of a lexical-formal field concern

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3 As was discussed above, the formal distinction between semantic and grammatical items, or functors, is not meant to imply that the latter are semantically empty; their semantic quality was suggested to be of a different nature from that of semantic items, relating to specific relations between these, as opposed to an independent representational structure (cf. section 1.1.2.1).
phonologically or orthographically identical items: homonymy, as the name implies, refers to identical names for unrelated concepts (e.g., colt (foal) - colt (gun)), while homophony denotes phonological but not necessarily orthographic identity (e.g., horse - hoarse) (ibid.). The examples show that the elements in question are not conceptually related, although words can be both semantically and formally close. Formally and semantically identical or similar items across languages are known as cognates. They usually share the same etymology, while formally similar but semantically divergent items (false friends) may or may not be etymologically related.

I will now turn to language production and scrutinise some aspects of lexical processing in the light of the knowledge structures and organisational principles proposed.

1.3 Lexical Processing in Language Production

Psycholinguistic research has brought forth a range of models of language processing, which approach the matter from different angles. They fall into two categories, comprehension oriented models and models of language production. An overview of such models can be found in, e.g., Garman (1990) or Singleton (1999). I will here restrict my discussion to issues of production.

Language production is thought of as including a variety of component processes on the way from prelinguistic conceptualisation to articulation (e.g., Aitchison 1989; Bates/MacWhinney 1989; de Bot1992; de Bot/Schreuder 1993; Bierwisch/Schreuder 1992; Bock/Levelt 1994 (E/K); Dell 1986; Dell/O’Sheaghdha 1991, 1992; Garrett 1984, 1988, 1990; Green, 1986, 1993; Levelt 1989; Levelt et al. 1999). Following Garrett (1988:71), the main stages of language production involve three classes of processing systems, which he labels lexical selection, phrasal construction, and phonological encoding.

Of interest for the present study are lexical selection and phrasal construction, which together make up the process of ‘putting thought into words’, sometimes labelled sentence planning (e.g., Aitchison 1989), here referred to as utterance formulation. Lexical selection refers to the choice of semantic items representative of a conceptual content, phrasal construction to their meaningful arrangement. Of major interest for the present
study are processing mechanisms of lexical selection as emerging from the network organisation of semantic items outlined above. Phrasal construction is a complex issue, which will only be touched upon peripherally. It concerns the meaningful arrangement of semantic items, which involves various aspects of grammatical processing. It will be argued that phrasal construction should be seen as relating immediately to the information structure of semantic items, which supports the notion of the central role of the lexicon in linguistic processing. It will further be suggested that lexical selection and phrasal construction and associated syntactic and morphological operations should not be regarded as strictly distinct, successive processes, but instead as different aspects of the larger process of utterance formulation. Their separate discussion facilitates a focus on the processing of individual words, i.e., the lexicalisation of individual concepts, in distinction to a focus on the verbalisation of more complex conceptual contents.

1.3.1 Lexical Selection

Lexical selection is the first step towards expressing a concept in words. As Singleton (1999:29) observes, "there is, of course, no doubt that lexical choice and meaning are intimately linked". Lexical selection could be regarded as a choice of meaning. It is more than just putting ideas into words, demanding that we carve our "chaotic nature of thought" (Saussure 1972:110) such that it becomes expressible through language. As discussed in Chapter 1, only a fraction of actual and conceivable conceptual formations are lexicalised. This means that we may have to make concessions – consciously or unconsciously - in relation to the thought content we wish to express when deciding what to say or write.

Lexical selection is here used to refer to the process of accessing the semantic items required for verbalising a given conceptual content. It is thought to involve a consideration of alternatives, documented by production errors such as blends (e.g., "evious for evident or obvious (Aitchison 1994:198)). These 'mixed products' allow for the conclusion that two or more often equally suitable items can be activated together and can compete for selection. Aitchison points out that humans are thought to "automatically consider words that are inappropriate, provided they are in some way connected to the topic concerned" (ibid.:199). Usually, only the most adequate solution is finally verbalised. These suggestions agree with Baars' (1980) Competing-Plans-
Hypothesis, which assumes that a speaker/writer often has a number of possibilities for realising a communicative intention, whereby alternative plans convey different shades of meaning (ibid.:41). Baars' hypothesis, however, is not restricted to semantic choice. It assumes that competing plans are developed at various levels of processing, which is supported by different types of errors at word, phrase, and sentence level. Of interest here are lexical selection errors. These include the above-mentioned blends and other semantic slips (substitutions), but also products which are not connected to a given topic at all, but instead formally resemble a target item (e.g., *sink* instead of *think*). Formal slips reveal that alternative solutions are also considered at the formal level. This indicates that lexical selection is not a simple straightforward operation, but involves the spread of activation in different domains. It involves the search of an appropriate lexico-semantic representation within a given thought pattern and the activation of the right expression to convey this content. This latter process has been considered an automatic response occurring when a lexico-semantic unit has been activated beyond a certain threshold level (Raupach 1994:32, referring to Morton (e.g., 1979, 1982; cf. also Green 1986, 1993, 1998)). The operation, however, appears to be more complex. What might at first sight look like a relatively simple, two-step process is more likely a complex procedure which involves parallel and interactive processing at different cognitive levels. As substitution errors and blends reveal, lexical selection involves activation spreading at the semantic level, between the semantic and the formal level, and further at the formal level. Following neurolinguistic evidence (cf. Chapter 1; e.g., Damasio et al. 1996; Paradis 1997), this involves the activity of intermediate processing units, which were suggested to have the function of 'switchboards', coordinating conceptual-semantic and lexical-formal knowledge. In this view, lexical selection consists of an interactive activation of conceptual and formal knowledge. It comprises the process of detecting a lexico-semantic activation pattern within the conceptual continuum (here labelled *semantic search*), and the mapping of its corresponding lexical *form*, which I will refer to as *form retrieval*.

Above-mentioned competing plans can be related to the principle of *spreading activation*, which assumes that activation fans out from a given centre, stimulating adjacent structures (cf., e.g., Aitchison 1994; Bierwisch/Schreuder 1992; Dell 1986; Dell/O'Sheaghda 1992; Roelofs 1992; Zimmermann 1994). This can lead to an overactivation of neighbouring or closely connected structures and result in unwanted responses. Unwanted responses are seen as indicating a lack of control over the system, possibly involving a failure of
specific inhibitory mechanisms, as some researchers suggest (cf., e.g., Aitchison 1994; Green 1986, 1993, 1998). Green (1986:213) describes the assumed processing mechanisms involved in more detail. He suggests that

"the internal representation of words can vary in their level of activation. ... a word must reach a certain threshold of activation in order to become available as a response".

According to Green, it must also come to dominate over other possible candidates by reducing their level of activation. As slips of the tongue document, this inhibition can fail. In the light of the bipolar representational structure of lexical items, this hypothesis requires a more differentiated view. At both the semantic and the formal level, a target structure must come to dominate over neighbouring structures. As was mentioned before, different types of errors document procedural lapses at different cognitive levels. Activation can 'take a wrong turn' at either the conceptual or the formal level, resulting in the production of items semantically or formally related to a target item. It can also happen that a lexical form is only partially identified, insufficiently for production in speech or writing; this is known as the tip-of-the-tongue (TOT) state (Garman 1990:170). Here, activation seems to 'get stuck' before the full representational structure is detected. An adult speaker is usually able to retrieve beginnings and/or endings of words, stressed vowels or syllables, and an item's overall prosodic structure, which appear to be the most prominent acoustic features (cf., e.g., Aitchison 1994; Garman 1990; Raupach 1994). The TOT state often animates speakers to actively search the formal environment of the incomplete form, which may or may not lead to its full retrieval, or to an activation of formally similar items. The fact that slips of the tongue are often self-corrected, sometimes even before an erroneously activated item is actually articulated, suggests that language production involves immediate and automatic internal feedback about the validity of the output. Such feedback need not involve complicated operations or additional functional mechanisms. It could simply relate to an automatic backward flow of activation from the formal to the conceptual level, where the semantic structure of an activated lexical form is registered as either congruent with or deviant from the intended meaning. This hypothesis will be further explored in connection with the data analysis (cf. Chapter 6).

In conclusion, the discussion suggests that lexical selection is neither a single straightforward process, nor something which consists of clearly distinguishable processing stages. Instead it should be regarded as a
complex procedure involving the interactive activation of representational and presumably operational structures at different cognitive levels. Three realms of processing have been distinguished:

1. Processing within the conceptual level; this refers to the scanning of a given thought pattern in search of a lexico-semantic representation structure. It involves the stimulation of the environment of a certain target structure.

2. Processing across the semantic and the formal level; this refers to the mapping of meaning (conceptual content) and form (lexical expression).

Semantic search and form retrieval are closely associated and are seen as relying on the combined processing of conceptual and formal information. They involve the adaptation of a speaker's/writer's meaning (her conceptual content of intended message) such that it becomes expressible in words, and the output activation of a lexical form upon identification of a bipolar structure. Semantic search as the process of scanning the conceptual continuum thus requires information about the availability of a formal representation for a conceptual content in order to identify a lexico-semantic activation pattern. This entails that the retrieval of a lexical form happens only when it has been identified as being available before. It implies that lexical selection involves the interactive activation of conceptual and formal structures. This exchange of information between the conceptual and the formal level could at the same time relate to the mechanism providing feedback about the successfulness of the planning process.

3. The third realm of processing relates to activation spreading at the formal level upon reaching a target structure; it becomes evident from output errors involving formal confusions.

In sum, lexical selection is seen as a complex, non-linear process, initiated conceptually by a communicative intention and involving the interactive activation of conceptual and formal knowledge. It is seen as involving the forward and backward flow of activation in the process of identifying a lexical representation for a conceptual content. Semantic search and form retrieval are thus not regarded as corresponding to two distinct processing stages, but to two partial processes relating to the flow of activation at different levels. It should be
added that this delineation of lexical selection entails that it is a procedure applying specifically to the access of semantic words. Many grammatical elements are seen as being supplied on the basis of activation spreading from selected semantic items as part of the process of phrasal construction, which will be discussed in the following section.

1.3.2 Phrasal Construction

Phrasal construction is here used to refer to the meaningful arrangement of the selected content words, which is traditionally associated with grammatical processing. It involves syntactic and morphological adaptations, i.e., the sequential arrangement of the selected items, their affixation where appropriate, and an insertion of function words to specify their interrelation. This process has received considerable attention over the years and led to a range of processing models with highly divergent perspectives on the issue. I will briefly outline a selection of approaches to analysing the process of phrasal construction. Rather than discussing any of these models in detail, I will present some of their central hypotheses and scrutinise the general principles and mechanisms they propound.

Sentence structure is today widely accepted to depend to a very considerable extent on the lexical (semantic) items chosen to represent a given conceptual content (cf., e.g., Aitchison 1989; Bates/MacWhinney 1989; Bock/Levelt 1994; Dell 1986; Garrett 1984, 1988, 1990; Green, 1986, 1993; Levelt 1989; Levelt et al. 1999; Roelofs 1992). In Aitchison's (1989:258) words, "it is quite impossible to plan the syntax with no idea of the lexical items which are going to be used". Levelt (1989), in his Speaking model elaborates on this issue in what he calls the 'lexical hypothesis'. It entails that the use of a particular syntactic structure arises from the grammatical properties and sequential activation of the lexical items selected to convey this message (ibid:181). Despite the significance assigned to the lexicon, there seems to be considerable disagreement concerning its overall structure and its status and specific function in language processing. Likewise disputed is the nature of the mechanisms controlling lexical operations, in particular the question of the validity of the concept of grammatical rules as governing linguistic processing.
Rule-based models appear to be strongly oriented by structural-linguistic analysis, proposing representational cognitive levels analogous to descriptive grammatical categories. Dell (1986) and Dell/O'Sheaghdha (1992), for example, model the mental lexicon in the form of a connectionist network, consisting of four levels of representation for different aspects of linguistic structure. These include a semantic level containing nodes for concepts, a syntactic level for the grammatical structure of words in a planned utterance, a morphological level for the basic units of meaning (morphemes), and a phonological level for the basic units of sound (phonemes). Processing in the system is thought to happen in the form of activation spreading from an activated node to all the nodes connected to it. At each level, categorial rules are seen as being operative, constructing representations appropriate to their level of linguistic analysis. The system distinguishes between meaning-related and form-related operations, but nevertheless concedes a certain degree of local interaction (ibid.:311). Dell and O'Sheaghdha (ibid.:287) suggest a reconciliation of modular and interactive processing, "whereby modularity is traceable to the action of discrete linguistic rule systems, but interaction arises in the lexical network on which these rules operate".

The model is favourable in that it recognises the lexical network as the substance within which linguistic processing takes place under the principle of spreading activation. Its integration of a modular and an interactive activation perspective on linguistic processing was also suggested as plausible in the light of cognitive functioning (cf. Chapter 1). It was further argued that linguistic operations are likely to be controlled by certain procedural mechanisms mediating between the different levels of representation. Following the earlier discussion, however, it seems to be unlikely that these should relate to a discrete rule system. Likewise, there does not seem to be any sound evidence that the mental lexicon should consist of four distinct levels of representation, corresponding to the levels of structural analysis and yielding abstract intermediate representations. Different types of errors, as cited in support of such a structural hierarchy (cf. also Bock/Levelt 1994; Levelt 1989; Levelt et al. 1999) only evidence the fact that phrasal construction involves a variety of analytic processes and the spread of activation in different cognitive domains, but not that these correspond to a hierarchical representational array with abstract informational units.

Levelt and his colleagues (1999) go even further in their dissection of the linguistic processing system. They delineate lexical information as being spread across three cognitive strata and several levels of representation. Lexical items are thought to consist of a lemma specifying their semantico-grammatical profile,
a lexical concept (if applicable), and its morphemes along with their segmental and metrical properties (ibid.:6). Correspondingly complex is the proposed procedure of utterance formulation. Following Bock and Levelt (1994), it involves four discrete processing components associated with distinct grammatical operations. The first one relates to the prelinguistic process of **message generation**. It refers to the selection of lexical concepts suitable to represent a given conceptual content. Levelt et al. (1999:8) here emphasise the significance of the perspective taken on a scene for the choice of lexical concepts. It is thought to reflect the speaker's attitude and determine her choice of words (cf. also Langacker 1987:120). Verbalisation then begins with the outline production of an utterance, labelled **functional processing**. It involves the activation of lemmas representative of the intended message and their grammatical specification, which is referred to as **function assignment**. Functional processing is followed by **positional processing**, which involves sequential ordering (**constituent assembly**) and **inflectional** modification. Finally, **phonological encoding** activates the required lexemes, giving the utterance 'skeleton' a formal shape that can be articulated. The entire operation is thought of as being strictly serial, proceeding in a feedforward spreading activation network.

The model has a number of positive aspects, but it also raises a number of questions. Problematic is its approach to defining the structure of the lexicon. The alleged multiplicity of representational levels and their abstract informational content is seen as being unrealistically and unnecessarily complex (cf. Meara 1999a). The model generally does not appear to be very much concerned about relating its proposed organizational principles to cognitive functioning. It remains open, for example, **how** abstract grammatical knowledge or the linguistic rules responsible for grammatical processing are thought to be represented and how they become operative. On the other hand, the processing stages outlined by Bock and Levelt are useful in that they identify the informational, or analytic aspects necessary for the construction of sentences. These include the identification of what could be called the **semantic role** of the concepts contained in the intended message, and information about the corresponding arrangement of their lexical representations and of further linking elements. It remains unclear, however, why the processing of this information should relate to a series of discrete operations and involve the generation of several intermediate representations. The categorisation of errors as cited in support of Levelt et al.'s theory, may identify analytic operations and processing routes, but it is not seen as providing evidence for clearly distinguishable processing **stages** or even abstract intermediate
representations. Such a perspective seems to be oriented by structural linguistic analysis without questioning its neurolinguistic plausibility.

In the light of neuro-cognitive reality, it was argued (cf. Chapter 1) that grammatical competence is likely to relate to procedural coordinative knowledge, and that grammatical analysis reflects the heuristics of science trying to impose abstract structure on the products of this skill (cf., e.g., Ellis 1997). This does not seem to justify a transfer of the analytic categories of the product to the process in the absence of neurolinguistic support or evidence for such a position.

In sum, Levelt et al.'s model is found suitable to identify the perceived psychological reality of productive competence, but not necessarily the actual processing mechanisms involved in utterance formulation. It is useful for specifying the psychological information components associated with the distributional properties of lexical items, which constitute our knowledge of lexical valency structure. Its delineation of the representational structure of lexical knowledge and of the operations involved in linguistic processing, however, are seen as evidencing the fundamental deficit of being too exclusively committed to structural linguistic analysis, at the expense of neurolinguistic plausibility. The mental lexicon as well as its proposed operational system appear to be modelled beyond cognitive reality. In its unnatural complexity, the model is seen as lacking a basis of practical functioning and therefore ultimately lacking explanatory value.

An important general statement about language production is that, the fact that sentence articulation is a linear process does not entail that sentence planning also proceeds in a linear fashion (Wiebalck-Zahn 1990:87). It is conceivable and, indeed, likely that lexical selection and phrasal construction are mutually dependent and proceed alternately (ibid:85). This mutual dependence has been modelled by Aitchison (1989), who distinguishes two levels of utterance formulation, outline planning and detailed planning (ibid.:250ff; cf. also Dell/O'Sheaghda 1991). According to Aitchison, outline planning involves a choice of key words, the syntactic structures they determine, and an overall intonation pattern. Detailed planning, then, relates to the activation of supplementary items and their arrangement, including morphological adaptations.

"We possibly start by picking perhaps one key verb or noun, and then build the syntax around it. Later we slot other words into the remaining gaps." (ibid.:258).

With regard to the informational content of lexical items, this entails that
"If a key word triggers off syntax, then we must assume that words in storage are clearly marked with their word class or part of speech ... as well as with information about the constructions they can enter into." (ibid.)

Aitchison's hypotheses also bear witness to some structural-linguistic influence, but without imposing its descriptive categories on proposed cognitive structure. Lexical items being 'marked with word class or part of speech' is, of course, an abstract semantico-grammatical description. A cognitive linguistic delineation might talk about items being known in terms of their semantic role, which captures their conceptual status without assuming abstract grammatical knowledge behind it. 'Information about the constructions they enter into' relates to their combinatorial potential, both conceptually and formally. This information is seen as being particularly important in relation to predicative items, which, by virtue of their argument structure determine sentence structure. This issue will be discussed in more detail in Chapter 3.

The appeal of Aitchison's model lies in the fact that it recognises the central role of lexical knowledge in grammatical processing. Her distinction of two basic stages of sentence planning, or utterance formulation, is also considered to be relatively realistic, for the following reasons. Semantic items need to be selected and identified for their position in order to know which grammatical items will be required to specify their relation and to complete an utterance. Therefore, two formulation phases are seen as essential, relating to the activation of content words and functors and their respective placement. Two processing phases can also be sufficient, if, following earlier suggestions, grammatical processing is reduced to the coordinated activation of the semantic and grammatical elements in question, which renders processing rules and graduated intermediate products unnecessary. In sum, Aitchison's model is seen as providing a valuable framework for explaining the process of utterance formulation. It acknowledges that a large proportion of grammatical knowledge relates to the information structure of lexical items, and it allows for dispensing with abstract rules and representations.

Aitchison's suggestions are in line with the Competition Model put forward by Bates and MacWhinney (1989), which aims at relating language use to general cognition (ibid.:3). In the Competition Model, utterance formulation starts from a richly endowed lexicon, which specifies the meaning and distributional properties of each lexical item. These include information about an item's collocational and colligational environment.
"The basic assumption is that as the input is processed it simultaneously activates all of the items that are consistent with it" (Green 1993:260).

This implies that word selection, as initiated conceptually, is supplemented by further activation spreading out from the selected items. Green (ibid.:261) adds that, if lexical items also specified positional information, the process of phrasal construction could be explained in relatively simple terms in the light of lexical information structure. This inclusiveness of lexical information structure is seen as a central aspect of linguistic organisation and will be elaborated on in Chapter 3. The Competition Model also has its favour in the fact that it accounts for the process of utterance formulation by assuming a direct mapping between conceptual and formal representations at both word and sentence level, involving their interactive activation (Bates/MacWhinney 1989:37ff).

In summary, the discussion has shown that different approaches to modelling language production are useful for shedding light on different aspects of linguistic competence. Many models, however, appear to be too exclusively committed to specific views of linguistic organisation to allow for a global perspective. It is therefore suggested that one should approach the task of constructing a comprehensive model of linguistic organisation by integrating different perspectives on lexical and grammatical processing.

1.3.3 Conclusions

Utterance formulation has been defined as the selection and meaningful arrangement of lexical items to represent a complex conceptual content. It is seen as involving a range of analytic and coordinative operations, which involve the spread of activation in the lexical network. Aitchison's (1989) model of sentence planning, which suggests a distinction of two processing stages and assigns a considerable proportion of grammatical knowledge to lexical information structure, was argued to provide a useful framework for elucidating the mechanisms of utterance formulation.

The two phases of utterance formulation were suggested to relate to the activation and ordering of the semantic items representative of a conceptual configuration and the completion of the utterance by inserting functors to specify their interrelation. Syntax is seen as depending on the conceptual organisation of the
semantic elements involved. Their conceptual status determines their sentence position in accordance with their valency structure. Predicative items are seen as playing a central role in phrasal construction because they establish the grammatical framework to be used. This grammatical framework is suggested as relating to flexible formulaic sequences governed by verbs and relational nominals. Formulaic sequences are prefabricated linguistic patterns of various complexity, which render language use more economical (cf., e.g., Perkins/Wray 2000; Wray 1999). They reduce the cognitive load by providing verbal routines, thus minimising the need for analytic operations. As opposed to fixed phrases, flexible formulaic sequences provide a structural outline framework containing slots for certain groups of lexical items (ibid.). The activation of predicative items is seen as triggering their associated grammatical constructions, which includes the morphosyntactic specification of their arguments. It involves the sequential arrangement of the selected semantic items and the activation of functors, which link them up, indicating their interrelation. The specification of functors is thus seen as depending on the constellation and on the formal shape of semantic items. Their activation is seen as being initiated by activation spreading from these. This hypothesis entails that functor specification is an integral aspect of a semantic item's colligational structure, or syntactic valency. Such a perspective agrees with Bybee's (1988:140) theory that morphological 'rules' are combinatorial generalisations and as such part of the representational structure of lexical items. On this account, the entirety of knowledge required to construct larger stretches of language can be related to the information structure of lexical items, rendering the notion of an underlying grammatical rule system redundant. This hypothesis seems to sit well with evidence about neuro-cognitive functioning, and also with the fact that native speakers process their L1 without the need for explicit knowledge of grammatical rules.

1.4 Summary

The discussion of the informational structure of what is commonly referred to as the 'mental lexicon' has suggested a range of principles of lexical organisation and processing relevant for the present study:
1. Lexical knowledge is spread across several cognitive domains, involving
   
a) three different levels of representation; a lexico-semantic one, embedded in conceptual structure; a
   lexical-formal one, relating to auditory and visual information; and an articulatory level, associated
   with motor activation patterns for spoken and written output;

b) combinatorial information, which determines the meaningful arrangement of lexical items into larger
   stretches of language to represent complex conceptual configurations. This information can be
described with reference to the valency structure of lexical items, i.e., to information about their
distributional properties, or contextual behaviour, both semantically and formally. The neuro-cognitive
structure of this knowledge is a controversial and speculative issue; however, in the light of an
absence of conclusive evidence for an abstract mental representation of grammatical rule
knowledge, and considering the argument that lexical processing can be explained without assuming
such knowledge, it seems plausible to relate combinatorial information to the procedural skill of
coordinating the activation of lexical elements in accordance with their distributional properties, rather
than to grammatical rule knowledge. This debate, however, is not a central issue of the present
thesis.

2. In view of the complexity of lexical knowledge, 'lexical items' must be regarded as abstract cognitive
   entities, multidimensional knowledge units which integrate in their information structure the entirety of
linguistic knowledge, including a large proportion of grammatical information. In other words, our
common-sense understanding of 'words' is seen as relating to the joint information of several dimensions
of knowledge.

3. The structure of the representational substance of lexical knowledge can be modelled in the form of
connectionist networks. These involve, of course, a certain degree of abstraction from the underlying
cognitive structures, but are considered suitable to represent their organisational principles. Depending
on the degree of abstraction (i.e., whether 'lexical items' are viewed as psychological units or dual
knowledge structures), one or two networks may be discerned.

4. Lexical processing involves neuronal activation spreading across the different domains of lexical
knowledge.
5. Utterance formulation consists of two interactive processing phases, which involve
   a) the selection and ordering of semantic items as representative of a conceptual content to be verbalised; lexical selection as part of this process, was defined as the process of activating lexical forms upon the selection of associated conceptual-semantic structures. This selection includes the activation of predicative items and their arguments. Predicative items, by virtue of their argument structure, provide a flexible framework for sentence structure.
   b) the completion of the utterance, which involves the activation and arrangement of functors to link up the semantic items and to specify their meaning; the required functors are seen as being triggered by activation spreading from the selected semantic items.

6. Production errors mark the points of breakdown of the processing system, thus providing insight into the architecture of the lexicon and allowing for conclusions about the mechanisms of utterance formulation.

In summary of the issues raised by Hypothesis 2, it is concluded that morpho-syntactic knowledge and grammatical processing in phrasal construction can be accounted for entirely with reference to the information structure of semantic, and in particular predicative items.

I will now turn to questions of plurilingualism and consider the above organisation principles in the light of the peculiarities of the plurilingual mind.

2. PLURILINGUAL LEXICAL ORGANISATION AND PROCESSING

2.1 Bilingualism

2.1.1 The Bilingual Mind

This section investigates lexical organisation and language production in a bilingual perspective. Bilingualism as the most basic variant of plurilingualism refers to speakers with varying or similar degrees of command of two languages. Bi- and multilingualism have more recently come to be recognised as a distinct state of mind,
referred to by Cook (e.g., 1991, 1992) as holistic multicompetence. Language is here regarded as "inherently dynamic, something that exhibits change and flux and is characterised by motion resulting from 'natural forces'", which takes a particular profile in the individual (Hytenstam/Viberg 1993:3). It thus stands in opposition to the Chomskyan view of language as a steady state (Jessner 1997:26). The complexity and dynamics of general linguistic organisation multiplies in the bilingual speaker, who must be regarded as a specific individual whose language competence goes beyond that of two monolinguals in one person (cf. Grosjean 1989). In the light of the earlier discussion of language and thought and the lexicalisation of conceptual knowledge (cf. Chapter 1), the biggest challenge in learning a second or foreign language is to start 'thinking differently', i.e., to take new perspectives on familiar contents, which is a necessary requirement in view of diverging verbalisation patterns across languages (cf. Cohen 1998:161). This leads to the development of two "dynamically interacting linguistic subsystems which themselves do not necessarily represent any kind of constant but are subject to variation" (Jessner 1997:27). The most important factor of functioning and variability is considered to be proficiency, and the bilingual lexicon is regarded as a "mixed system containing different types of structures and linkages between them for different types of words" (Romaine 1995:119).

A much-debated issue is the relationship between two languages in the brain. Are the lexicons of two languages organised similarly, are they stored and accessed separately, or do they function in an integrated manner? This question has been investigated extensively by Singleton (e.g., 1996, 1997, 1999), who confirms Romaine's (1995:119) suggestion that seemingly contradictory experimental results are likely to reflect systematic differences in the populations tested, or may be due to the nature of the task that subjects were required to perform. Singleton (e.g., 1999:189f) draws the conclusion that L1 and L2 mental lexicon are neither completely separate nor entirely integrated systems, but can be of variable character, depending on individual factors, such as mode of acquisition, perceived linguistic distance, or level of bilingual proficiency.

Along with a variable organisation of the bilingual lexicon, bilingual processing can take different routes. In principle, however, it is considered not to be radically different from monolingual processing (cf., e.g., de Bot

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4 I will follow the convention of using the term 'second language' to refer to any non-native language, independent of the mode of acquisition. 'Foreign language' will be employed as a stylistic variant in the same sense.
This psycholinguistic position is supported by the earlier-cited neurolinguistic evidence of cortical activity in bilingual production (cf. Chapter 1). Neurolinguistic studies show that the distribution of activity in different cortical regions can vary quantitatively, but that generally, multiple languages avail of the same neural substrate (ibid.; cf. also, e.g., Cook 1992). In the light of the cognitive foundations of lexical knowledge, this is not surprising. It was argued that the representational substance of lexical knowledge is embedded in general conceptual and perceptual structure (e.g., Damasio et al. 1996; Gazzaniga et al. 1998). On the basis of this hypothesis, it is obvious that – at least in relation to its lexico-semantic and lexical-formal substance – language as such can be but one integrated system. Psychologically perceived separation is seen as arising from the ability to process two or more languages separately, which could relate to differences of connectivity between the representational structures of different languages (cf. below). Raupach (1994) emphasises the need for investigating processual aspects in order to account for plurilingual lexical organisation. He suggests viewing the mental lexicon as being characterised by its processing activity, rather than describing it as a static entity (ibid.:37).

The further discussion will consider both static and dynamic aspects of plurilingual organisation, the former relating to the structure of semantic and formal substance, the latter to the spread of activation within these structures.

2.1.2 The Bilingual Mental Lexicon

2.1.2.1 L2 Lexical Knowledge

As was suggested above, L2 lexical knowledge is seen as relating to the same general organisational principles as L1 lexical knowledge. Differences between L1 and L2 lexical organisation are associated with the fact that a second language, in particular if acquired in classroom learning, tends to be integrated in the existing linguistic system and is therefore less independent than an L1. Principles of bilingual organisation in view of this perspective will be discussed in the following sections. A few other aspects of L2 lexical organisation are worth mentioning. Following Wray and Perkins (e.g., Perkins/Wray 2000; Wray 1999), the L2
lexicon involves more analytically stored elements and less formulaic sequences, which has implications for the processing of L2 vocabulary as will be discussed later.

To ensure that lexical items are associated with a context of use, modern L2 instruction includes the teaching of what I will refer to as basic formulaic phrases, such as be afraid of, look forward to doing something. Such phrases are flexible formulaic sequences, which provide the language learner with information about the collocational and colligational environment of their governing elements, perhaps most importantly about the valency, or argument structure of predicative items. Combinatorial knowledge of L2 vocabulary must generally be considered fragmentary, because of the L2 learner's limited experience with usage contexts. In terms of colligation, grammatical rules can compensate for this deficit. Explicit grammatical knowledge as the basis of linguistic operations is thus one of the main differences between L1 and L2 competence. A lack of L2 collocational knowledge tends to be compensated for by a transfer of the semantic valency of closely related L1 items, often in ignorance of distributional differences of so-called translation equivalents. This potential error source will be discussed in more detail later in this chapter and in Chapter 3. I will now proceed with a closer look at bilingual network organisation.

2.1.2.2 Bilingual Network Organisation

Languages are today commonly regarded as forming distinct but interlinked and interacting subsystems of a common linguistic system, which follow similar though language-specific principles (cf., e.g., Fabbro/Paradis 1995; Green 1986, 1993, 1998; Perecman 1989; Paradis 1985, 1987, 1997; Singleton 1996, 1997, 1999). Proceeding from the above notion that their nature and interrelation is by no means unitary or static but dynamic and flexible, Paradis (e.g., 1985, 1987) proposes a model of bilingual organisation which takes account of these assumptions. His widely accepted Subset Hypothesis suggests that two languages are stored in identical ways in a single common system, whereby the elements of each language are seen as forming separate networks of connections. In the light of findings obtained from aphasia studies, which evidence selective impairment of different languages, Paradis concludes that bilinguals must have two subsets of neural traces, which enable them to access their languages separately, while at the same time a
larger set embraces the whole system, rendering possible language mixing. He emphasises that the organisation of two languages can vary across individuals and within individuals across time. According to Paradis, a typical developmental sequence in the process of L2 acquisition involves the shift from a mixed L1/L2 system to two distinct subsystems. In early stages of acquisition, second language items typically have strong ties to corresponding first language items, forming what he calls an extended system. Those interlinguistic links become looser as, with increasing proficiency, the L2 network builds up. Eventually, the two languages are thought to develop into (more or less) independent subsystems. Some of their elements, however, such as cognates, may retain their strong primary connections.

In anticipation of the discussion of multilingual organisation, it may be mentioned that further languages are viewed as following the same general principles as the first second language. Likely to start as an extension of another language (although not necessarily the L1), they may gradually turn into more or less independent subsystems. Which languages are most readily associated and to what extent a second language will become independent is variable, relating to individual factors such as the above-mentioned perceived linguistic distance, method of acquisition, or user proficiency.

Paradis’ model appears suitable to explain a selective impairment of individual languages in aphasic patients, as well as the seemingly contradictory phenomena of language mixing and separate processing in healthy speakers. It does, however, raise the question of the nature of several different subsets of neural traces, proposed by Paradis. Where languages share the same neural substrate and the interconnectivity of their elements is not only variable but, indeed, changes repeatedly, it is hard to imagine that these constant changes should involve complex physiological adaptations. Furthermore, the knowledge of multiple languages would require several distinct systems and additionally various types of crosslinguistic connections, which appears to be neuro-physiologically unlikely. It seems more plausible to assume that differences between intra- and interlinguistic connections relate to the strength and quantity of these links. With frequent use and increasing proficiency, intralinguistic associations multiply and grow stronger, and intralinguistic processing becomes automatised. Crosslinguistic connections, on the other hand, become weaker due to lesser use (cf., e.g., Eccles 1989).

Albert and Obler (1978:246) characterise the general framework of crosslinguistic connectivity in the following words:
"It is clear that words in one language, and their translation equivalents in the other (when such exist), are related in the brain in a non random way, much as a word and its synonyms in the same language may be connected in an associational network."

The following section will trace the connectivity between words of two (or more) languages.

2.1.2.3 Bilingual Lexical Connectivity

The relationship between the L1 and L2 mental lexicon as a whole is bound up with the relationship between the words of the two languages. Lexical items are semantically and formally linked, in such a way that association at the formal level is an 'inbuilt' perceptual classification phenomenon, resulting from phonological and orthographic similarity, while semantic links are learned associations. Typologically related languages usually have a higher degree of structural (including formal) resemblance than distant languages, and often share cognates, i.e., words which are similar in both form and meaning. Congruence or similarity at both the formal and the semantic level can give rise to an overgeneralisation of the correspondence between two lexicons or linguistic systems. Distributional aspects or grammatical valency, on the other hand, tend to reveal subtle but important differences (cf. below).

Weinreich (1953) established a framework of modelling the relationship between the first and second language mental lexicon, which can be extended to take account of additional languages on the same basis. His model starts from the bipolar nature of lexical items and scrutinises the range of possible connections as emerging from structural and psychological factors. It proposes three categories of bilingual organisation, or cross-linguistic lexical connectivity (cf. figure 2.1):
In a **subordinative** relationship, a second language expression is connected to a first language concept via a primary link to the corresponding first language form. A **compound** arrangement posits a connection of word forms at the conceptual level, i.e., a second language form is associated with a first language concept. **Coordinative** bilingualism refers to a situation where two expressions are associated with two distinct concepts. Weinreich relates the type of bilingualism found in a person to learning experience, and points out that a bilingual mental lexicon need not be of a single type only.

De Groot (1993) elaborates on Weinreich’s model, suggesting a mixed representational system, in which cognates and concrete words are subject to compound storage, while non-cognates and abstract words are processed coordinatively. De Groot (ibid.) and Woutersen (1997) have further extended the model to include proficiency as an additional variable. They found that early stages of second language learning are often characterised by subordinative connections, with a gradual shift towards compound and coordinative organisation. This perspective appears to be a valid account of the variability and constant flow of the language systems in a second language learner and a bilingual individual, which Jessner (1997:26) ascribes to "the various factors involved in the language acquisition process". Acquisitional factors – a discussion of which I will not pursue here – include most prominently age and method of acquisition. An additional variable, suggested by the data of the present study, is the classroom language, in cases where second language learning is mediated by a language other than the mother tongue. This issue will receive further attention in Chapter 6. Besides accounting for cross-linguistic lexical connectivity, the Weinreich-De Groot-Woutersen model is suggestive for aspects of lexical processing, in particular for mechanisms at work in form retrieval in production and concept access in comprehension. It may provide a partial explanation for individual differences in both automatic and strategic processing, relating to the types of crosslinguistic connectivity.
2.1.3 Lexical Asymmetries Across Languages

In Chapter 1, it was shown how languages can vary in their lexicalisation patterns. The conceptual continuum, can, for example, be carved up differently according to the needs of a speech community (cf., e.g., Eysenck/Keane 1995: 352). Ideas or distinctions relevant to one population might be completely negligible for another. These differences are reflected in the structural organisation of a language and follow the principle of language economy (Wemer 1987, 1989, 1991). With regard to the lexicon, Wemer (1987: 193) posits that frequently used conceptualisations call for a ready-made expression, in order to avoid the cognitive effort involved in the composition of complex formulations. A lexicalisation of less frequently expressed ideas, on the other hand, would not only overload the memory, the rare use of those items would render their memorisation difficult in the first place (ibid.).

Object categorisation is a field where crosslinguistic differences are most obvious. An example of asymmetric lexicalisation patterns can be found in the lexical field associated with our category HORSE. English here lexicalises, for example, the distinction between a male and a female foal (colt - filly), while German does not. German, on the other hand, has several expressions for horses of different colours, which do not exist in English (e.g., Schimmel (mould - white horse), Rappe (black horse), Fuchs (fox - reddish-brown horse).

Other cognitive events, such as inner states or processes, which involve more complex conceptual configurations, may not only vary in relation to whether or not they are lexicalised, but also in relation to the semantic and formal structures by which they are represented. Such differences reflect different ways of conceptualising certain events, in particular different perspectives on a scene (cf. Langacker 1987: 120). A simple example, again comparing English and German, may be given from the field of emotional states. Here, the two languages differ, for instance, in their most general way of expressing the concept of FEAR. While English avails of an adjectival construction (be afraid (of something)), which expresses the affective state of the experiencer, German employs a nominal construction (Angst haben (vor etwas) - 'have fear (of something)'), which seems to model the emotion more as an impersonal entity that has 'taken possession' of the experiencer (cf. Chapter 1). Other, more subtle differences manifest themselves in divergent valency structures of related expressions. Further examples of this will be discussed in Chapter 3.
2.1.4 Language Processing in the Bilingual Lexicon

2.1.4.1 General Prospect

It was mentioned already that bilingual processing is taken to be subserved by the same general mechanisms as monolingual processing (cf., e.g., de Bot 1992; de Bot/Schreuder 1993; Green 1986, 1993, 1998; Singleton 1997, 1999; Singleton/Little 1991). Analogous to L1 production, L2 production is thought of as a complex procedure involving a range of coordinative operations on the way to articulating a conceptual content. An important difference is that phrasal construction in an L2, in particular in early stages of classroom learning, is to a lesser extent proceduralised but mediated by the declarative grammatical knowledge. I will come back to this question later.

Concerning the question of separateness or integration of multiple languages, studies of language mixing and code switching suggest that in bilingual production "both languages are activated when a bilingual prepares to speak and the two languages interact via links between the corresponding stages along a processing continuum" (Perecman 1989:227). Green (1986, 1993, 1998) suggests that the languages of the plurilingual mind can vary in their level of activation. He distinguishes between a selected, an active, and a dormant status. Selected is used to refer to the language chosen for and widely controlling the language output in a given situation; an active language would be one activated along with the selected language, but (normally) below output threshold only; dormant denotes a language stored in long term memory but with no influence on the ongoing production process. Which of the languages of a plurilingual individual becomes activated during production and has a possible influence on the target language product relates to several factors, among them frequency and recency of use, (perceived) linguistic distance, or situational conditions (cf., e.g., Dewaele 1989, 2001; Hammarberg 1998; Möhle 1989; Raupach 1994; Williams/Hammarberg 1998). The specific roles of 'active' languages and their variables will be discussed in more detail in the context of multilingual processing.

On the whole, crosslinguistic consultation and crosslinguistic influence in L2 use must be seen in relation to crosslinguistic connectivity. This takes us back to the question of the relationship between two languages in the mind. Based on data collected in the Trinity College Dublin Modern Languages Research Project (TCD
MLRP), Singleton (1999) suggests a certain degree of integration of L1 and L2 vocabulary. His L2 performance data exhibit a considerable amount of crosslinguistic consultation in L2 problem solving, however, not to an extent that would justify the notion of entirely integrated lexicons (ibid.:250). Varying degrees of crosslinguistic influence suggest that separateness, or rather, separate processing of different languages depends to a considerable extent on L2 competence. Singleton found that "lower proficiency is associated with higher levels of L1/Ln-based solutions to L2 problems" (ibid.), which furnishes support for Paradis' proposal that a second language starts off as an extension of another language (the mother tongue or another L2), allowing for recourse to that language in cases of difficulty (e.g., 1985:23f). It should be added that crosslinguistic consultation may also be the only option left to the learner if her L2 system is too weak to offer alternatives for the non-availability of an item in demand. With a developing L2 lexicon the range of possibilities grows, and intralinguistic processing increases, due to strengthened connections and a larger selection of material.

A further important result of Singleton's investigations relates to individual variation in L2 performance. He concludes that

"different individuals make different use of the organisational resources on offer. Thus, for example, while connectivity between the L1 and the L2 lexicon seems to be universally present, individuals vary in the extent to which they exploit such connectivity in solving their L2 problems." (ibid.:265).

This statement seems to be applicable to strategic processing in general (cf., e.g., Ridley 1997), and it can also be taken as one possible explanation for variation in form- and meaning-based processing. Individual variation, however, will be of only marginal interest in the present study. The main focus of my investigation will be on the general principles that transcend individual differences.

2.1.4.2 L2 Formulation

Utterance formulation as the process of putting-thought-into-words was said to include the selection of semantic items, their meaningful arrangement, and the supply of functors to specify their interrelation. I will now focus on questions of lexical selection, which are the main matter of interest in the present investigation.
As in L1 production, L2 lexical access is thought to follow the general principle of spreading activation, which can, here too, explain the process of semantic search and form retrieval and account for production errors (cf., e.g., Poulisse/Bongaerts 1994; Zimmermann 1989, 1994). The mechanisms at work in bilingual processing are much the same as those of monolingual lexical access, where neighbouring items receive stimulation from activation spreading in the area of a target structure. Green (1986, 1998) suggests that items are simultaneously stimulated in both languages, with only those of the required language being activated for output. Similar to a monolingual situation, unwanted responses among competing structures are thought to be suppressed by specific inhibitory mechanisms (ibid.).

A deeper look into the mechanisms of L2 lexical processing takes us to the routes taken in lexical access. Here, a question of recent debate has been whether there are fundamental differences between LI and L2 processing. A frequently taken view is that in the mother tongue, strong semantic links give rise to predominantly meaning-based operations, while in a second language stronger phonological connections result in primarily form-based processing (cf. Meara 1984:233f; cf. also, e.g., Channell 1988; Laufer 1989;). This hypothesis, however, appears to be a one-sided perspective, often based on meagre evidence. Zimmermann (1994:118), investigating processing strategies in lexical search, mentions instances of seemingly form-oriented processing, which on closer scrutiny—in this case on the basis of think-aloud introspective data—turn out to be semantically oriented after all. Such findings should be understood as a warning against rash interpretations of seemingly clear relations. Singleton (1999:189), after discussing a wide range of second language studies relating to the question of the role of form and meaning in L2 acquisition and processing, arrives at the conclusion that

"while formal processing may play a particular important part in early stages of the learning of a new word—in both L2 and L1—... lexical units are increasingly processed qua meaning rather than qua form as their integration into the mental lexicon progresses".

On this account, 'integration' of items in the lexicon relates to their strengthened position in the system on the basis of having established semantic connections. It is worth noting in this context that formal associations are structure-inherent and as such naturally available, while semantic associations are learned (cf. above). Singleton (ibid.) observes that "meaning rather than form poses the greater challenge in lexical acquisition ... in both L2 and L1". With regard to the relationship between L1 and L2 items, it is therefore not surprising, that
early stages of L2 learning, where semantic links are still scarce and often unstable, are characterised by subordinative organisation and, correspondingly, by form-mediated processing. Increasing lexical proficiency, which is here seen as corresponding to the integration of words in the semantic network in either a compound fashion or coordinatively, then allows for increasingly semantic processing – which must be considered the natural driving force of language use; after all, the pivot of lexical operations, or linguistic processing in general, is the meaning that is communicated – mediated by linguistic form.

Finally, a few words may be spared for L2 phrasal construction. It was already pointed out that it is, especially in early stages of L2 acquisition, mediated by explicit grammatical knowledge involving the controlled reflecting application of morpho-syntactic rules, which coordinate analytically stored lexical items. This operation is gradually proceduralised as the L2 system becomes more independent and fluency increases. L2 vocabulary, however, is not only learned as words in isolation. As was mentioned earlier, modern teaching material includes basic formulaic phrases, in particular in connection with predicative items. They provide the learner with flexible grammatical constructions, i.e., a formal context which can and has to be modified according to the situational conditions. This adaptive process includes in particular inflectional and word order specifications and the slotting in of situationally relevant arguments (e.g., the phrase look forward to something has to be completed with two arguments, and the verb has to be inflected: Peter is looking forward to his holidays). It was pointed out before that such phrases governed by predicative items provide the language learner with information about the argument structure of these predicative items. This is seen as important because the argument structure even of close translation equivalents can vary considerably and give rise to erroneous transfer. In cases of an insufficient knowledge of lexical valency structure and morpho-syntactic regularities, L2 phrasal construction is often oriented by L1 formulation patterns or by seemingly correspondent L2 structures. Crosslinguistic and intralinguistic transfer in grammatical processing will be discussed in more detail in Chapters 3 and 6.

I will now proceed to discuss a model-theoretic approach to identifying the mechanisms of bilingual processing. The following section takes a look at spreading activation in artificial neural networks, which suggests that lexical activation in a plurilingual setting can be traced back to system-inherent organisational principles.
A relatively recent approach to modelling lexical organisation comes from Meara (1999a, 1999b), who investigates self-organisation in artificial neural networks. Criticising the opaque complexity of the psycholinguistic models in the tradition of Levelt's (1989) Speaking model, his declared goal is to build noncomplex formal models which not only describe a certain process or operation but also specify how it works. His so-called Random Boolean Networks simulate simple lexical networks consisting of a set of units - thought of as lexical items - which are variably interconnected. They thus resemble psychological lexicons in which words are regraded as unified entries.

According to Meara, (1999a:135), certain phenomena emerge "as a property of the entire system as a whole" and are not adequately accounted for by focussing on the properties of individual words. He starts from the simple assumption that words are connected to other words in the lexicon, in such a way that their degree of intertwining in the system can vary in terms of the quantity and quality of their links. Each 'word' is assigned to a 'language' and connected both 'intra-' and 'cross-linguistically', such that the interconnectivity within a language is denser than across languages. Links can be uni- or bi-directional, which relates to the way they can receive and pass on stimulation when the system is taken into operation. 'Lexical items' are either in an active (or ON) or in a dormant (or OFF) state, simulating active and passive vocabulary. Unlike Green's (1986, 1993, 1998) hypothesis, which proposes that the whole language system is selected or active or dormant, activeness is here a quality of the individual word. It depends on the state of the items it is connected to in the sense that it receives stimulation from its 'active' neighbours and becomes 'active' itself when a certain threshold has been reached. The model simulates lexical activation through stimulation fanning out from a certain point in the system that has been activated. Random stimulation in any part of the system leads to a flow of forward and backward activation, changing the 'alertness' state of its units. When stimulation ceases, the system eventually settles back into a steady state. It is set up such that its initial steady state distinguishes an assumed 'L1' from an 'L2' in that active L1 units outnumber active L2 units. Under stimulation, this distribution of alertness can change. Meara (1999a) found that under stimulation the system tends to activate predominantly units of the stimulated language. When activation ceases, it soon settles back into an equilibrium state with a 'dominant' L1. These results resemble real-life linguistic behaviour surprisingly
accurately. It is a well-known phenomenon that a weaker L2 can temporarily become dominant under activation, for example in an L2-speaking environment. Meara’s findings suggest that this phenomenon appears to be a property of the system as a whole, i.e., resulting from the kind of interconnectivity prevailing among its elements, which canalises the spread of activation in the network. It offers a solution to the question of how bilinguals keep their languages apart. Due to a dense network of intralinguistic connections, which dominate both quantitatively and qualitatively over crosslinguistic links, the activation of a given language automatically leads to a predominant stimulation of items of the same language. In relation to Paradis’ Subset Hypothesis, it also demonstrates that there need not be distinct sets of neural traces for the networks of different languages, but that subsystems can emerge simply on the basis of number and directionality of connections. Such an explanation must, of course, be considered a gross simplification of the actual cognitive facts. However, it seems to provide a set of principles which are able to explain certain aspects of lexical organisation and lexical processing on the basis of system-inherent structures.

Meara (1999b) also simulated recovery from bilingual aphasia, which can be explained in similar terms by the mechanisms emerging from the structural organisation of the system. I will not discuss these experiments in detail, only quote Meara’s conclusion that ”What these simulations show is that complex underlying patterns of recovery do not necessarily imply a complex underlying organisation” (ibid.:53).

In sum, Meara’s findings appear to be applicable to the organisation of the mental lexicon from a psychological viewpoint. They suggest that the mental lexicon should be viewed as a self-organising and self-regulating system, whose processing mechanisms emerge directly from its structure. It should be interesting to extend Meara’s models to include the bipolar dimension of lexical knowledge and simulate stages of lexical access in a network comprising two representational levels. Another challenge could be to model the nodes of a comprehensive psycholinguistic network, the lexical items such that the multidimensionality of their information structure becomes discernible. this would facilitate an illustration of their multidimensional connectivity. The complexity of the mental lexicon could then be accounted for with reference to the nature of its elements. Chapter 3 will make some suggestions towards approaching such a model.

The remainder of this chapter will take a look at multilingualism, and focus on the peculiarities that arise when the mind has to deal with more than two languages.
2.2 Multilingualism

2.2.1 Multilingual Lexical Organisation

It was suggested already that the plurilingual mind builds on the same cognitive organisation principles as the monolingual mind with, however, an exponentially increasing complexity the more languages are involved, owing to the multifarious interconnection of the respective languages. In this perspective, multilingual lexical organisation can be regarded as a continuation of bilingual organisation, which, however, displays certain particularities that arise from the complexity of the system and from the peculiarities of the different languages. Important differences across languages concern the lexicalisation of conceptual knowledge, which can diverge considerably, as Raupach (1994:26) points out (cf. also section 2.1.3 above). Most fundamentally, certain conceptualisations may be lexicalised in one language but not in another. Lexicalisation patterns can further vary in the sense that different languages avail of different formal structures to express certain conceptual contents, and that the combinatorial properties of lexical items can vary. This variation is a challenge to L2 acquisition and use, as familiar processing mechanisms may have to be redefined according to the diverging structures of the new system. Typologically related languages generally have a higher degree of similarity than distant ones and do not demand as much reorganisation. They are more readily associated and are usually cognitively more tightly connected. In sum, multiple languages are seen as being linked up variably in the mind, which can result in different roles in multilingual processing, as will be discussed in the following section.

2.2.2 Multilingual Lexical Processing

According to Möhle (1989:183) "knowledge of several foreign languages – without respect to the degree of mastery – has an influence on the processing of linguistic material in situations in which the individual is communicating in one of these languages." She points out (ibid.:193) that "Interaction between different foreign languages can occur spontaneously or as a result of conscious search for linguistic devices", whereby
"The most important condition for linguistic interaction to take place is obviously the degree of formal relationship between the languages". The formal relationship between languages tends to be associated, though not necessarily congruent with perceived linguistic distance, which is perhaps an even more important variable (cf. Singleton, e.g., 1996, 1997, 1999). Other important factors, as pointed out before, are degree of mastery or proficiency, method of acquisition, attitudes towards the languages in question, frequency and recency of activation, and formality of the communicative situation (cf., e.g., Dewaele 1998, 2001; Hammarberg 1998; Möhle 1989; Singleton 1999; Williams/Hammarberg 1998).

Möhle (1989) distinguishes between interacting languages, which are actually used in production, and intervening ones, which exercise a seemingly unmotivated, uncontrolled subtle influence on the language of communication. Her observation on languages intervening is that any language, irrespective of its relationship to the target language, can appear randomly during processing.

These findings are confirmed by Meara’s (1999a) aforementioned computer simulations. Meara also designed trilingual networks with a graded steady state activeness, or alertness, of three languages, which he refers to as L1, L2 and L3. Here, activation spreading upon random stimulation would always trigger units not only of the stimulated language but also of both other languages. Even if an ‘L3’ was never actively stimulated, it became activated to a certain extent simply on the basis of being intertwined in the system. According to Meara, this could be a key to L3 interference, which is known to be difficult to control in multilingual processing. Meara’s findings "suggest that if you mix your languages, then you are particularly likely to be plagued with interference from L3, even if you are actually using only your L1 and L2. In this model, L3 interference appears to arise quite naturally as a property of the system as a whole" (Meara 1999a:138). In other words, the structure and organisational principles of the system seem to predict that no language will ever remain entirely ‘dormant’, and that L3 interference is unavoidable in a multilingual situation, unless a third language were to be completely isolated, i.e., disconnected from other languages. These results, if taken as applicable to real-life lexical organisation, suggest that Green’s distinction of selected, active, and dormant languages is oversimplistic – a criticism also made by Williams and Hammarberg (1998:303).

5 The term interference is here used in a non-behaviourist sense, analogous to Möhle’s (1989) term intervention, or Garrett’s (1988:71) intrusion which labels the involuntary substitution of an item for a certain target form in production.
Hammarberg and Williams (e.g., Hammarberg 1998; Williams/Hammarberg 1998) investigated language switches in L3 production, focusing on the influence of previous linguistic experience, especially of other L2s, on a new language. In a longitudinal study they scrutinised the language development of an adult L3 learner, which they followed up over two years.

Their results suggest that lexical processing, in particular in early stages of L3 acquisition involves both reflected and automatic cross-linguistic consultation and transfer, whereby different languages tend to be used for different purposes. In their case study, the target language, Swedish, became 'supported' by the subject's mother tongue, English, and by German as her major second language. Both languages were consulted frequently, but in different distribution: while English occurred mainly in what they labelled an *instrumental role*, i.e., for metalinguistic comments and asides, German served in a *default supplier role*, providing material for lexical construction attempts in L3. The influence of both German and English was found to cease over time with increasing proficiency, with their respective functions being taken over by Swedish itself. Scattered appearances of other, minor second languages were considered negligible for the investigation in question.

The instrumental role of English was explained predominantly by the subject's identification with the language. The default supplier role of German was thought to result from an interplay of different factors, namely proficiency, typology, recency of use, and L2-status. As concerns the first three factors, all were acknowledged to be similar for German and English. The remaining variable *L2 status* obviously applied to German only, and it was considered crucial for two major reasons (Williams/Hammarberg 1998:323):

1. The situation of learning a new language reactivated the L2 acquisition mechanism, familiar from previous L2 learning. This mechanism, which was taken to be different from the L1 acquisition mechanism, in turn reactivated other L2s, in this case predominantly German as the only active and fluently mastered L2.

2. In her effort to learn a 'foreign' language, the informant felt the desire to suppress her native language in the belief that another inherently 'foreign' language would serve better as a point of reference for achieving this goal.
As a result, German was kept 'online' all the time, which was also taken as a possible explanation of a rather peculiar phenomenon. An interesting finding relates to the back-influence of German on English: Hammarberg and Williams discovered recurring instances of anomalous English displaying German influence in the sense that deficient English utterances featured an underlying German structure. This back-influence of L2 German on L1 English appeared to be due to the extreme foregrounding of German at the time (ibid.:313).

A final comment may be spared for the rare and random appearance of other L2s in the earliest stages of learning Swedish, which were considered without significance for the acquisition process. This random appearance is in line with Meara's (1999a) description of L3 interference and Möhle's (1989:186) findings concerning an "uncontrolled subtle multilingual influence" in L3 production, which appears to emerge as a random, automatic response of the system upon activation spreading in various directions.

In summary, multilingualism is in many ways on a continuum with bilingualism, but deserves special attention with regard to a number of variable factors arising from the nature of the languages involved and from the specific situation of the language learner/user. The languages assembled in a multilingual mind can be connected in a highly complex and individually variable way, and multilingual lexical processing may display unexpected traits, demanding a close scrutiny of all the contributing factors.

2.3 Summary

Section 2 has discussed some of the characteristics and peculiarities of plurilingual lexical organisation and processing, which can be summarised as follows:

1. L2 lexical knowledge is seen as underlain by the same organisational structures as L1 knowledge.
2. Formal L2 acquisition tends to result in a higher degree of analytically stored items and involves an explicit knowledge of grammatical, i.e., morpho-syntactic rules.
3. Schematically speaking, the plurilingual lexicon can be described as an integrated whole, within which individual languages can be singled out on the basis of a relatively dense network of
connections among their respective items, as opposed to weaker crosslinguistic links. Such more or less independent subsystems are thought to emerge gradually, with growing L2 proficiency.

4. On closer scrutiny, the plurilingual lexicon reveals itself as a highly complex system within which lexical items can be multifariously interconnected at different levels of description. L2 lexical knowledge tends to start off as an extension of the L1 (or Ln) lexicon and can develop into a more or less independent subsystem.

5. Owing to the complexity of the plurilingual network and the peculiarities of L2 lexical storage, L2 processing can be considerably more complex than L1 processing. Utterance formulation often proceeds less straightforwardly involving crosslinguistic consultation:
   - Lexical access in L2 production can be mediated by an L1 or Ln concept or form (which is often reflected in different types of production errors).
   - Similarly, grammatical processing and phrasal construction can be L1, L2, or Ln-based or -influenced and result in erroneous productions.

6. L2 phrasal construction is often mediated by the application of explicit grammatical rules and therefore less proceduralised than L1 phrasal construction.

7. As in the case of the monolingual mind, lexical errors provide insight into the architecture of the plurilingual mind and are suggestive of language processing mechanisms.

In sum, the plurilingual mind has been depicted as an integrated, flexible, dynamic system as suggested by Hypothesis 3.

3. CONCLUSIONS

Chapter 2 has discussed the organization of lexical knowledge in a psycholinguistic perspective, addressing Hypotheses 2 and 3, i.e., the perspective that the entirety of linguistic knowledge can be related to the information structure of lexical items, and that the plurilingual mind is an integrated system characterised by the dynamic interaction of its languages. The so-called mental lexicon was investigated in the light of the
diversity of knowledge components contributing to its information structure. Lexical items were defined as multidimensional knowledge structures, consisting of representational substance and combinatorial potential. The latter was suggested as relating to generalisations about their distributional properties, both conceptually and formally, as captured by the notion of lexical (semantic and syntactic) valency structure. Language production was discussed with reference to lexical information structure. It was argued that it is unlikely to be operated by a linguistic rule system, instead relying on procedural knowledge coordinating the activation of conceptual-semantic and lexical-formal structures. On this account, grammatical processing was included in the notion of lexical processing. Following Ellis (1997), linguistic rules were argued to reflect the heuristics of structural linguistic analysis without having an independent cognitive standing. This perspective is seen as being supported not only by the principles of neuro-cognitive organization as outlined in Chapter 1, but also because there does not seem to be any conclusive evidence for the existence of abstract grammatical knowledge and corresponding abstract operations.

Special attention was paid to the mechanisms of lexical selection and phrasal construction. The former was set in relation to the cognitive organisation of lexico-semantic and lexical-formal knowledge. The latter was seen as being determined by the semantic items selected to represent a given conceptual content. A key role was assigned to the argument structure of predicative items.

The suggested principles of lexical organization were related to the peculiarities of the plurilingual mind, which was found to be built on the same organisational structures as the monolingual mind but with a higher degree of complexity due to crosslinguistic intertwining. The plurilingual lexicon was defined as a flexible, dynamic system which accommodates for different types of crosslinguistic connectivity, often associated with developmental stages. L2 lexical knowledge was argued to be generally more or less incomplete due to a limited experience of the learner with usage contexts. L2 knowledge was further found to deviate from L1 knowledge in that L2 productive competence, in particular in early learning stages, relies strongly on grammatical rule knowledge instead of procedural coordinative knowledge. L2 production was said to involve more analytic processing than L1 production and to harbour the danger of crosslinguistic and intralinguistic transfer due to incomplete lexical (including grammatical) knowledge.

Of special interest for the following chapter are approaches to modelling lexical organisation and processing. The discussion suggested that current psycholinguistic research appears to have difficulties developing a
comprehensive explanatory model of lexical organization and language use, either because it is too limited in
its scope or because it is too much committed to structural linguistic analysis. The present thesis suggests
that an explanatory model could get near at hand if more attention was paid to the neuro-cognitive
foundations of linguistic competence and language use and to the interdependence and interaction of the
different dimensions of lexical knowledge. It aims at developing a model of lexical knowledge organization
which can elucidate the mechanisms of utterance formulation with reference to the cognitive structures that
give rise to them. The following chapter presents an attempt to integrate the complexity of lexical organization
with its different levels of analysis in a relatively simple way. It distinguishes two perspectives in order to
account for the different aspects of lexical organization and processing. The mechanisms of lexical selection
will be discussed with reference to the network structure of lexical knowledge in the light of the bipolar nature
of lexical items. Grammatical processing and phrasal construction require a more abstract perspective
because different dimensions of knowledge need to be integrated in a way that is at the same time
transparent and comprehensive, and satisfies a psycholinguistic, a neurolinguistic, and a structural-formal
perspective alike. Most of all, the model will have to be suitable to explain real-life linguistic behaviour. I will
suggest that the multidimensionality of lexical information can be illustrated in the form of a conceptual frame,
which allows for setting different levels of description in relation to each other. The validity of both delineations
will later be tested by applying them to L2 production data.
CHAPTER 3 TOWARDS AN INTEGRATIVE PERSPECTIVE ON LEXICAL ORGANISATION

O. GENERAL

The discussion of Chapters 1 and 2 has led to the conclusion that a 'language module' in the sense of a distinct cognitive circuitry exclusively committed to linguistic processing is unlikely to exist. Instead, linguistic competence is here seen as an integral part of general cognition, with perhaps a few coordinative mechanisms specifically geared for performing language-related operations. On this view, the so-called 'mental lexicon' does not consist of a collection of unified cognitive entities comparable to the entries of a dictionary, which are stored somewhere in the brain. Lexical items must be considered as multidimensional knowledge structures which consist in the association of neural activation patterns across several cognitive domains, involving conceptual, perceptual and articulatory representations. Lexical knowledge also includes information about the combinatorial potential of lexical items and the way this potential is used for constructing larger stretches of language. It was suggested that this information relates to the procedural knowledge of coordinating the activation of lexical elements in agreement with their distributional properties such that they are able to represent specific complex conceptual configurations. This involves the ability to identify the conceptual status of cognitive events, to arrange corresponding semantic items in the right sequence, and to activate functors to specify their interrelation. This ability is traditionally described with reference to grammatical knowledge, in particular to syntactic rules and to the valency structure of lexical items. Explicit rules as a basis of grammatical operations were argued not to agree with cognitive reality. The concept of lexical valency can be related to associative connections and relations at the conceptual and formal level and their integration. These knowledge structures are seen as constituting the main body of combinatorial information, which appears to be controlled by certain operational units outside the representational structures of lexical knowledge, which coordinate the flow of energy in the system (cf., e.g., Damasio et al. 1996; Gazzaniga et al. 1998). In the light of this structural complexity, lexical processing can be adequately accounted for only with reference to its cognitive foundations. On the other hand, a neurolinguistic perspective is limited with regard to illustrating perspicuously the perceived psychological reality of lexical knowledge.
organisation and processing. Moreover, neurocognition is not (yet) able to provide ultimate answers to
questions of procedural knowledge organisation. On the whole, as discussed in Chapter 1 and 2, various
perspectives and models proposed by different schools of thought are each suitable to take account of
selected aspects of lexical organisation, but they tend to remain fragmentary with regard to a comprehensive
illustration of the inner and outer workings of lexical operations. A tentative approach to comparing different
orders of description was made by Garman (1990:175ff), who, however, only arrives at the conclusion that
each of these orders is to be regarded as a hypothesis in its own right, instead of explicating how they are
supposed to be related.

I will here aim at linking a neuro-cognitive and a psycholinguistic perspective, and also integrate some
fundamental tenets of structural-formal analysis, in order to arrive at a partial model of lexical organisation that
is psychologically explicit and at the same time neurologically plausible. Since language is embedded in
general cognitive structure, such a comprehensive model should start from a physiological account of the
contributing knowledge structures, and aim at explaining perceived psychological reality in the light of
cognitive organisation principles. As we are only at the beginning of an understanding of cognitive
organisation, any such model will necessarily remain an approximation and will also involve a certain degree
of abstraction form cognitive reality. It might, however, be considered successful, if it were able to illustrate
real-life linguistic behaviour in the light of our present state of knowledge of neurolinguistic functioning.

The present study is concerned with the process of utterance formulation and its underlying cognitive
principles. Utterance formulation was here defined as relating to the selection of semantic items
representative of a given conceptual configuration and their meaningful arrangement, referred to as phrasal
construction. Lexical selection and phrasal construction were argued to be two aspects of a relatively complex
operation, characterised by parallel distributed and interactive processing at the conceptual and formal level of
representation. They are seen as involving the evaluation of individual conceptual contents, or concepts, in
terms of their semantic role and the mapping of associated lexical forms. The main focus of this study will be
on lexical selection in L2 production. Lexical selection was defined as the retrieval of a lexical form upon the
activation of an associated conceptual-semantic structure. This process was argued to happen within the
representational structures of conceptual-semantic and lexical-formal knowledge, involving the spread of
activation within and across the associated neural networks. Understanding the processes of lexical selection
and possible production errors means understanding the structure of the system and the spread of activation within it. I will therefore resume the discussion of lexical network organization, and display lexical networks in such a way that the mechanisms of lexical selection can be illustrated transparently.

In a second step, I will try to relate grammatical knowledge as relevant in the process of phrasal construction to lexical information structure. This will require a certain degree of abstraction from neuro-cognitive reality, in order to capture the interdependence and interaction of the different dimensions of knowledge involved. I will aim to integrate representational substance and combinatorial potential of lexical items in an all-embracing psycholinguistic component structure model, which coordinates the different levels of description. The model provides a framework for discussing grammatical processing with reference to lexical knowledge. It also draws a unified picture of lexical items, which provides the grounds for illustrating the perceived psychological reality of lexical networks.

1. A NEUROLINGUISTIC PERSPECTIVE ON LEXICAL KNOWLEDGE REPRESENTATION AND PROCESSING

1.1 Lexical Organisation

1.1.1 Component Aspects of Lexical Knowledge

Lexical competence is traditionally defined in terms of the entirety of knowledge a speaker has about a word in her lexicon, "a fully specified model of the way individual words work in the language" (Meara 1996:50). This competence comprises both declarative and procedural knowledge, i.e., information about the form and meaning of lexical items, about the way they combine with each other, and about their articulation (cf., e.g., Möhle 1994; Raupach 1994; Singleton 1999).

The basic components that constitute the nature of a linguistic symbol are its semantic and formal structure. This relation has been compared with a two-sided coin or two semi-circles, or, in cognitive grammar has been defined as a bipolar associative structure (cf., e.g., Saussure 1972; Langacker 1987). Symbolic structures, as
discussed in Chapter 1, are by their nature neural activation patterns spread across two levels of representation. Their two poles are primarily unrelated but conventionally associated. A third substantial component of lexical knowledge is its articulatory structure (used here to refer to both spoken and written language production), without which, obviously, words could not be put to use. It relates to the motor patterns initiating muscle activity (cf., e.g., Barsalou 1992a; Caramazza 1997; Gazzaniga et al. 1998).

Figure 3.1 Representational structure of lexical items

Figure 3.1 illustrates the representational structure of a lexical item. It displays from top to bottom the semantic quality (S); two distinct, yet in alphabetical writing systems more or less closely associated, dimensions of formal knowledge (an auditory (F_A) and visual (F_V) structure); and, associated with formal knowledge, the corresponding articulatory structures for speaking (A_S) and writing (A_W).

Lexical knowledge, however, goes beyond the realms of items in isolation. It includes information on their combinatorial potential, i.e., on their interaction with other items in terms of collocation and colligation. These dimensions will be discussed later.

I will now consider the question of how the relation of lexico-semantic and lexical-formal structures in the mental lexicon can be illustrated perspicuously.

1.1.2 Lexical Networks

As discussed in Chapter 1, complex lexical relations are often illustrated in the form of semantically organised networks, which are subdivided into semantic field groupings with additional form-based connections between items of semantically distant fields. Figure 3.2 displays such a network, starting from our earlier example of the semantic field associated with the category HORSE at the centre. The elements of the HORSE-field are
semantically connected, and their formal structure links them up with semantically unrelated fields, for example, HOUSE, STUDYING, WATER LANDSCAPES, or FUEL.

Such a breakdown, as opposed to a division into formal fields, makes intuitive sense, and is supported by findings that meaning-related lexical associations tend to predominate qualitatively over form-based ones (cf., e.g., Singleton 1999). It fails to acknowledge, however, that that formal links are nevertheless as multifarious as semantic links. Each of the members of the HORSE-field is individually intertwined in a network of formally similar items. If this multitude were to be included in the illustration, it would soon become entirely opaque. The model is also inappropriate with regard to elucidating the different dimensions of lexical processing in the system, or to disclosing the mechanisms underlying different types of production errors.

I will attempt to disentangle the confusing complexity of lexical networks by relating them back to their neurocognitive foundations. Lexical networks can then be modelled as representations at two cognitive levels and the associations that hold within and across these levels (cf., e.g., Aitchison 1994; Harris/Coltheart 1986). As before, I will refrain from distinguishing visual and auditory form knowledge, and instead subsume them under formal structure or knowledge, in order to reduce the complexity of the system and to facilitate an
understanding of the general organisational principles. This approach is seen as not distorting the overall picture because of the relatively high degree of correspondence prevailing between the phonological and orthographic systems of the languages under scrutiny in this study. Based on displaying lexical items as bipolar structures as in figure 3.3, lexical relations can now be illustrated as a triple associative network.

![Figure 3.3 The bipolar nature of lexical items](image)

Such a network comprises the associations that hold between the semantic configurations at the conceptual level, between perceptual structures at the formal level, and those that connect the two levels giving rise to the notion of 'words'. The conceptual category HORSE, its associated lexical field, and connections to semantically unrelated fields, may then be displayed as in figure 3.4, as a set of networks across two levels of representation. Following the convention of Chapter 1, conceptual entities are printed in capital letters and lexical forms in bold script. Lexical items are marked by italic script.

![Figure 3.4 Lexical network organisation as representations at two cognitive levels](image)
The illustration shows that the basic forms of semantically connected items tend to be formally distant, while formally similar items are usually semantically unrelated (unless, of course, they are morphologically related).

This organizational principle of affinity and contrast, as holding between simplex (basic) forms (cf. Chapter 2), requires that similarity at one level of identification corresponds to contrast at the other, in order to secure discernibility (cf., e.g., Feder Kittay/Lehrer 1992). This form of organization must be considered a fundamental symbolic principle, rather than "a hangover from a much earlier stage of evolution" where sound and meaning were not required at the same time, as Aitchison (1994:224) suggests. What results is a highly complex network system of learnt (semantic) and naturally given (formal) associations, which need to be well-controlled for successful lexical processing.

The principle of similarity and contrast, however, does not always apply. Chapter 1 introduced the conceptual field of emotions and pointed out that some emotions of similar valence are expressed by similar lexical forms, which results from the common etymology of the respective expressions and the relatedness of their concepts (Wierzbicka 1992). In this case, as illustrated in figure 3.5, the semantic and formal structure of a lexical field are partly arranged in parallel (cf. anguish, agony, anxiety, anxious), instead of being clearly formally distinguishable (like sad and worried). This lack of contrast, a cluster of similar forms corresponding to related concepts, can give rise to confusion, in particular for the L2 learner, and may result in a higher frequency of lexical confusions than appear in the processing of other items. This confusion of basic emotion terms will be scrutinised in Chapter 6.

![Figure 3.5 Lexical field of ANGER and FEAR](image_url)
In summary, displaying lexical network structure in the above manner illustrates that lexical processing relies on the joint activity of two primarily distinct representational systems. It becomes obvious that it involves high demands on the precise control of their coordination. By rendering discernible the dual nature of lexical knowledge and the triple associative relations among its component units, the multiplicity of pathways that lexical processing can take becomes evident; and with it the range of possibilities where activation can go stray.

The following section will scrutinise the mechanisms of lexical selection in language production with reference to this model.

1.2 Lexical Selection in Language Production

Lexical selection has been described as the process of detecting a lexico-semantic activation pattern representative of a conceptual content (semantic search), and the activation of a corresponding formal representation (form retrieval) (cf. Chapter 2). The mapping of meaning and form is considered to be highly automatised and hardly perceivable as such in everyday language use (cf., e.g., Aitchison 1994; Green 1986). It becomes noticeable, though, in situations where a speaker is either at a loss for words or makes a mistake. Such instances also reveal that the processing activity involved in lexical retrieval is considerably more complex than it may appear at first sight.

Lexical selection follows upon the intention to communicate a given conceptual content verbally. Following Aitchison (1994:230), it involves "first a broad sweep through the general area, in which numerous words which fulfil certain outline specifications are activated", eventually resulting in the selection of a situationally appropriate one. This process usually happens automatically and does not demand conscious awareness. In the case of our category HORSE, a prospective speaker has a range of possibilities to verbalise her understanding of a given horse. Depending on the situation, she may opt, for example, for pony, stallion, nag, or simply horse. Let us assume she opted for horse. From a cognitive viewpoint, this selection involves two presumably interactive processes. She has to identify a lexico-semantic activation pattern to represent her conceptual understanding of the given object, and she has to retrieve a corresponding lexical form. Scanning
the conceptual structure, she selects the pattern HORSE as the most appropriate one and activates the associated lexical form horse. This operation is seen as involving the spread of activation at the conceptual level, between the conceptual and the formal level, and within the formal level (cf. Chapter 2).

Slips of the tongue, often self-corrected, like Look at the pony – err – horse, or See that house – err – horse over there, reveal the activation of the environment of the selected structures at both the conceptual and the formal level. The first example is an instance of overactivation, or rather, misdirected activation at the conceptual level. The target structure had been HORSE, yet, for some reason, the neighbouring structure PONY received more activation and led to the retrieval of its corresponding form. The second example gives evidence of the spread of activation at the formal level. In the wake of selecting HORSE, energy spread down to the formal level, aiming at horse, where it ‘overshot the mark’ and triggered the neighbouring form house.

In scientific terms this means that a neural pattern identical with that of the target structure but for a small section was activated by mistake (cf. Ch. 1). It thus resembles the misdirected flow of energy at the conceptual level, where HORSE and PONY are highly congruent. Another example of processing failure is the tip-of the tongue (TOT) phenomenon, where a lexical form is partly but not completely identified (cf., e.g., Aitchison 1994; Garman 1990; Raupach 1994). As discussed in Chapter 2 (cf. Green 1986, 1998), these errors appear to result from a lack of control of the processing system. The working of the control system and the reasons for such a breakdown of the system will not be discussed here, as they are irrelevant for the present discussion. The important conclusions to be drawn concern the processing principles and activation routes of lexical selection, and the aberrations that can occur.

A final consideration concerns the process of semantic search. It was suggested that this refers to the scanning of the thought pattern to be verbalised and the selection of a particular lexico-semantic structure to represent this conceptual content. Following Aitchson (1994:198), "In everyday conversation, words are selected relatively randomly, as opposed to special occasions where they must be selected carefully". In the above communicative situation, we could conclude that the speaker's decision in favour of the item horse reflects a casual attitude to the reference object, and that he might as well have called it a cob or pony if it was a smallish horse. Using one of the more general terms hints at a relatively unspecific concept in mind, where the speaker has not given the situation or object, in this case the animal, particular attention, but only identified its basic character. Under different circumstances, certain peculiarities could have attracted her.
attention and caused the desire to verbalise these. She might have chosen her words more carefully, and talked about the stallion or the piebald. The difference between a concept being either general or specific is seen as potentially relevant in analysing language production processes, when spontaneous production is compared to carefully reflected formulation. A different choice of words for communicating one and the same situation or similar events, may indicate the speaker's/writer's perspective and attitude (cf., e.g., Langacker 1989:120; Levelt et al. 1999:8), and a documentation of the steps and routes taken in reflecting semantic search could shed light on the organisation of conceptual structure.

Against the background of the preceding principles of lexical organization and processing, I will now consider the peculiarities of a plurilingual situation.

1.3 Plurilingual Organisation and Processing

The peculiarities of plurilingual organisation and processing are best explained with reference to Weinreich's (1953) model of bilingual organization as discussed in Chapter 2, which fits in well with the above illustration of lexical connectivity. It posits that L2 expressions can derive their meaning from an association with L1 conceptual patterns, either directly or mediated by an L1 form, or from distinct, newly configured (L2) conceptual structures. Accordingly, lexical access can take different routes. Again, an example from the category HORSE may serve to illustrate different types of lexical organisation (cf. figure 3.6 and 3.7) and processing.

![Figure 3.6 Compound organisation of horse/Pferd and pony/Pony by L2 learners](image-url)
Both English and German distinguish horses by their size, referring to big horses as horse and Pferd, and to small ones as pony and Pony, respectively. Although not exact translation equivalents, horse/Pferd and pony/Pony tend to be associated with the same conceptual content by the language learner of either language, who is usually not aware of the subtle differences. In Weinreich’s (1953) terminology, this type of organisation would be labelled *compound storage* (figure 3.6). English has lexicalised an additional subcategory of horses as cob, characterising a smallish, stout riding horse. Since this distinction does not exist in German, a German speaker who comes across the term without having its particular connotation explained, may associate cob with pony and simply register it as a synonym of the latter. Thinking of it as ‘the other word for pony’, he would establish an indirect link to the category PONY, mediated by another L2 item, and process it accordingly. Extending Weinreich’s (ibid.) system, this type of association might be called *subordinative storage*, in the particular sense, however, of subordination to an item of the same language (which, in turn, is stored in a compound manner together with its associated L1 item (cf. figure 3.7.a)). If the learner gets used to calling what he thinks of as PONIES cobs, he is likely to establish a direct link between the lexical form and the conceptual content (*compound organisation*, cf. figure 3.7.b). Accessing the form in language production (or the meaning in comprehension), could then proceed directly along the pathway between L2 form and L1 concept. Eventually, someone may explain the precise meaning of cob as distinct from pony. In this case, the learner could identify a new subcategory of horses, i.e., develop a distinct conceptual structure to define the form cob. Furthermore, he might redefine his understanding of English pony and memorise the different items *coordinatively* (cf. figure 3.7.c)\(^1\).

\(^1\) It should be noted that the different types of bilingual organization do not necessarily occur in a developmental sequence as presented in the example.
The example demonstrates that L2 acquisition often requires that familiar conceptual structures have to be broken up or modified (cf. Cohen 1998). With regard to lexical selection in L2 production, an appropriate choice of words thus depends not only on the availability of lexical forms, but on their L2-adequate conceptualisation. Otherwise, lexical forms could be used inappropriately. In the above example, our prospective L2 user may, with an incorrect understanding of the semantic structure of cob, erroneously refer to a Shetland pony as a cob. This error, in contrast to slips of the tongue or other involuntary misproductions, testifies to a shortcoming in L2 competence as opposed to a lack of control over the processing system. Corder (1967) here distinguishes between 'errors' as systematic deviations reflective of a deficient mastery of the target language, and 'mistakes' as random performance slips. Incorrect target language products can therefore denote either an accidental misproduction or the learner's current state of interlanguage. They must be analysed carefully, in order to deduce the correct information about the learner's mental lexicon.

In a multilingual situation, the above described mechanisms can apply to L3 influence in the same way. Whether the learner tends to orient himself by his mother tongue or an L3 depends on perceived linguistic distance and other factors, as discussed in Chapter 2 (cf., e.g., Dewaele 1998; Möhle 1989; Singleton 1999; Williams/Hammarberg 1998).

In sum, the suggested approach to illustrating lexical network structure appears to be a valuable instrument for elucidating both mono- and plurilingual organization and processing. It suggests that the plurilingual lexicon should be regarded as an integrated whole within which the elements of different languages exist side by side but can vary in their interconnectivity.

1.4 Conclusions

The above illustration of lexical items as bipolar entities whose representational substance is spread across two distinct cognitive levels, appears suitable to disentangle the confusing complexity of lexical network organisation, and reveal its underlying cognitive structures. It discloses the 'mental lexicon' as a triple associative network of semantic, formal and semantic-formal connections. The model is also suitable to elucidate the spread of activation in lexical access, and to shed light on potential error sources, here
demonstrated from the example of lexical selection in L2 production. Conversely, language processing data should be able to confirm the proposed principles of lexical organization. Chapter 6 will test whether they can be verified by tracing lexical selection routes in L2 production. Of particular interest will be the question in how far semantic search processes can be used for reconstructing the organisation of conceptual structure. Of further interest are questions of plurilingual organisation.

The model may raise a number of questions. So far, only the representational substance of lexical knowledge has been considered, and the discussion of lexical processing has been restricted to the processing of items in isolation. How can further dimensions, in particular information about the combinatorial potential of lexical items, be included, and how can processing at the phrase or sentence level and grammatical errors be accounted for? The illustrations appear unsuitable for the integration of further links and relations (for example to grammatical items) and more abstract information such as serial ordering, without becoming entirely opaque. The triple associative network may also raise the question as to what happened to the common sense understanding of ‘words’ and the notion of a ‘mental lexicon’. After all, language learners struggle to acquire the vocabulary of a language and its grammatical ‘rules’, rather than try to control the migration of neurotransmitters through the brain.

The answer to both these questions lies in a shift of perspective in the description of lexical knowledge. The network model is committed to illustrating lexical organization in close analogy to cognitive structure. This is workable as long as it refers to a single type of cognitive domain (that of the representational substance of lexical items) only. An integration of other levels of description in order to satisfy a wider psycholinguistic perspective, however, requires a more abstract view of lexical knowledge organization. The following section will model the multidimensionality of lexical knowledge in the form of a conceptual frame representing the information structure of lexical items. This allows grammatical information to be related to lexical knowledge and will accordingly facilitate an analysis of grammatical processing (phrasal construction) with reference to lexical knowledge. It also gives a psychologically unified account of the notion of ‘words’ for a common-sense perspective on lexical network organisation.
The objective of this section is twofold: it will extend the above account of lexical knowledge structure to include combinatorial information, while at the same time aim at modelling the complexity of the lexical system such that its perceived psychological reality becomes discernible. In order to arrive at such a perspective, the multidimensionality of lexical knowledge needs to be reflected in the internal structure of lexical items. This will allow for a unified perspective on lexical items, and for a model of an integrated mental lexicon in the form of a single network whose nodes are multifariously interconnected. As was mentioned before, such a model will necessarily include an abstraction from cognitive reality. It is nevertheless hoped to provide an understanding of the underlying structures, rather than alienate its cognitive foundations past recognition.

2.1 Lexical Information Structure

2.1.1 Lexical items as mental models

In Chapter 2 it was argued that lexical information structure goes beyond the basic knowledge of form and meaning of a word, including collocational and colligational aspects, or an item’s valency structure (cf., e.g., Langacker 1987; Lutjeharms 1994; Singleton 1999). This combinatorial knowledge has various facets and is relevant for phrasal construction. It is, however, not associated with distinct representational patterns, but with specific types of relations at both the semantic and the formal level, which reflect the distributional properties of lexical elements (cf., e.g., Bybee 1988; Ellis 1997). The different knowledge components, semantic, formal, collocational and colligational information, are mutually dependent and interact in our use of language. How can these diverse types of knowledge be integrated in an all-embracing model?

In order to illustrate how the various dimensions and aspects of linguistic knowledge merge in the information structure of lexical items, I suggest that words should be viewed as mental models, similar to those introduced in Chapter 1 for explaining conceptual structure. Mental models were defined as extended conceptual frames, "consist[ing] of constructed groups of concepts which constitute the generic knowledge about events,
scenarios, actions, or objects ... [and of] relations together with slots, or variables, which can be filled with optional values" (Cohen 1990:316; cf. Chapter 1, section 2.2.4.1). Lexical information structure can be compared to that of complex cognitive events like scenarios etc., and the organizational structure of mental models appears to be tailor-made for explaining the complexity of lexical knowledge. I will therefore try to model a lexical (semantic\textsuperscript{2}) item as a multidimensional knowledge unit in the form of a conceptual frame consisting of a number of interrelated and dynamically interacting domains of knowledge. It illustrates grammatical knowledge by elucidating lexical valency and dependency structures and renders possible a comprehensive psycholinguistic perspective on lexical organization and processing. This is useful for elucidating the foundations of different types of errors and for explaining principles of phrasal construction.

![Diagram of lexical information structure](image)

**Figure 3.8 Lexical information structure: frame of attributes**

Analogous to the illustration of conceptual frames in Chapter 1, figure 3.8 displays the dimensions of lexical knowledge as a set of seven attributes, five of which, *semantic quality, semantic and syntactic valency, and phonological and (orthographic) layout*, relate to intellectual aspects, the remaining two (*pronunciation structure* and *written output structure*) to motor patterns. These latter are connected to their respective domains of formal knowledge and are primarily relevant for language production, while the other dimensions

\textsuperscript{2} The following model is primarily designed to illustrate the information structure of *semantic* items. It may therefore not be entirely suitable to represent *grammatical* items, in particular their semantic structure. The
are essential for all situations of language use. Motor knowledge will not be discussed any further, since it is not considered to have any immediate influence on the prearticulatory processes of utterance formulation.

Semantic quality, semantic and syntactic valency, and phonological and orthographic layout are regarded as the central attributes of lexical knowledge, which set the outline conditions for language use. These attributes, which correspond to specific dimensions of knowledge, are particularised for a range of values, a some of which are further differentiable.

Figure 3.9 illustrates a selection of values associated with the different attributes. Each of them is seen as being individually pronounced for a specific lexical item. Phonological and orthographic knowledge have, for the sake of simplicity, been subsumed under the heading of formal structure. As discussed earlier, this simplification appears justified in the context of the languages under investigation. It may therefore suffice to note that the correlation of these attributes is variable from system to system, and that even in alphabetical systems the degree of correspondence between sounds and letters can vary considerably.

information structure of grammatical items will not be discussed in much detail here, since it is not relevant
We are now left with a frame consisting of four attribute-value sets, four dimensions of lexical knowledge, which interact in putting lexical items to use. They are part of an individual item’s information structure, but their impact extends beyond the word level. Before discussing their dynamic relation, I will outline the function of the attribute-value sets. They are seen as representing the following knowledge structures:

**Semantic quality** relates to aspects of meaning, comprising a *basic meaning*, context-dependent *modified* or *extended* shades of this meaning, and *metaphorical* meanings.

**Semantic valency** refers to meaning-related combinatorial aspects, which include the range of associative connections with other semantic items (*collocates*), and to an item’s *semantic role* within such configurations. In other words, the attribute specifies the way lexical items are connected on the basis of their conceptual content. It covers, on the one hand, concrete information about possible alliances, as emerging from an item’s conceptual frame. Following the discussion in Chapter 2, collocates relate to *natural, conventional, personal*, or *situational associations* with other semantic items. Semantic valency is further seen as including semantico-grammatical information about an item’s semantic role in a complex setting. It refers to the relational status or function of an entity in a given scene. Semantic role thus relates to the notion of syntactic category as the grammatical specification of the semantic status of lexical items.

Closely associated with semantic valency is **syntactic valency**. It relates to aspects of formal representation, namely to the arrangement of lexical forms as reflective of the relations that hold between their conceptual contents (cf., Lutjeharms 1994:150; Chapter 2, section 1.1.2.2). It thus refers to *grammatical* or *morpho-syntactic adaptations*, in particular to *functor specification* and to the determination of an item’s position in phrase and sentence (*positioning*). The interdependence and interaction of semantic and syntactic valency will be discussed in more detail later.

The remaining attribute-value set (*formal structure*) relates to lexical-formal knowledge. It includes a *basic form*, and information on possible *situational* or *stylistic variations*, as, for example, allophonic variation in spoken language.

I will now take a closer look at the relations within the lexical frame, and at the interdependence of the different attributes and their values.

To begin with, the given quadrangle can be sectioned in two ways:

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for the present study.
1. The two dimensions on the left relate to aspects of conceptual-semantic structure, those on the right to their formal linguistic representation. This division singles out the complementary poles of a symbolic structure (cf., Langacker 1987).

2. The upper two attributes relate to an item's representational substance, the lower two to its contextual behaviour.

The most fundamental relation within the lexical frame holds between basic meaning and basic form. Basic form relates to a non-inflected form; basic meaning is used to refer to its most readily associated conceptual content, which may vary across individuals but often relates to central category members (e.g., the lexical form horse is usually associated with a prototypical horse as opposed to its wider meaning, which would include Shetland ponies and other more peripheral members). This primary word knowledge could be considered the core entry of the mental lexicon and might be compared to the basic entry in a dictionary.

Semantic quality and semantic valency structure are seen as being mutually dependent. The precise meaning of an item emerges from its contextual embedding, i.e., its collocational environment (e.g., the meaning of horse in the context of riding is different from that in the context of handicraft). Conversely, a specific meaning can put restraints on the collocations an item can enter into. An item's status or function relative to its collocates is situationally specified. It finds its formal expression in morpho-syntactic modifications, which are associated with syntactic valency structure (e.g., whether the mouse is afraid of the elephant or vice versa determines their sentence position and inflectional adaptations (if applicable)).

Semantic and syntactic valency provide the outline framework for an item's integration in larger contexts, i.e., for combining lexical items into meaningful stretches of language. As such, their combined information can be regarded as the main body of grammatical knowledge. Morpho-syntactic information is also related to an item's formal structure. The latter determines the shape that morphological modifications will take (e.g., type of plural suffix). Conversely, morpho-syntactic specifications can give rise to formal adaptations (e.g., shift of stress pattern).
Following this outline of the suggested dependencies within the lexical frame, I will proceed with a closer look at the information structure of semantic and syntactic valency and discuss their interrelation. It should be mentioned again, however, that the investigation of the lexico-grammatical interface is not the primary concern of my study and will therefore have to remain fragmentary. A basic recognition of the suggested organisational structures is considered essential, though, for understanding the mechanisms of phrasal construction and associated production errors.

Semantic valency was defined as the information about an item’s combinatorial potential at the conceptual level, which is formally expressed in its syntactic valency (Lutjeharms 1994:150). It was suggested that semantic valency relates to two aspects of collocational information, to possible co-occurring elements and to the item’s possible positions in relation to these elements. An item’s relational status, i.e., its position or function relative to other items, was referred to as semantic role, and it is seen as being conventionally associated with morpho-syntactic specifications to express this role. This means that, for nouns, for example, their thematic role is linked with certain grammatical modifications (as associated with syntactic category), which involve determination of sentence position, inflection, or use of prepositions, as appropriate. Verbs would be identified as to their specific predication in relation to their arguments and adapted accordingly (inflection according to person, number, tense, aspect, etc.). Beyond that, they have an influence on the grammatical behaviour of other words. The valency, or argument structure of relational items, in particular verbs and other predicative elements, includes information about required modifications of their collocates in a given context. They can determine grammatical structures (as, for example, infinitive or gerund constructions) and morpho-syntactic modifications of their arguments (such as word order or case structure in many languages, or the use of prepositions). The syntactic valency of predicative items can thus be described as having an internal dimension, relating to their own grammatical behaviour, and an external one, relating to modifications of other elements. Also of importance is the fact that predicative items are seen as linking up grammatical items, i.e., that these are regarded as part of their information structure (cf. Bybee 1988).

In sum, the valency structure of lexical items is seen as holding the main body of grammatical information. This supports the arguments brought forward in Chapter 2, that not only the separation of lexicon and grammar is an artificial distinction, but that, indeed, language production springs from lexical knowledge, rather than from a pre-lexical grammatical scaffolding to be filled out with words. The grammatical scaffolding
of a phrase or sentence arises from the information structure of the lexical items used and is specified on the basis of situational conditions. This hypothesis will be considered in more detail later, in connection with the discussion of phrasal construction.

I will now take a crosslinguistic perspective and discuss discrepancies in the information structure of semantically similar items in English and German.

2.1.2 Structural differences across languages

Chapters 1 and 2 discussed lexical differences across languages with reference to lexicalisation patterns as reflective of the way in which a given language divides up the conceptual continuum (cf., e.g., Cohen 1998; Raupach 1994). In connection with emotion terms it was also pointed out that formally (i.e., grammatically) different ways of verbalising similar concepts can indicate different attitudes to or perspectives on a given scene (cf., e.g., Langacker 1987:120; Levelt et al. 1999:8). Crosslinguistic lexical differences can be more subtle than this, though. So-called ‘translation equivalents’, in particular cognates, which may at first sight appear to be more or less synonymous, often display structural differences at various levels. These can be explained with reference to the specification of their lexical frames. Distributional differences (i.e., diverging contexts of use), for example, relate to different collocational networks, indicating conceptual-semantic dissimilarities. In the case of predicative items, underlying semantic differences can also become evident from diverging argument structures. A simple example would be the English verb go and its German counterpart gehen. The basic meaning of the English item is relatively wide, applying to different ways of proceeding from A to B, while the basic meaning of the German verb is restricted to the notion of WALKING. On the other hand, both go and gehen share extended and metaphorical meanings as in go to school, or go to Africa, so that it would be inappropriate to categorise gehen as synonymous with walk. Important in this context is that the semantic differences go along with a divergent argument structure: go in its basic meaning can take a
complement specifying the instrument of proceeding (go by car/bus/etc.), which, for obvious reasons, is impossible for gehen^.

Another example of syntactic differences as reflexive of diverging semantic structures, would be the German verb erinnern, whose semantic scope is relatively wide, comprising the meanings of remember and remind. Its argument structure is distinct from that of its English counterparts, and it can vary depending on its specific meaning in a given context of use. The transitivity of remember corresponds to a reflexive use of erinnern (remember something vs. sich an etwas erinnern ('remind oneself to something')), while the construction remind someone of something is congruent with jemanden an etwas erinnern ('remind someone to something'), but for the differing prepositions. Such subtle structural differences between close equivalents are potential sources of difficulty for the L2 learner. They may lead to particularly careful processing if he is aware of them, or, if he is not, to production errors, especially to literal translation in the sense of a transfer of L1 values at different levels of description.

The following section will scrutinise the mechanisms of phrasal construction in the light of the proposed information structure of lexical knowledge.

2.2 Lexical Information Structure and Phrasal Construction

2.2.1 Formulation Mechanisms

Utterance formulation was defined as the selection and meaningful arrangement of lexical items. Different schools of thought were shown to distinguish different procedural mechanisms, sometimes involving rule-based grammatical operations that appear to be complex beyond cognitive reality (cf. Chapter 2). A useful delineation was found in Aitchison's (1989) model of sentence planning, which posits two major processing stages, labelled as outline and detailed planning. They are seen as relating to the selection of certain key words (semantic items) and the syntactic structures they determine, and to the activation and arrangement of

^ The exception of 'zu Fuss gehen' ('go by foot' (walk)) is not seen as contradictory to the above statement. It must be regarded as an accentuation of the predication in specific contexts, the notion of walking, which is not lexicalised in German, rather than the designation of an instrument.
supplementary elements. Aitchison's perspective can be set in relation to Garrett's (e.g., 1988) model, which distinguishes two classes of processing systems, lexical selection and phrasal construction. Phrasal construction includes the syntactic specifications assigned to Aitchison's outline planning and the operations involved in her account of detailed planning.

I will now discuss the mechanisms of phrasal construction in the light of lexical information structure. They are seen as involving the interaction and interdependence of different knowledge components and operational mechanisms. It needs to be emphasised that phrasal construction is here not seen as a distinct processing phase, but as a description of the kind of operations traditionally associated with grammatical processing. These mechanisms and their underlying organisational principles can be elucidated with reference to the above frame model.

The semantic items selected to represent a given conceptual event are here considered to contain, by virtue of their component properties, all the information required to express this concept in a complex phrase or sentence. The specific configuration of the conceptual scenery, i.e., the nature and relational status of its component parts, determines the semantic role of their referring expressions and is seen as initiating morpho-syntactic specifications. These include their sequential activation and morphological modification and the triggering of function words. This operation was said to be likely to involve two processing steps, because morphological adaptations and the use of grammatical words depend on the nature and arrangement of the selected content words (cf. Peter's book versus the book of Peter, where the serial order of Peter and book determines the use of different functors). Perhaps more important to emphasise, however, is the fact that phrasal construction is here seen as involving the parallel and interactive processing of the different dimensions of knowledge of all the selected semantic items. The resulting phrase or sentence structure is then posited to be a product of the joint information of the different items involved.

It was suggested that much of the process of phrasal construction relates to the retrieval of flexible formulaic sequences. Such prefabricated linguistic patterns determine a specific grammatical construction and provide slots for certain groups of lexical items (cf., e.g., Perkins/Wray 2000; Wray 1999). The most fundamental formulaic sequences are seen in this perspective as being governed by the valency structure of predicative items. These determine the grammatical construction they appear in, as well as the morpho-syntactic specification of obligatory and possible arguments. Carrying the main body of information about sentence
structure, predicative items are regarded on this view as the key items of phrasal construction. Their function is to specify the relation that holds between certain events, not only by virtue of their meaning, but also by providing a structural framework for verbalising this relation. This framework offers a range of possibilities, which are situationally realised depending on the nature of the arguments and on the perspective taken on a given scene. An example may serve to illustrate these explanations:

The inner state of fear can be expressed by the adjective afraid or by the verb fear. Both items require two arguments, an experiencer and a cause. Fear determines that the experiencer has to be in the subject position and the cause in the object position. The latter can take the shape of a thing or an action. Afraid also requires a form of be to link up inner state and experiencer, and the preposition of to link up the cause. It then offers two possibilities: if the cause is a thing, a noun can be slotted in; in the case of an action, a gerund is required. Let us assume Peter cannot swim. The situation provides experiencer (Peter), relation (fear), and cause (water or swimming). If the item afraid is selected to express Peter's fear, it automatically triggers the linking functors and determines the sequential arrangement of the different elements. The realisation of be as is, additionally depends on the fact that the experiencer is a single person, and on the speaker/writer's present viewpoint. We thus arrive at one of the following utterances:

- Peter is afraid of water
- Peter is afraid of swimming

A selection of the verb fear to verbalise Peter's feeling would have resulted in one of the formulations:

- Peter fears water
- Peter fears swimming

Here, the syntactic valency of the predicate does not specify any linking elements to express the interrelation of the different semantic items.

The proposed mechanism of phrasal construction as outlined here suggests that the semantic items selected to express a given conceptual configuration immediately and interactively trigger the grammatical items consistent with them. This hypothesis bears important implications for the organization of grammatical items (cf. Chapter 2; e.g., Bates/MacWhinney 1989; Green 1993). Elements with a mere grammatical function, such as many bound morphemes or semantically empty words like postpositions, could be bound up in the lexical network primarily on the basis of formal connections to semantic items. Their selection may – at least in many
instances - depend entirely on the semantic items they modify, and they may not have in such instance an independent semantic quality. An investigation of the processing of grammatical items could shed further light on this question.

I will now turn to L2 formulation and associated problems, which are seen as being related to divergent valency structures across languages and a different cognitive organization of combinatorial knowledge in first and second language.

2.2.2 L2 Production

It was pointed out repeatedly that the storage and processing of multiple languages in the mind are thought to be subserved by the same general organizational principles (cf., e.g., de Bot 1992; de Bot/Schreuder 1993; Fabbro/Paradis 1995; Green 1986, 1993; Perecman 1989; Paradis 1985, 1987, 1998; Singleton 1999). This entails that L2 lexical knowledge involves the same dimensions of knowledge that constitute the L1 lexicon, and that it can likewise be described with reference to the information structure model. There are, however, a few differences which concern in particular the nature of combinatorial information, in particular of colligational aspects. In Chapter 2 it was argued that L1 'grammatical' knowledge relates to distributional generalisations, implicitly known and processed automatically (cf., e.g., Bybee 1988; Ellis 1997). The teaching methods of L2 classroom learning, on the other hand, often include a largely separate acquisition of vocabulary and grammatical rules, and the latter declarative information about combinatorial structures is only gradually proceduralised. Where L2 vocabulary is learnt via word lists and lexical items are memorised in isolation, i.e., stored analytically, the L2 lexicon contains a lesser degree of formulaic sequences, or lexical chunks, than the L1 lexicon. (cf., e.g., Wray 1999). Consequently, L2 production, in particular in early stages of acquisition, is characterised by analytic operations, involving reflective processing, as opposed to automatic, holistic processing in L1 use. This often renders the speech or writing of the learner unidiomatic (ibid.).

More important in the context of formulation errors, however, is the quality of combinatorial knowledge. Incorrect L2 utterances can be analysed with reference to the information structure of lexical items. Simply
speaking, target language inappropriate phrases or sentences are seen as relating to deficient lexical frames, i.e., wrong attribute-specifications, which often display either crosslinguistic influence or intralinguistic transfer. Such incorrect information structures can concern any component aspect of lexical knowledge and lead to a variety of production errors. I will here discuss one possible error source and explain its impact on phrasal construction.

As was mentioned above, varying lexicalisation patterns across languages can cause difficulties for the L2 learner. In particular close translation equivalents with distributional differences or divergent valency structures can be tricky. Errors frequently result from a transfer of L1 patterns to L2 items, but they can likewise give evidence of an L3 influence or of a transfer of L2, i.e., target language structures. The incorrectly supplied frame of a predicative item has a particularly strong impact, as it can affect several elements in a sentence. The above discussed items remember and erinnern may serve as an example. Both items specify two arguments, an experiencer and a thing to be remembered. English formally realises the concept of someone remembering something through a simple subject-verb-direct object construction (I remember Peter). The transitive English verb corresponds to a reflexive German counterpart, which requires the additional use of a reflexive pronoun and the preposition an ('to'). English speaking learners of German, however, tend to produce one of the following incorrect utterances:

- Ich erinnere Peter
- Ich erinnere an Peter

Similarly erroneous as they may be, they are seen as reflecting a different state of metalinguistic awareness. In the first version, the syntactic valency of remember is simply transferred to the German verb, with the speaker/writer presumably being ignorant of crosslinguistic differences. The second sentence reveals an awareness of the diverging structure of erinnern, but only a partial knowledge of its actual morpho-syntactic specification.

Another instance of a transfer of L1-values to an L2 item is the utterance *Ich bin Hunger ('I am hunger') in analogy to I am hungry. Here, the speaker selects the item Hunger as suitable to express his feeling of an empty stomach, unaware of its paradigmatic status, i.e., its precise semantic role. Conceptually associating it

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As in lexical selection, L1/n orientation depends on a number of structural, psychological, and acquisitional factors, which were discussed in Chapter 2. The mechanisms of an L1 influence in L2 errors, as exemplified here, are seen as being transferable to an L3 influence in the same way.
with hungry, he treats it as an adjective and supplies the linking verb sein instead of haben. The risk of such errors occurring is reduced when lexical items are stored as part of formulaic sequences, in this case, for example, the phrase Hunger haben ('have hunger'), in the above example the phrase sich an jemanden erinnern. Such basic formulaic phrases provide the language learner with information about the valency structure of lexical items and, in the case of predicative items, with information about sentence structure.

While crosslinguistic influence often affects sentence structure, intralinguistic transfer tends to be associated with morphological errors, at least as far as the languages under investigation are concerned. Target language German almost seems to invite overgeneralisation in the realms of inflectional specification, such as an application of the past participle prefix ge- to an item like erinnern, resulting in geerinnert instead of erinnert.

The examples show how, in the light of the above-suggested mechanisms of phrasal construction, grammatically incorrect utterances can be related back to incorrectly specified lexical frames. Generally speaking, the complexity and multidimensionality of lexical information structure provides a rich source of conceivable production errors at different points of the formulation process. Particularly endangered is the L2 learner, whose lexical knowledge is still more or less fragmentary. The examples also indicate that incorrect utterances need to be analysed thoroughly in order to detect the underlying deficient knowledge structures. Where the formulation process is traceable, it could yield useful information on the precise character of erroneous products.

I will now return to questions of lexical connectivity and discuss the applicability of the lexical frame model in contexts that require a unified perspective on lexical items.
2.3 A Psycholinguistic Perspective on Lexical Networks

2.3.1 Multidimensional Connectivity of Lexical Items

Lexical connectivity has been described as semantic or formal associations of different types. At the conceptual level, an item was said to be linked to semantically related items, at the formal level to formally similar or grammatically associated items. This complexity has been modelled in the form of a triple associative network. How can the different levels of description be integrated in a single comprehensive network model, in order to illustrate the perceived psychological reality of lexical connectivity?

An integrative network model needs to portray the diversity of associations that hold between words, distinguishing different types of semantic and formal connections. In order to be transparent and psychologically realistic, such a model has to portray lexical items as unified cognitive entities. The lexical information structure model provides an integrative perspective on lexical items, which satisfies these demands. It could be used to represent words in single-level networks. It could, however, be slightly confusing in a graphic illustration, if each item were represented by its lexical frame. An alternative display, which renders a network model more transparent, would be to illustrate the component properties of lexical knowledge as a set of layers centred around the semantic quality as their core attribute (cf. figure 3.10).

Figure 3.10 Lexical information structure: Layer Model

This display has the additional advantage of being able to rank the relative significance of the attributes in descending order from centre to periphery. The two inner circles, semantic quality and formal structure, can be said to constitute the 'hardware' of lexical knowledge, the linguistic sign. This portrayal is seen as
representing the character of a lexical item particularly well: a conceptual content is encapsulated in a linguistic form. It shows the inseparability of the two dimensions; a form without a meaning would be an empty cover, a non-word, while a conceptual content without a formal frame would be a non-lexicalised concept. The two outer layers, then, represent the item's combinatorial potential: information about putting lexical items to use, or 'lexical software'. Again, the semantic component is contained in, i.e., expressed through a formal shape.

The specific nature of the relations that hold between words in a comprehensive network could now be illustrated as associative connections at different levels of description, by linking the respective attribute layers. In this way, the specific character of the relationship of an item like horse to semantically or formally related items (e.g., pony, foal, or hoarse, house, respectively) and to collocationally or colligationally associated ones (e.g., stable, riding, or a, the, and an inflectional suffix like plural -s, respectively) can be integrated in a relatively transparent way. A further advantage of this approach is that multiple connections between lexical items become visible. Associations at several linguistic levels, as opposed to single connections only, could be regarded as a factor of strength of lexical links.

In sum, the above manner of illustrating lexical connectivity is seen as being useful for both making visible and disentangling the confusing complexity of lexical networks. Perhaps most importantly, it helps define an item's specific position in the lexical network.

### 2.3.2 The Plurilingual Mental Lexicon

Another area of application which requires a unified perspective on lexical items are language networks. Chapter 2 raised the question of the relationship of multiple languages in the mind and their degree of integration. They were argued to be neither totally integrated nor entirely separate, but stored together in a common system, following the same organizational principles (cf., e.g., Green 1993; Singleton 1999). Paradis' (1985, 1987) Subset Hypothesis was regarded as a suitable model of the plurilingual lexicon, as it accounts for the dynamic, changing character of the linguistic system (cf., e.g., Hyltenstam/Viberg 1993; Jessner 1997). In a lexical network system, different developmental stages can be explained with reference to changes in
lexical connectivity. A typical developmental sequence is outlined by Paradis (1985:23f) as the development of a mixed L1/2 system and its gradual change into increasingly independent subsystems. Following Paradis (ibid.), early stages of L2 acquisition are characterised by a rich L1 network and fewer L2 items which are predominantly linked to L1 items and scarcely to each other. This extended system can, with increasing L2 proficiency, develop towards a balanced bilingual situation with a well-developed L2 lexicon in which intralinguistic connections dominate over crosslinguistic ones. Figure 3.11. illustrates lexical connectivity in a balanced bilingual system.

As in a monolingual lexicon, the nodes in the network are thought of as multidimensional knowledge structures. The nature of their connections can thus be differentiated as described above, as associative connections at different linguistic levels, and processing phenomena can be analysed with reference to the resulting plurilingual lexical pathway system. The model can also be related to Meara's (1999a,b) hypotheses about plurilingual lexical organization and the spread of activation in a network system with various types of connectivity among its elements. Different kinds of links, and in particular varying degrees of strength could be
related to the quantity of connections between items. Activation phenomena could then be explained accordingly.

3. CONCLUSIONS

Chapter 3 has developed a formal model of lexical organization, whose purpose is to elucidate lexical information structure and lexical processing with reference to its underlying cognitive structures. An important question was how the different dimensions of knowledge involved and the different levels of linguistic analysis can be integrated in such a way that their dependence and interaction in lexical processing becomes discernible. Two complementary frameworks were used to account for different aspects of lexical organization and processing:

1. The mechanisms of lexical selection in language production were scrutinised in relation to the spread of activation within the representational structures of lexico-semantic and lexical-formal knowledge.

2. Grammatical processing, phrasal construction and the perceived psychological reality of lexical connectivity demanded a more abstract perspective. They required an integration of the representational substance and combinatorial potential of lexical items, in order to arrive at a comprehensive understanding of the mechanisms of utterance formulation and of lexical network structure. This was achieved by adopting a frame model, as applied in conceptual semantics, to elucidate the interrelatedness of the different dimensions of knowledge. The model allows for a unified view of the component aspects of lexical information as represented in the knowledge of 'lexical items'. It was found suitable to explain the process of phrasal construction in the light of the interaction of the different dimensions of knowledge involved, and to provide a framework for illustrating the perceived psychological reality of lexical network organization.

The proposed organizational principles of lexical knowledge and processing will be tested on L2 production data in Chapter 6. Chapters 4 and 5 will discuss the background and development of an empirical study designed to elicit these data.
The first part of the present thesis made suggestions towards drawing an integrative picture of lexical knowledge organization on the basis of current research on various aspects of the topic. It tried to relate different perspectives and (seemingly) conflicting hypotheses, in order to arrive at a comprehensive understanding of lexical information structure and lexical processing.

The purpose of the second part of the study is to test some of the fundamental hypotheses of the proposed model on language production data. It is therefore desirable to obtain information on the different aspects of utterance formulation, i.e., on lexical and grammatical processing, from a single set of data, to ensure a continuous methodological approach. As became obvious from the review of the literature, seemingly contradictory results often reflect inconsistent methodological or conceptual approaches (cf. Grosjean 1998). I will therefore aim at designing an empirical investigation, which is capable of yielding information on the entire process of utterance formulation.

Chapter 4 will scrutinise a selection of methodological approaches which are considered suitable for this purpose. Chapter 5 will describe the development of the data collection, and Chapter 6 will analyse the data.
CHAPTER 4 METHODS OF INVESTIGATION

0. GENERAL

The present chapter deals with methodological issues of data elicitation as relevant for the present study. It will consider sources of evidence and specific approaches to collecting corresponding data. Some sources of evidence were already mentioned in the context of the discussion of lexical knowledge organization in the previous chapters. I will now focus on two specific types of source, which are particularly useful for shedding light on the organization of lexical knowledge. These are L2 production errors and associative chains. Closely linked to the type of data is the methodology used to elicit such data. Two approaches will be discussed, namely translation tasks and think-aloud protocols.

1. SOURCES OF EVIDENCE

Second language research has traditionally been concerned with aspects of L2 acquisition and use. Error analysis is one of its oldest fields of investigation, detecting the systematicity behind errors, the major objectives being to shed light on the acquisition process and to optimise teaching methodology. For many years, the central methodological approach to error analysis was the contrastive analysis of source language and target language, which relates interlanguage products back to typological differences across languages (cf., e.g., James 1980). The analysis of second language use was later extended to include a wider range of research questions, from issues of language comprehension to communicative strategies. Within the domain of L2 production, lexical planning and processing have more recently become the centre of attention (Zimmermann 1990:431). This shift of interest from product to process is also reflected in more differentiated approaches to error analysis. New dimensions of error classification have evolved which take a stronger interest in procedural aspects (Færch/Kasper 1987). Not always, however, a clear line is drawn, between the quality of an error, i.e., the way in which a product deviates from target language norms, and its origin, i.e., the process and underlying mechanisms that caused it to emerge.
In order to arrive at a comprehensive understanding of plurilingual organization, second language use has to be investigated with a view to both process and product. An interesting study in this connection comes from Wiebalck-Zahn (1990), who distinguishes consistently between product and process in analysing the communicative efficiency of lexical strategies in L2 production. She regards the blending of product and process as a relic of the contrastive analysis hypothesis, which tends to equate product and process (ibid: 93). Her major criticism is directed at error taxonomies which mingle different levels of description. She points out that a specific process can result in different products, and that one and the same type of product can be traced back to different processes. Following Wiebalck-Zahn (ibid:94f), error analysis therefore requires a differentiation between product categorisation and analysis of the production process.

Product categorisation, would include the classification of a linguistic form with regard to its status in the L2 system, in particular in relation to a possible target item (i.e., whether it is, for example, a superordinate or a co-hyponym, or whether, perhaps, it does not exist at all). It would further involve a contrastive comparison of lexical structures in L1 and L2, as captured by expressions like cognates or false friends. A description of the production process can relate errors to metalinguistic knowledge, for example, to specific assumptions about the relationship of L1 and L2, which motivate operations such as loan translation or foreignisation. It may also reveal a failure of the processing system, as for example in slips of the tongue, which reflect a misdirected flow of energy in the system.

A joint analysis of the information gained from these analytic categories (and a possible further differentiation), may provide a differentiated understanding of the organization of plurilingual lexical knowledge and processing.

1.1 Production Errors

"Errors have considerable potential to shed light on the nature of the language system, since they mark those points at which the system breaks down. The symptomatology of errors can thus, in principle, carry information on where in the system the breakdown has occurred, and how, in the sense of the possible mechanisms involved."

(Garman 1990:151).
Different types of errors typically denote difficulties at different linguistic levels. They thus provide insight into the cognitive architecture of linguistic organization, and have also been taken as evidence for different processing stages in language production (cf. Chapter 2; e.g., Aitchison 1994; Garman 1990; Garrett 1990; Levelt et al. 1999). The latter conclusions are seen as being somewhat problematic, in particular with regard to the process of phrasal construction, which has been argued to be likely to involve a considerable degree of parallel processing and interaction of different mechanisms, rather than being composed of a series of distinct component processes (cf. Chapter 2 and 3). It may therefore be more appropriate to suggest that errors could be seen as indications of certain mechanisms involved in language production.

The present study is primarily interested in questions of lexical selection and, to a lesser extent, of phrasal construction. Concerning the former, production errors are able to shed light on the network organization of lexico-semantic and lexical-formal knowledge, and on associated processing mechanisms (cf., e.g., Aitchison 1994; Garman 1990; Green 1986, 1993). Blends, for example, point to competing alternatives at the semantic level and the failure to inhibit unwanted responses. Substitutions of semantically related items similarly reveal misdirected activation at the semantic level. The erroneous production of items formally related to a target structure denotes a lack of control at the formal level.

In L2 production, the same principles are thought to apply, additionally shedding light on crosslinguistic connectivity. Further insight into the plurilingual mind is offered by lexical creativity in the sense of non-target lexemes, or ‘lexical inventions’ of different types (cf., e.g., Dewaele 1998). These are reflective of metalinguistic knowledge and often involve intra- or crosslinguistic transfer, revealing erroneous generalisations or beliefs about various aspects of L2 structure.

In sum, production errors are considered to provide insight into the cognitive organization of the different dimensions of lexical and linguistic knowledge. They also hint at processing mechanisms, which, however, can only be verified by investigating the production process itself. An approach to identifying processing mechanisms is the analysis of associative chains, which, in reflective processing, document procedural steps in utterance planning.
1.2 Associative Chains

For many years, language processing mechanisms were only inferred from a product analysis based on structural-formal description. Introspective methods, which will be discussed in detail later, have enabled researchers to gain insight into the underlying thought processes (cf., e.g., Ericsson 1990; Ericsson/Simon 1984). Linguistic processing could now be traced more immediately. Scrutinising the chain-of thought in lexical and grammatical problem solving, for example in communicative tasks, translation tasks, or C-tests, was found to shed light on different issues of linguistic organization (cf., e.g., Faerch/Kasper 1987; Ridley 1997; Singleton 1999).

Information on lexical organization is also derived from word association tests. These data are used for reconstructing lexical networks and identifying different types of connectivity (cf., e.g., Deese 1965; Meara 1992, 1996). However, like production errors, associative chains of this type do not provide any immediate procedural information, and are at best indicative of certain processing mechanisms.

For the purpose of the present study, it would be useful to avail of an instrumentation which yields information on the variety of issues associated with lexical organization and processing. Much of the empirical research, however, is designed for eliciting data on highly specific research questions, and is therefore of limited usefulness for drawing a more comprehensive picture of lexical knowledge structure. An investigation that stands out in that it is able to address a broader scope of issues on the basis of one and the same set of data comes from Zimmermann (e.g., 1989, 1990, 1994). It yields information on different aspects of lexical processing in language production and allows for conclusions about their underlying organization principles, by drawing on associative chains produced in lexical problem solving. I will briefly outline some aspects of Zimmermann’s investigations, accentuating those factors that are most relevant for my own study.

Zimmermann reports on a project of investigating lexical processing in L1-L2 translation, with the distant goal of distinguishing productive from unproductive lexical strategies. Productive strategies are considered those that succeed in satisfying a communicative intention, while unproductive ones do not (Zimmermann 1994:107). Results intermediate to his objective were detailed accounts of processing activity at various levels, which shed light on the cognitive structures behind the different dimensions of lexical knowledge. It is this aspect which is of focal interest for the present study.
Zimmermann's main data sources were L1-L2 (German-English) written translations and associated concurrent think-aloud protocols. The latter document strategic as well as non-strategic processing at various linguistic levels (ibid:110) in the form of associative chains produced by the subjects in their attempt to find solutions to lexical difficulties. Zimmermann's primary interest is in lexical achievement strategies in cases of an inaccessibility of specific target items. His main focus is on mechanisms of lexical search and retrieval, which are considered to shed light on the network organization of the plurilingual lexicon. Lexical approximation and intermediate or temporary solutions, disclosed by the TAPs, are of particular interest as they document the fanning out of activation in various directions.

Zimmermann started his investigations with the following hypotheses about semantic search and lexical retrieval:

1. **semantic search:**

   "Wenn ein L2-Wort unbekannt oder zeitweise blockiert ist, wird in der Umgebung des entsprechenden Konzepts gesucht, weil ein "benachbartes" Konzept vielleicht auch in der L2-Form bekannt ist und das L2-Äquivalent ersetzen kann oder zu ihm führt. Die Suchaktivität ist gedacht als Welle von Aktivierungen, die "nähere" oder "fester verbundene" Speicherpunkte eher erreicht (Suche im "semantischen Lexikon")."

   (ibid.: 108)

   ("If an L1 word is unknown or temporarily blocked, the environment of the corresponding concept is searched, because a neighbouring concept might also be known in the L2 form and might replace the L2 equivalent or lead to it. The search activity is seen as a wave of activation, which arrives earlier at "nearer" or "more closely connected" nodes (search in the "semantic lexicon").")

2. **lexical retrieval:**

   "Daneben wird gleichzeitig von der L1-Form her gesucht, weil sie selbst (als Transfer) das L2-Äquivalent ersetzen mag oder über sie eine geeignete Form erreicht wird (Suche im "phonologischen Lexikon")."

   (ibid.)
Zimmermann's data analysis brought out a large variety of lexical strategies, the most important of which were the following achievement strategies:

- a systematic scanning of the semantic and phonological environment of the required items in both L1 and L2 (and occasionally in L3);
- an episodic search, i.e., a recollection of previous contexts of appearance and verbal routines;
- applications of metalinguistic knowledge, such as ad-hoc word formation.


An important conclusion was drawn from non-strategic, rapid sequences of associations activating both semantically and formally related elements. Zimmermann (1994:110) suggests that such associative chains could be interpreted in terms of simultaneous search processes at different cognitive levels (cf. also Raupach 1994:32). While an interpretation in terms of simultaneity remains speculative, the data certainly indicate that the mind-brain automatically follows up all the possibilities available to reach its goal. The informants' processing activities were analysed in terms of identifying lexical network organisation. The following results are most notable:

1. From the think-aloud protocols, which trace the routes taken in lexical retrieval and search, it was possible to outline the informants' mental representations of lexical fields as centred around certain core items (Zimmermann 1994:120ff). Within these fields, semantic and formal connections can be distinguished. Particularly interesting is the organization of conceptual-semantic structure as disclosed by semantic search activity. Depending on the extensiveness of the search process, it allows for the reconstruction not only of an item's semantic field, but often also of its wider conceptual frame (ibid.). The frequency of activation of particular elements is suggested to reflect the closeness of items, or the strength their mental connections (ibid.:112). A privileged status in this connection was further given to first attempts (ibid.).
2. Zimmermann justifies the reconstruction of an item's collective mental representation on the basis that the informants formed a relatively homogeneous group of learners, some of whom alone activated a number of crucial frame elements and/or a substantial part of the whole pattern (ibid.). The illustration below (figure 4.1), reproduced from Zimmermann (1994:122), displays the associative network of the noun Pendler (‘commuter’), as reconstructed from the processing activity of 12 informants. It highlights a number of central items, which served as points of orientation during the selection process; it also marks varying degrees of closeness and strength of mental connections between items as emerging from their frequency of activation (ibid.:107). The model could further indicate routes of lexical access by means of arrows between lexical items (ibid.:123).

![Mental representation of PENDLER](image)

3. A further important result of Zimmermann's study concerns the relationship of L1 and L2. Zimmermann (1990:90) suggests that there are generally at least two pathways to L2 items, a direct, conceptually mediated one, and an indirect, L1-mediated one. In relation to his 1994 data, however, Zimmermann (1994:107) posits an overwhelming dependence of L2 forms on L1 conceptual structures, as suggested by frequent L1 consultations.

4. Of lesser relevance for Zimmermann's research goals and therefore not extensively analysed were findings in respect of grammatical operations, processes such as strategic morphological variation.
These are interesting for the present study in that they provide insight into the processing of morphological knowledge.

In conclusion, Zimmermann's investigations show that an analysis of strategic processing in L1-L2 translation can provide useful information on a variety of issues of lexical organisation:

1. It supports the validity of the concept of spreading-activation in cognitive, in this case lexical, processing. The associative chains obtained suggested themselves as a rich source of information on lexical network organisation and its two distinguishable levels of representation, in particular on the conceptual embedding of semantic knowledge.

2. The information on lexical processing obtained from different subjects can be integrated to reconstruct a collective mental representation of the structural environment of lexical items.

3. Zimmermann's data allow for conclusions about the crosslinguistic connectivity of lexical items and, thus, about the organization of the plurilingual lexicon.

4. The data are further suggestive of the organisation of morphological knowledge.

Considering the richness of Zimmermann's data in relation to questions of lexical organization and processing, it may further be expected that such data could also yield information on the process of phrasal construction. On the whole, his research method suggests itself as appropriate for the purpose of the present study. The second part of this chapter will therefore take a closer look at the investigation methods used, i.e., translation tasks and think-aloud protocols.

2. DATA ELICITATION TASKS

The previous sections suggested translation tasks and concurrent TAPs as a useful approach to eliciting data on lexical organization and processing. I will now scrutinise their advantages and discuss possible difficulties.
Translation lends itself to the investigation of lexical processing and error analysis for several reasons. First of all, it "entails a considerable reduction of planning complexity compared to normal, active free speech planning" (Hölscher/Möhle 1987:113f), and as such allows the informant to concentrate on the 'technical' side of the task. This is owing to the fact that the content of the target utterance is given, and along with it the requirement to find the "closest natural equivalent of the source language message" (Nida/Taber 1969:2; cf. also Bassnett-McGuire 1980). This allows only for a limited degree of freedom on the part of the translator, canalising his efforts towards aiming at "accuracy and precision of expression" (Tudor 1988:364). The number of choices among available linguistic devices is further restricted, as the content is not only specified at a general level, but is relatively precisely defined through the choice of words in the source text (cf. Hölscher/Möhle 1987:114). For typologically close languages this often means that a more or less "ideal" translation equivalent is available, which in its connotations resembles the source language expression. This is not to say, however, that translation can be equated with 'substituting lexical items across languages'. It always includes the process of phrasal construction and is thus a test of lexical as well as grammatical competence.

An additional advantage of translation tasks is that they rule out the problem of avoidance, which is often met in free speech or written composition. They force the performer to tackle the difficulties he is confronted with, and aim at some sort of solution to the problem. A documentation of the cognitive routes taken in performing the task (ideally by means of think-aloud protocols, cf. below), can then enable the analyst to draw conclusions about processing strategies and mechanisms and their structural foundations.

Following Zimmermann and Schneider (1987:177f), translation tasks are a valuable instrumentation, because they yield highly authentic data, in a framework that facilitates analysis. They posit that "translation is in many ways an artificial form of communication", and possibly "the safest source of information about processes of lexical search ... [since] the original intended meaning is mostly given to the analyst".

An objection against translation tasks cited by Larsen-Freeman and Long (1991:32) is that translation tasks tend to be criticised for encouraging word-for-word rendition, thus yielding an unnaturally high proportion of source language influence. However, Larsen-Freeman and Long (ibid.) continue, referring to relevant test results, "in general the errors subjects made in translation were the same as those they committed in their
spontaneous production and imitation". The danger of word-for-word rendition or literal translation can also be reduced by appropriate task instructions.

Another objection against translation tasks is that they inevitably raise the activation level of the source language, thus creating a mixed language mode (cf. Grosjean 1998), which increases the probability of interference. With regard to the present research project, this is not considered to be a disadvantage, though.

The purpose of my study is not, to describe a certain state of L2 competence and quantify interference and error frequencies, but instead, to investigate the mechanisms of L2 use - including those of error production - in order to arrive at conclusions about the cognitive organization of language in general. The question is therefore not whether the subjects' target language production might carry less traces of L1 if that language had remained at low levels of activation; the important issue is how interference manifests itself and what it tells us about the principles of plurilingual lexical organization. In this context, crosslinguistic interference and errors are even considered desirable.

In conclusion, translation tasks - in particular when accompanied by think-aloud protocols (cf. below) appear to be a useful method of collecting data on plurilingual lexical processing. They set relatively clear goals for the informants, canalise their activity, and provide the analyst with a comparatively structured framework of criteria for evaluation.

2.2 Think-Aloud Protocols

The main tenor of the methodological discussion hitherto has been that, in order to gain a deeper insight into the cognitive organisation of linguistic, or lexical structure, it is desirable to obtain more immediate information on the mechanisms involved in language processing. How does language planning proceed, and how are lexical choices made? Chapter 2 and 3 made suggestions towards the mechanisms involved in these processes, but how can they be tracked in language use?

Introspective verbal reports, in particular think-aloud protocols (TAPs) have been able to shed light on pre-articulatory mental activity. Over the years, a number of different self-report techniques, sometimes subsumed
under the heading of "introspection" have been tested, often yielding disputed results in relation to varying types of experiments and research questions (cf. Ericsson 1990; Ericsson/Simon 1984; Smith 1994). Most controversial are retrospective interviews or reports, in which subjects comment on their thought process retrospectively from memory, but also controversial are introspective reports (in a narrower sense), where the thought process is concurrently commented upon. Both methods have been criticised with regard to the authenticity of their results, the former because the information retrieved from long-term memory may deviate from the original activity, and the latter because immediate self-observation may distort and alter the thought process (ibid).

More reliable information, in particular on problem solving, was found to be gained form TAPs, i.e., concurrent verbalisations without conscious monitoring of, or commenting upon the thought process. According to Krings (1987:164f), this technique "does not demand abstraction, selection, or inference processes on the part of the subjects. ... [They are] simply encouraged to verbalise whatever comes to their minds while translating". TAPs have the advantage that the relevant information is produced from short-term memory and is as such most genuine. Ericsson and Simon (Ericsson/Simon 1984:63; Ericsson 1990:195) emphasize that thinking-aloud has not been found to corrupt the thought process and that it "appears to differ from silent thinking only in that solution times are somewhat longer due to the additional time required for verbalisation" (Ericsson 1990:195). TAPs thus appear to yield maximally relevant data on thought sequences.

It has been pointed out, however, that thinking aloud, like verbal reports in general, can by their very nature never give a full account of cognitive activity, since part of it is procedural(ised) and, as such, cannot be verbalised (cf. Dechert 1987). Börsch (1986:201) goes even a step further to posit that "conscious awareness is limited to the products of mental processes, whereas the processes themselves are not accessible to introspection". Whether one accepts this relatively strong position or follows Dechert (1987:97, 108) and Krings (1987:161), who maintain that at least non-automatised processing as an activity based on declarative knowledge is available for verbalisation, the essential understanding is that "the kind of information gained in the thinking-aloud protocols can help us infer underlying processes", as "we get insights into normally unobservable processing ... which could not have been attained by analysing task results and ignoring underlying processes" (Hölscher/Möhle 1987:113, 132). Important to note in this context is the fact that
language output is always linear and therefore cannot make visible possible underlying parallel distributed and interacting processes (Dechert, personal conversation; cf. also Ericsson 1990:195; Sharwood-Smith 1994:67). Hypotheses about interactive processing, as discussed earlier, are the result of neurological investigations and/or logical inferences in the light of neuro-cognitive plausibility.

With regard to the question of a comprehensiveness of verbal protocols, it must generally be kept in mind that the analyst can never be sure to what extent even controlled or reflected activity is documented. Nevertheless, the crucial point is that the value of TAPs is less a question of "whether they are perfect but whether they lead to better process descriptions than can be produced without such data" (Bereiter and Scardamalia 1983:13).

TAPs therefore appear to be the best possible complementation of written translation studies for the present purpose. Krings (1987:166) and Smith (1994:16) point out that inner speech and subvocalising can often be observed to accompany such tasks, so that thinking-aloud more or less just exploits a natural momentum of translating. With regard to the execution of the data collection, Ericsson (1990:195) accentuates the advantage that it does not demand any extensive training but only "brief instruction ... to enable subjects to think aloud for the first time. This means that the subjects can be kept naïve with regard to the theoretical issue under investigation", which permits a highest possible degree of naturalness in their performance.

Analysing the data, then, demands a certain degree of flexibility and creativeness on the part of the researcher. Krings (1987:167) emphasises that "TAPs cannot be analysed adequately on the basis of preestablished categories" since they "have a low degree of structuring". Therefore, "analytical categories need to be developed and refined gradually, taking into account the internal structure of the data" (ibid.:173).

An important variable for analysing verbal data are speech pauses. They enable the analyst to separate automatic from reflected processes, whereby fluent production/articulation hints at automation, while hesitations denote contemplation (cf., e.g., Dechert 1987; Krings 1987; Wiebalck-Zahn 1990; Zimmermann 1994). The ambiguity of pauses, though, renders it difficult to interpret them beyond this point. Zimmermann (1994:111) explains that it is often impossible to decide what is being planned or considered during longer periods of silence, "longer" referring to pauses exceeding tenths or hundredths of seconds. Moreover, even
fluent production can be based on reflected processing, which can be detected only by analysing the output products (cf. Zimmermann 1994:110, who found examples of morphological planning in fluent production). On the whole, "verbal protocols in connection with a careful study of temporal variables and speech errors ... may open our view to the inner workings of speech production" (Dechert 1987:108), and also of written production. They can shed light on the principle of spreading-activation in all its complexity (ibid: 109; Zimmermann 1994:111), and permit insights into the cognitive organisation of lexical and grammatical knowledge, at both an individual and a collective level (cf. Krings 1987; Zimmermann 1994).

In summary, the value of TAPs, in particular in connection with written translation, lies in their potential to reveal processing activity underlying linguistic behaviour, which goes beyond the informative value of the translation product, and possibly even beyond the level of awareness of the informant. TAPs appear to be especially fruitful in relation to the organization of the mental lexicon, allowing for conclusions about the cognitive architecture of lexical knowledge.

3. CONCLUSIONS

Chapter 4 has introduced a number of research methods for eliciting information on lexical knowledge organization. It has discussed the usefulness of production errors and of associative chains as information sources for investigating issues of lexical knowledge organization and processing, and the value of translation tasks and TAPs as devices for collecting such data. These methodological approaches will now be combined in the design of an L1-L2 translation study to elicit data on lexical processing.
CHAPTER 5 DATA COLLECTION

0. GENERAL

This chapter will present the background, the subjects and the methodology of the project on which this thesis is based. The idea behind the project was to design a study that would be capable of yielding data on as many aspects of bilingual processing as possible, in order to arrive at a comprehensive view of lexical organization. An attempt was made in this connection to elaborate a simple elicitation task that would generate data rich enough to shed light on the general cognitive mechanisms behind language use, on the influence of previous linguistic experience, on communicative strategies, and, more specifically, on the different dimensions of lexical knowledge. As discussed earlier, many experiments have focussed on isolated aspects of psycholinguistic operations, and have led to hypotheses about specific dimensions of linguistic organization. The present project starts from the assumption that their synthesis could be facilitated and confirmed if several of such dimensions could be tracked in a coherent study and could be shown to be interrelated.

In principle, such a study is not too difficult to design. Chapter 4 discussed a selection of research methods and pointed out the potential of written translation tasks in combination with think-aloud protocols (TAPs) in this context. The real challenge lies in finding an appropriate source text and directing the informants in such a way that their performance yields usable data. Such a text must be neither too easy nor too difficult, so that the subjects are obliged to draw on all their sources within the limits of a solvable problem. With regard to the TAPs, the subjects must be motivated to speak freely and to avoid trying to control their chain-of-thought or their oral output. Supplementary information on their L2 competence and linguistic background have proven useful to support or modify hypotheses or conclusions drawn from the analysis of the experimental data (cf., e.g., Ridley 1997; Singleton 1999). Such information can also be helpful in elucidating obscure points and in shedding light on individual differences, and it may be collected by means of a questionnaire.

Before discussing the data collection relative to the main study of my project, I will briefly present a preliminary study, which explored some methodological and instrumentalational issues.
1. PRELIMINARY STUDY

In order to arrive at an appropriate design for my main study, I carried out a preliminary study based on data collected in a related research project on lexical problem-solving strategies. It consisted of two different tasks, a written translation of a technical text from L1 English into L2 German, with which were associated simultaneously recorded TAPs, and an oral story-telling task, which was first performed in L1 and immediately afterwards in L2, each performance taking around five minutes. This preliminary study involved 12 beginners and 19 advanced English-speaking and one Dutch-speaking university students of German, who were also asked to complete questionnaires on their language learning background. I analysed the two sets of data in the light of the above outlined research objectives to see in how far they would yield results of a kind that would be useful in this connection.

Without going into much detail, I will outline the findings of this study and discuss them in the perspective of the design of the main study.

Task 1

The first task consisted in translating passenger instructions excerpted from an Aer Lingus in-flight magazine from English into German. It yielded particularly rich data on lexical problem-solving, which was precisely its intention. It was possible to single out several approaches to overcoming specific lexical challenges, in particular under the heading of lexical achievement, which included retrieval and compensatory strategies (cf., e.g., Faerch/Kasper 1983; Ridley 1997). On closer scrutiny, however, the choice of text had a certain disadvantage for a more general investigation of lexical processing. The lexical items in question were mainly a matter of "either-you-know-them-or-you-don't", and in the majority of cases they appeared to be, indeed, unknown to the subjects. This often limited their efforts to compensatory strategies, i.e., a search for substitutes, rather an attempt to find the required item.

With regard to lexical errors, it was possible to single out a large variety of error types and to relate them back to cognitive mechanisms and to the knowledge sources they were drawn from.
Grammatical and orthographic difficulties and errors also emerged, but only to a lesser degree. Beyond an often obvious influence of L1 and of other second languages on orthographic errors, the verbal protocols did not shed much light on error motivation. A similar finding holds for grammatical errors. These were relatively rare anyway, since the source text was structurally simple and did not pose any major difficulties in that respect. The TAPS, on the whole, elucidated mainly questions of lexical problem solving, perhaps due to the fact that the informants were instructed to pay particular attention to selected lexical items. Concerning the aspect of the subjects' L2 competence, the beginners' data were generally found unsuitable to provide differentiated information on linguistic organisation. It was therefore decided that, for the purpose of the present study, the informants should be advanced learners with a relatively wide range of L2 linguistic possibilities available to them.

It was concluded that the methodology in question was successful for the purpose it was set for, but was of limited usefulness with regard to the purposes of the present main study. It was further concluded that for a wider-ranging investigation, the translation source should be a text with the following characteristics:

1. It should be built on relatively basic vocabulary, which the informants were likely to have come across before, but which they were less likely to use frequently, so that one might expect difficulties in retrieving it. Such a situation is assumed to channel the efforts of the subjects in the direction of attempting to retrieve a missing item, before or instead of just looking for alternatives. In other words, it is expected to lead to a multidirectional search process.

2. It should, on the whole, allow for a relatively direct translation into German, in the sense of an availability of (close) translation equivalents in the lexical domain. (Opposed to that, widely divergent lexicalisation patterns harbour the danger of evoking a rephrasing of complex contents, which would be a shift away from immediate lexical problem solving.)

3. It should also contain a number of more complex syntactic structures, or items with divergent argument structures across the languages under investigation, in order to elicit grammatical processing.
The second task involved the oral telling (in L1) and retelling (in L2) of a picture story on a one-to-one basis in the presence of the researcher, which was tape-recoded. Again, the story contained several key words which the informants were unlikely to know, and which they were expected to have to compensate for.

This task turned out entirely unsuitable for my declared research goals. To begin with, the complete freedom in telling the story made it possible for the subjects simply to avoid difficulties, even with regard to key words. The fact that there were no distinct guidelines given not only led to highly divergent productions across the informants, but also (in particular due to the lack of a written translation source) to often almost unrelated English and German versions, which made it very difficult to analyse the data in terms of a translation process.

The differences between English and German versions appear to be linked to several factors. Perhaps most strikingly, lexical difficulties were 'solved' through avoidance, which resulted in omissions and rephrasings of larger contexts. Other factors are more subtle: the plot of the story appeared to be difficult to understand, which became obvious from comments and asides, from the degree of content-related self-correction, and from the fact that the range of stories produced varied considerably with regard to their content. In addition, different details seemed to catch the eye of the informants during the second account; even a completely different understanding of the plot was possible. The extreme diversity across the informants also made it difficult to establish a frame for comparison. Finally, the oral nature of the task elicited accounts which very much reflect the properties of oral speech, most notably incomplete or elliptic clauses and sentences, repetitions and self-corrections, frequent use of fillers, etc., which render a syntactic analysis somewhat problematic.

Despite the inappropriateness of the task in respect of the generation of the type of data and information I was interested in, two aspects maintained their appeal.

1. The idea that the informants should produce their own translation source offers a considerable advantage: it reduces the cognitive load by anticipating the dimension of text comprehension, thus enabling the subjects to concentrate on L2 formulation.
2. A picture story as a starting point for producing a translation source – if it is well-chosen – can provide a relatively precise frame of reference, without imposing too much detail and pre-fabricated structure. The informant will be able to express her conceptualisation optimally and may therefore be assumed to aim at a likewise precise rendition of her communicative intention in the L2. This may be expected to lead to a considerable degree of conceptual processing in connection with lexical selection.

In the light of the difficulties encountered in the analysis of the data, it was concluded that the task should involve a written composition and translation, in order (a) to ensure that an L1 source text is translated instead of the story being retold, and (b) to elicit language suitable for grammatical analysis. The picture story as a composition source would need to fulfil certain requirements, in order to elicit data relevant for the main study:

1. It should be motivating and should be easy to understand, without leaving much room for interpretation in relation to the content, in order to avoid conceptualisation difficulties and to ensure comparable stories/compositions across the informants.

2. It should contain a number of key situations and/or key elements that the subjects would be likely to include when retelling it, again, in order to ensure comparability.

The insights gained from the pilot study were worked into the design of a main study, whose aim was to elicit data on as many aspects of language production as possible. The analysis of the collected data, however, will here be restricted to issues of lexical selection and, to a lesser extent, of phrasal construction.

2. MAIN STUDY

This section will discuss the approach to data collection adopted for the main study. It introduces the subjects recruited for the experiment, the methodology used, and some difficulties that emerged.
2.1 Subjects

The subjects involved in the bilingual part of the main study (Group A) were 30 English-speaking university students not specialising in a foreign language but taking German as an additional 2-year module during their undergraduate courses. They came from various fields of study, namely Engineering (11), Arts (7), Science (10), and Computer Science (2). All of them had attended Irish secondary schools, where they had had German up to School Leaving Certificate level. Apart from some marginal individual differences relating to time spent in German-speaking environments, they constituted a relatively homogeneous group insofar as they all had a similar language learning background and a solid foundation in German based on their school experience. At the time of the study, the majority were at the end of their first year of the German module, 6 were at the end of their second year. The language module (which was also available for other languages) was offered as an additional qualification relevant to the undergraduate courses. It was designed to improve the students' overall L2 competence, in particular in relation to finding their way in an academic or work situation abroad. The difference in the course programme between first and second year lay in a focus on oral work (1st year) versus written work (2nd year). Most of the second-year students had had prolonged or intensive work or study periods abroad, and their overall L2 competence could be considered somewhat higher than that of their first-year colleagues. Concerning their performance in the translation task, however, no significant differences were found between the two groups. Variation of L2 competence across the 30 subjects did not correlate with their status of either year 2 or year 1 students. The 2nd year students' L2 production was judged as being somewhat more fluent and involving less reflected processing, but the quality of their output and the types of errors were as variable as those of the 1st year students. The 30 subjects were therefore treated as an integrated group in the analysis of the data.

With regard to the multilingual part of the study, 5 students of Germanic Languages were recruited for this (Group B), three of them in their second, and two in their fourth year of study. One of the fourth-year students was a Norwegian who had lived in Ireland for many years. These students' undergraduate degree programme involved intensive courses in German (beginning in the first year at an advanced (School Leaving Certificate) level), Dutch, and Swedish (beginning in the first and second year, respectively, both at beginners' level). The second-year students had a very good command of German, advanced skills in Dutch, and a basic knowledge
of Swedish (in the case of the Norwegian student an almost native-like command of Swedish). The fourth-year students, after prolonged study periods abroad in at least two of their target language environments, could be considered fluent or almost fluent in at least two of the languages, with a very good knowledge of the third.

2.2 Methodology

The data collection covered two broad categories: elicited language and introspective data, and background information on the subjects' linguistic background.

The former comprised three sets of data, namely, the composition of a story on the basis of a series of pictures in the subjects' L1, a translation of the same story into the L2, and think-aloud verbal protocols (TAPs) relative to the performance of the translation task.

The multilingual study was designed in a similar way, including a story composition in L1 (which for the Norwegian meant in Norwegian) and its translation into three target languages, accompanied by TAPs. The translations were carried out one immediately following upon the other, first into German, then into Dutch, and finally into Swedish. The only exception here was the Norwegian student who translated into Swedish as her most proficient L2 first, then into German and Dutch.

The personal information included responses to a questionnaire on the subjects' language learning background and previous linguistic experience, and information on their performance in the language modules' examinations. Not all of the data were equally relevant for the present study. Elicitation procedures and instruments, difficulties, and the expected relevance of the information gained will be discussed in what follows.
2.2.1 Elicited Language and Introspective Data

2.2.1.1 Theoretical Considerations

The Task

The present study is concerned with questions of utterance formulation in L1-L2 translation. As discussed above, the formulation process involves several more or less distinct, yet interacting processing mechanisms. The main focus of this study will be on lexical selection, with phrasal construction being a secondary issue. In order to arrive at a comprehensive understanding of lexical organization and the interdependence of the various processing stages of utterance formulation, it was suggested that it would be useful to gain information on all these aspects from data elicited by a single task. In order to cover the range of information required, the following triad was designed with a view to obtaining complementary information on a single linguistic activity. The central task was the written translation of a text from L1 into L2, accompanied by TAPs relative to the performance of this task. The translation was preceded by the individual creation of a translation source.

(1) Story Composition

Under normal circumstances, the act of translating involves two distinct cognitive activities, namely "the decoding of the stimulus sentence and the encoding of the translation" (Larsen-Freeman/Long 1991:29), and is thus a relatively complex and demanding procedure. Since the comprehension dimension is of no immediate relevance for the present investigation, it appears sensible to eliminate it from the task, in order to reduce the cognitive load on the subjects. The only way to achieve this is to start from a text they are familiar with. A familiar text, however, harbours its own problems: it needs to be understood in terms of its conceptual content, but should obviously not have been processed to any great extent, in particular not cross-linguistically.
by the informant before. Ideally, it should also comply with her own way of writing, in order to be maximally accessible. How can such a text be provided?

The above-discussed approach involving a self-produced translation source immediately before carrying out the translation seems to offer a solution. The advantages are twofold: not only can the text be expected to be well understood, both structurally and conceptually, but conceptual contents have also recently received focal attention and can therefore be easily recalled from memory. The subjects should thus be able to concentrate exclusively on the L2 encoding of their intended message.

However, the approach still poses certain difficulties. To begin with, the question of the comparability of the results may arise, due to the lack of a common translation source. The answer to this lies in the specific purpose of the investigation. Its primary goal is to explore the processing mechanisms of lexical selection and their underlying cognitive organisation principles. This includes a focus on small translation units, in particular lexical items and possibly minimal phrases, but not on their sentential embedding. In terms of comparability the crucial issue is therefore to ensure that certain lexical items occur in as many compositions as possible.

The approach may appear to exclude the comparability of phrasal construction across individuals, if their source texts, and the attendant lexico-grammatical constructions and associated difficulties differ. This, however, is not necessarily the case. It was suggested that phrasal and sentential structure and construction depends to a certain extent on the predicative item selected to express a given concept, or conceptual relation. It may therefore be expected that identical lexical choices in terms of predicative items bring in their wake similar formulation processes; if not, the results may help modify the hypothesis.

A second point to be considered is the problem that the subjects could aim at producing a text that is easy for them to translate, or even back-translate from what they may think of producing in German. The answer to this lies in the conclusion that they simply must not be aware that their composition will be their later translation source.

Finally, the argument may be brought forward that some subjects might produce simplistic, easy-to-translate texts, while others might create compositions that confront them with major difficulties. This question appears to be difficult to solve. However, in the present context it is seen as being of minor significance, at least with regard to questions of lexical selection. If the investigation concentrates on the processing of the items
common in all translation sources, the character of the rest of what happens elsewhere in the material becomes less important.

(2) Translation

With the comprehension dimension excluded from the task, the act of translating becomes a relatively straightforward procedure, demanding focal attention only on the conceptual content and its lexicalisation. As discussed in Chapter 4, translating requires a rendition as close to the original as possible, reproducing the source language message in terms of meaning, structure, and style (Bassnett-McGuire 1980:2; Nida/Taber 1969:12). This demand can give rise to a conflict between free and literal translation. It engages the translator in a search for translation equivalents in the target language which fulfil all three requirements. Task instructions should draw the informant's attention to these points, without overemphasising their importance.

The translation task has a twofold function: it triggers linguistic/lexical processing, and it leads to an L2 performance product, which can be scrutinised from different angles. It can be set in relation to the primary (L1) product, to a (close) translation equivalent, which might be considered a target ideal, or, if applicable, to appropriate alternatives, and to the process that brought it about. It can thus be analysed structurally and psycholinguistically, and may help reconstruct the translator's linguistic knowledge organisation. It was emphasised already in Chapter 3, that the purpose of this study is not to characterise individual people's current state of L2 competence. Its major objective lies in investigating general principles of (plurilingual) lexical organization, by means of analysing L2 processing mechanisms. It is therefore of minor relevance why crosslinguistic influence, errors, etc. occur – the essential question is how they are processed.
TAPs, as discussed in Chapter 4, extend the researcher's scope by documenting the otherwise inaccessible process that leads to the outcome of a cognitive activity. They are often capable of explaining dubious or seemingly inexplicable results. However, they illuminate not only the path to the final product, but also evidence approximations that were later discarded. Intermediate solutions and strategies are seen as being at least as interesting as the translation outcome itself (cf. Zimmermann 1990:432). The TAPs, reporting on the informants' chain-of-thought, in fact constituted the main corpus of data. They were transcribed and analysed together with the written translations. A combined analysis of translation products (in particular erroneous ones) and the steps taken in the translation process provided a comprehensive picture of lexical knowledge organisation and processing.

2.2.1.2 Design of the Investigation

The study in its final form, aimed at complying with the requirements outlined above as closely as possible. It consisted of the composition of a story on the basis of a series of pictures in English (the subjects' L1) and its translation into German. The data were collected from all the informants (except for one, who was involved in a trial run of the study) in a single session taking place in a language laboratory, where they were placed in auditory booths to record the TAPs. This was not only organisationally relatively simple, but also most suitable for two further reasons. The first relates to the anonymity of the laboratory situation. I assumed that the subjects would be less inhibited from speaking aloud in a situation where they did not feel observed personally. I therefore discarded the idea of individual sessions right from the start. More important, however, was the second reason, which concerned the surprise effect of the picture story and of producing their own translation sources. It was essential to ensure that everyone taking part in the study was kept naïve with regard to both these facts, otherwise they might obviously have prepared themselves for the study task.
The cartoon taken as the composition source featured an episode of Calvin and Hobbes, which was slightly shortened in order to provide a compact, easy-to-retell plot (cf. overleaf).

It shows Calvin unhappy with his hairstyle, a solution to which is found by Hobbes giving him a haircut. The result is disastrous, Calvin’s reaction when he sees it in a mirror is sheer horror. In fear of his mother’s wrath he tries to hide the bald facts under a hat, but does not get away with it. Again, Hobbes comes up with a solution: he draws hair onto Calvin’s head, which restores the peace between the two friends.

The story was selected for several reasons.

- I had used Calvin and Hobbes in various ways in classroom teaching before, and had found that the students always responded very positively to the material. I therefore expected this particular stimulus to provide a high motivational factor.
- The plot is easy to understand, located in the realms of everyday life with most of its situations being familiar or easily imaginable for most people. This aspect was again considered to have a positive motivational aspect, and also to have the advantage that it is centred on basic vocabulary.
- It contains a number of key situations, which were expected to evoke the use of specific lexical items, which were to provide the basic corpus to be investigated in terms of their processing. Beyond a range of concrete things and actions, the plot builds on a series of related emotional situations, which may allow for a certain degree of freedom concerning lexicalisation. The most interesting aspect about the verbalisation of these situations is that corresponding lexical items and phrases are not entirely congruent in English and German, neither structurally nor conceptually. It turned out that difficulties in translating these items led to particularly rich conceptual processing.
- Despite its relative straightforwardness and simplicity, the story harbours a range of hidden difficulties. These include the ones just mentioned, and also the fact that despite the basic character of the vocabulary, some of it might not be immediately accessible, since it would not be used much in the subjects’ current language learning situation. It was therefore expected that they would be engaged in trying to retrieve such items.
Calvin and Hobbes: "The Haircut"

---

I can't get this stupid hair to comb right.

See how it sticks out in the back?

Maybe you need a haircut.

Yeah, but barbers never cut it the way I want.

---

You cut your hair?

No, I didn't.

Why on earth did you cut your own hair?

Look at you!

---

Hey, what a great idea! Thanks!

Hey, what a great idea!

So exactly, how would you like the back cut?

Just trim the part that sticks out and taper it a little.

Wouldn't you rather have it real short?

---

...Well I didn't.

Look, I'm sorry.

I messed up your haircut. I don't mean to.

A fat lot of good that does me.

I can make it up to you honestly.

---

Hey, just cut a little bit.

Are you sure?

Don't you think it should be real short?

It looks like it should be real short.

---

You'll love it. It's sort of like a Mohawk.

You'll love it. It's sort of like a Mohawk.

---

I bought a yellow magic marker.

Yeah? Wow?

I'll just mean some hair on there. It's looking better already.

Yeah? Wow?

---

If mom sees this, she'll blow her gills, Ted. I want to do it like.

I want to do it like.

---

She'll blow her gills. I won't tell you.

How much did you pay for it?

---

Thanks, Hobbes. You're a real life saver. I'm so happy.

Honesty no harm taken.

---

All's well that ends well.
Task 1: L1 Composition

With regard to the composition, three crucial conditions had to be ensured.

1. Most importantly, the subjects should not be aware that their composition would provide their later translation source.

2. Certain key situations should be verbalised, some of them preferably using specific lexical items.

3. The language production should be as casual as possible, i.e., without focal attention on the choice of words.

In relation to the first requirement, I resorted to telling the informants that before the translation task began, they were to be given a short ‘warm-up’ period, in which they could get used to the experimental situation. Most notably, this referred to speaking aloud while writing, hearing themselves over the headphones, and getting used to the background noise of the other informants talking. In order to make it easy on them, so they were told, it would not involve any L2 production, but simply a composition in English.

The second requirement gave rise to the consideration that some kind of subliminal composition guidelines should be given, in order to avoid a situation where the products would diverge too much. I decided to give the subjects a brief account of the story myself, including the elements and situations I wanted to be verbalised. I was aware that a possible drawback of telling the story myself could be that the informants might follow my choice of words. Considering the advantages, however, it was a chance I had to take, and the results proved the decision right. Here, as well, I gave a practical explanation for doing this, saying that I was hoping to facilitate the task, and to give them an idea of how much could approximately be written within the given time limits. The latter aspect was indeed important, in order to ensure that the story would be completed.

The third requirement was met by setting a relatively tight time frame, in this case a maximum of 10 minutes. It demanded spontaneous writing and did not leave much time for careful consideration.

In addition, the students were given written instructions (cf. Addendum 3): to be concise and write a coherent story instead of just describing pictures; not to interpret the happenings, for example by pointing out that
Hobbes is a creature of Calvin's imagination; and to avoid direct speech (in order to ensure that the dialogues would not simply be copied).

Task 2: L1-L2 Translation and Think-Aloud Protocols

The essential requirements of the translation task were to ensure a complete and faithful transposition of the original into the L2 and a verbalisation of the subjects' chain-of-thought for recording. The guidelines for the second task (cf. Addendum 3) therefore included the instruction to translate as closely as possible, with the comment (followed by two supportive examples) that a literal translation is not always possible but that there is usually a similar way of expressing ideas. It was hoped that this advice would lead the informants to aim at maintaining as much of the original conceptual content as possible, while at the same time avoiding imposing English structures on the German text, just in order to translate 'closely'. Further instructions emphasised the importance of complete and unaltered translation, and also reminded the subjects again to 'think aloud'. I encouraged them simply to speak out loud what was going on in their mind, without trying to analyse or comment on their thoughts. I also told them not to worry too much about making mistakes, since I was less interested in the quality of the product than in the process behind it.

The use of dictionaries was not allowed for obvious reasons, and the time limit was set at 30 minutes. Allowing 10 minutes for the first and 30 minutes for the second task was primarily an adjustment to technical pressures, as the cassettes available for recording were 45 minutes long and it seemed a sensible idea to have a few minutes in reserve if needed. Therefore, the size of the cartoon and the time allocated to the composition were designed in such a way as to make 30 minutes a reasonable limit for the translation.

A preliminary run of the experiment with one of the informants was undertaken in order to detect possible problems or major deviations from the expected results. On the whole, the design appeared to be appropriate, with the only minor difficulty of finishing the composition within 10 minutes. Instead of changing the time frame, though, I decided to put extra emphasis on the fact that the ten minutes given for the first task were very short. I also allowed for an extra two or three minutes at the end of the task, where required.
2.2.2 Background Information on the Informants

Questionnaires

The questionnaires were designed to gain a comprehensive picture of the subjects' language learning background. As was mentioned above, such information was collected with regard not immediately to the present data analysis, but in particular to possible further uses of the data with other investigation goals, such as the study of factors of individual variation. They covered the following areas of interest:

1. Student details: age, field and year of study
2. Reasons for taking a German language course
3. Language experience: details of second language learning (languages, age at which learning began, institutions, native speaker contact, time spent abroad), and the use put to the different languages

The questionnaires given to the Group B students were slightly modified, in particular to include information on perceived linguistic distance, and a personal assessment of their proficiency in the different languages being taken.

Examination Results

The above data were supplemented by information on the Group A students' performance in mid-term and final exams in the language modules. These examinations involved an evaluation of different linguistic criteria, namely phonological, grammatical, lexical and pragmatic performance. The differentiated accounts of their proficiency thus obtained were seen as permitting particular perspectives on the subjects' L2 competence if required (for example for the purpose of studying individual variation). For Group B no such detailed data were available, as their courses did not involve comparable testing methods. Up-to-date general examination results were not available at the time of the study, either.

It may already be mentioned here that no detailed background information was included in the data analysis of Group A. For Group B only the most basic facts about their linguistic experience with the respective second
languages was taken into consideration. These include overall proficiency and the fact that, as would have been expected, the Germanic languages were perceived as being linguistically closer to each other than to English. In the case of the Norwegian native, her particular situation of studying languages through the medium of a second language was further acknowledged.

2.3 Problems

On the whole, the data collection can be considered highly successful. The L1 compositions provided a translation source as desired, and the biggest element of uncertainty and unpredictability, the TAPs, turned out to be the most valuable information source. A few minor problems did not distort the overall validity of the data. These were the following:

1. Data Elicitation

   - One informant did not record her TAP, either because she did not press the right buttons, or due to a technical defect.
   - Another subject did not ‘think aloud’ much, perhaps because he found the task too difficult or irritating, or simply because he kept forgetting to speak out his thoughts.
   - Two informants did not provide an English composition, but told the story in German straight away, presumably because they did not concentrate on the instructions. (This may be hard to believe, but it happened.) For the reasons outlined above (cf. preliminary study), their L2 stories can therefore not be treated as translations proper; however, the TAPs nevertheless provided information on communicative intentions and processes of lexical selection and phrasal construction, which made it possible to analyse processing strategies and mechanisms.
The trial subject ran out of time completing his English composition. Therefore, a few situations were missing in his material.

Not all of the alleged key situations of the story were indeed verbalised by all the subjects. This fact, however, did not affect the overall quality of the results.

Two informants produced a relatively free rendition of their story in German, which made it difficult to compare translation source and product. In one case, this was clearly motivated by the fact that her English version was stylistically too demanding for her to translate into German.

Group B

Again, one informant produced hardly any processing data, presumably because she found it difficult to concentrate on both translating and thinking aloud.

Less of a problem than an amusing anecdote relates to the fact that I had to leave the room for a few minutes during one of the translation tasks. Two of the students used the occasion to exchange information, and pretended to come up with a sudden 'inspiration' afterwards – unfortunately for them witnessed by the tapes.

2. Transcription of the TAPs

A general difficulty in transcribing recorded speech is that it can include unintelligible passages. Fortunately, in all but one case, these were only very few. In the remaining case, one of the multilingual informants, the entirety of the recordings were completely unintelligible, due to his extremely unclear diction. Since the TAPs provided the main body of information on lexical processing, his material could not be used.
3. CONCLUSIONS

Chapter 5 has introduced the methodology of the empirical study on which the present thesis is based. It has discussed the development of the data elicitation tasks and presented the subjects involved in the study. The declared goal of the project was to generate data on as many aspects of plurilingual language use and of lexical organisation as possible. The data obtained were, indeed, found useful for investigating a wide range of linguistic phenomena. For the purpose of the present study, however, only a selection of specific questions on lexical connectivity and lexical processing will be investigated.

The following chapter will analyse the data in the light of the present research questions.
CHAPTER 6 DATA ANALYSIS. LEXICAL PROCESSING IN L1-L2 TRANSLATION

O. GENERAL

The data elicited in the empirical study described in Chapter 5 were analysed with reference to the central hypotheses underlying the lexical organisation model proposed in Chapter 3. It was suggested that tracing the processes involved in lexical selection and phrasal construction in L2 production can shed light on the structure of the mental lexicon. Of particular interest here is the organisation of lexical knowledge in relation to its representational substance (with a specific focus on conceptual-semantic structure) and to its combinatorial potential, with a view to the mechanisms of utterance formulation and the relationship of multiple languages in the mind in the light of lexical connectivity. It was suggested that structural principles and processing mechanisms are closely associated. The hypotheses put forward in the course of the discussion were the following:

1. Conceptual structure is represented or mirrored in lexico-semantic organisation; it can be traced by analysing lexical selection and in particular semantic search activity in cases of an unavailability of required target language items.

2. Grammatical knowledge can be related to the information structure of lexical items; more specifically, phrase structure depends to a considerable extent on the information structure of predicative items; tracing grammatical errors and steps taken in phrasal construction allows for insights to be gained into lexico-grammatical organisation and lexical connectivity beyond semantic and form-based associations.

3. The plurilingual lexicon is an integrated system, characterised by the dynamic interaction of different languages in the mind, whereby the relationship of such languages can vary considerably, depending on a number of structural and psychological factors; depending on their organization, it may involve a certain degree of separate processing of their elements. From crosslinguistic consultation and influence in L2 production inferences may be drawn about crosslinguistic connectivity and plurilingual knowledge organisation.
Chapter 6 will test these hypotheses in the framework of the model outlined in Chapter 3, and in this way at the same time test the model itself. This relates to a further concern of the present study, namely the suggestion that an explanatory psycholinguistic model of lexical organisation should aim to integrate different theoretical positions, in particular avoiding a one-sided perspective which analyses linguistic behaviour with reference to structural-linguistic categorisation, irrespective of the neuro-cognitive plausibility of such principles.

The data analysis is divided into two parts. The first part scrutinises mechanisms of lexical selection, the organisation of conceptual-semantic knowledge, and plurilingual connectivity. It focuses on the processing of individual items or individual concepts. The second part investigates a selection of production errors in the light of lexical information structure, and aspects of grammatical processing as relating to the process of phrasal construction. Both parts will deal with bilingual and multilingual issues separately.

The following data are relevant to the investigation:

1. L1 written compositions
2. L2 written translations
3. TAPs associated with the performance of the translation task

The TAPs included about 20 hours of speech which were transcribed by the researcher; in the case of the Dutch and Swedish translations, the transcriptions were carried out by the researcher and additionally by native speakers, respectively, Dutch and Swedish lectors of the Department of Germanic Languages of Trinity College. In the transcriptions interlanguage forms were spelt in accordance with target language orthographic rules. This was decided because the alternative, a phonetic transcription, would have made the transcriptions unnecessarily difficult to work with for the present purpose. Phonetic transcription was opted for only in cases where it was unclear what language or item was aimed at, for example in some cases of fragmentary items. A convention also had to be found for the transcription of speech pauses. Because of their ambiguity (cf. Chapter 4, e.g., Zimmermann 1994) and because they were considered relevant only insofar as their presence indicated not immediately documented problem-solving activity, they were not quantified. In order to impose some structure on the verbal protocols, a distinction was only made between 'relatively short pauses'
(up to a few seconds, represented in the transcriptions by 1 dash) in which the informant seems to have been concerned with his current difficulties, as opposed to 'longer pauses' (2 dashes) where it is impossible to decide what he might have thought about. This classification admittedly involves a certain degree of vagueness and subjective judgement, but it is not seen as distorting the informational content of the transcriptions for the present purposes because pauses were not analysed qualitatively.

For the bilingual study, a range of situations were singled out from the stories, and the corresponding data extracted from the corpus and prepared in a way relevant to the present study. This included most notably a reduction of the verbal data, for the sake of transparency, to the relevant information. An example of this operation will be given below.

The situations selected for investigation in Group A were chosen on the following grounds:

- They were verbalised by most of the subjects.
- Their verbalisation involves a high percentage of errors and/or translation difficulties for the informants and a considerable variety of lexicalisations.
- Associated with translation difficulties, the TAPs document a range of interesting processing sequences.
- The central concepts of the situations are lexicalised by predicative items which vary in meaning and valency structure across the languages under investigation. This leads to careful processing at word and sentence level if the informant is aware of these differences, or to production errors if he is not.
- Three of the four selected situations involve the description of related emotional reactions around the notion of discomfort, which allows the relevant processing to be compared.

The relevant situations are the following:

1. Calvin getting suspicious while Hobbes is cutting his hair;
2. Calvin being horrified by the result;
3. Calvin's mother being shocked by Calvin's bald head;
The processing of these situations involved 437 lexical activations that are of interest for the present study. They include 90 different English and 88 different German items with a total of 234 English and 203 German forms. Apart from lexical selection being subjected to scrutiny in this context, a selection of examples of grammatical processing were also analysed, relating to the same and to other scenes from the picture story.

The data of Group B were analysed without orientation by pre-established categories, the focus being on the situations and items that suggested themselves in each case. The respective findings are understood as tentative interpretations, which would be interesting to follow up in a large-scale investigation.

It was mentioned earlier that the purpose of the present study is to investigate general principles of lexical organisation as transcending individual variation. The Group A data were therefore not scrutinised for factors of individual variation relating, for example, to the informants' linguistic background. For Group B, only basic facts about their previous linguistic experience and language learning background, in particular in relation to their overall proficiency in the different languages are taken account of. Such information is seen as relevant for understanding the relative status of their languages and, thus, understanding processing peculiarities. In the case of the Norwegian, the particular situation of learning second languages through the medium of another L2 is further taken into consideration.

I will now turn to the data analysis and begin with the investigation of lexical search and retrieval and its implications for lexical network organisation and conceptual-semantic structure, and for crosslinguistic lexical connectivity.

1. ROUTES OF LEXICAL ACCESS, LEXICAL CONNECTIVITY, AND CONCEPTUAL STRUCTURE

This section will investigate principles of lexical organisation as emerging from the search process in cases of the non-accessibility of required semantic items in the target language. Of particular interest are the implications of semantic processing for conceptual organisation and for crosslinguistic connectivity. The data
analysis will scrutinise lexical processing in connection with four different concepts, namely the activity of (artistic) DRAWING\(^1\) and the verbalisation of WORRY, SHOCK and ANGER and related notions.

Before beginning with the data analysis, the preparation of the TAPs needs some further discussion.

1.1. Preparation of the Verbal Protocols

The verbal protocols contain a considerable amount of data irrelevant for the present research goals. In order to make them maximally relevant and transparent, information not required here will not be presented. Its deletion and the resulting relationship between the original recorded speech and the presented associative chain will be explained in the light of an example. The following chain-of-thought documents the processing activity of informant 15\(^2\), who lacks a translation equivalent of the verb draw in the context:

source phrase: ... and Hobbes draws on his head

translation product: ... und malt\(^3\) (auf sein Kopf) ('and draws( on his head)')

The TAP here reads as follows:


The declared goal of the analysis of the verbal protocols has been said to be the reconstruction of lexical networks and an identification of processing mechanisms by tracing the routes taken in L2 lexical search and retrieval. This means that the information crucial to this objective is the activation of the semantic environment of a target concept as represented by an L1 lexical item, and/or of the formal environment of this item or of a selected L2 target item. Of further interest are metalinguistic comments like "it's not right", which often

\(^1\) Following the convention of Chapters 1 and 3, conceptual entities are printed in capital letters, lexical forms in bold script, lexical items in italic and reference objects in normal script. For items from languages other than English, a translation equivalent is given with their first appearance in the text.

\(^2\) The informants were numbered 1-30 (Group A) and 31-34 (Group B), and will be referred to by their number, if required, in the course of the discussion.
document the subjects' beliefs about lexical relations or about the validity of their selected solutions. Irrelevant in the present context (although highly interesting in the light of other research objectives) are constant repetitions of either the source item, the source phrase, or the incomplete target phrase. Similarly irrelevant here are filled pauses (which are commonly transcribed as *uh*, irrespective of their phonetic quality) or exclamations like "oh my god". In sum, only thought sequences relevant to the present objectives will be presented. In the case of the above example, the informant's chain of thought would be reduced to the following sequence:


This chain of activations is seen as representing the (evidenced) steps taken in search of an equivalent of *draws*. The informant first isolates the source item, then associates the German form *schmiert*, which is judged to be inappropriate, then returns to *draws* and continues her search in a different direction from there, activating the related English form *writes*, its German equivalent *schreibt* and the corresponding German infinitive *schreiben*; next she associates German *malt* and the corresponding English infinitive *paint*, followed by a reactivation of the German item, this time in the infinitive form; this choice is accepted as a solution to her problem - though in her opinion an incorrect one - and leads her to the selection of *malt* for written production, misspelt as *mailt*.

This sequence of lexical activations is seen as documenting the spread of activation in the conceptual environment of *draw* and the triggering of the lexical forms associated with activated semantic structures. It includes repeated activations of an item if these reactivations are discontinuous, i.e., interrupted by the activation of a different item. This process is seen as evidencing the forward and backward flow of activation in the system. The chain does not include continuous repetitions, which only imply that the repeated item itself is kept at a high level of activation. This is not informative in terms of lexical organization. The chain may include morphological variations, which evidence grammatical-formal processing. Such processing, however, will be investigated primarily in the second part of this chapter. If selected for an in-depth analysis, as in this case, the presented thought sequence includes relevant metalinguistic comments of the informant, such as "it's not right".

*German language errors are documented as occurring in the written products of the subjects, unless lexical*
A final word may be spared for the value of the TAPs. As was discussed in Chapter 4, verbal protocols can neither give a full account of the processing activity going on in the mind, nor can they document parallel distributed processes. What they are used for here is an investigation of the mechanisms involved in L2 lexical selection by tracing documented stages of lexical access, and a reconstruction of lexical field organisation and of conceptual-semantic structure.

1.2 Investigating Lexical Organization

As was mentioned before, the discussion of the data is divided into two parts, one dealing with the bilingual results, obtained from Group A, the other with the multilingual data (Group B). I will begin with the analysis of the Group A data, which involved 30 advanced English-speaking learners of German with a similar level of bilingual proficiency. For Group A, the investigation of lexical organisation in the light of lexical selection activity will focus on the processing of the different concepts listed above, beginning with the notion of DRAWING, followed by the analysis of the three 'emotional' scenes. In view of the multitude of data obtained, not every single instance of a specific phenomenon can be discussed. Of major interest here are examples where the informant’s processing activity is documented, and changes of (lexical) meaning between translation source and product. It should further be mentioned that the four situations will be scrutinised for different aspects of lexical organisation each, in connection with the research questions, depending on the nature of the data and whether or not certain aspects have been covered before. Situation 4, which will be discussed first, will be considered for a relatively wide range of processing and structural phenomena, giving an overview of the different points of interest, which will then be followed up in one or more of the following sections.

items are represented by their basic forms.
1.2.1 DRAWING

1.2.1.1 Overview of the Data

I will begin the discussion of the data with a look at the verbalisations of the scene from the picture story in which Hobbes draws yellow lines on Calvin’s head to cover the bald facts. It is verbalised by 27 of the subjects, with a total of 56 English and 58 German lexical activations, involving 8 different English and 18 different German items. These are distributed as follows:

<table>
<thead>
<tr>
<th>L1 source items types:</th>
<th>3</th>
<th>tokens:</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 written solutions types:</td>
<td>13</td>
<td>tokens:</td>
<td>27</td>
</tr>
<tr>
<td>L1 approximations types:</td>
<td>8</td>
<td>tokens:</td>
<td>29</td>
</tr>
<tr>
<td>L2 approximations types:</td>
<td>11</td>
<td>tokens:</td>
<td>31</td>
</tr>
</tbody>
</table>

They relate to the following lexical items (basic forms, here most prominently verbal infinitives):

<table>
<thead>
<tr>
<th>L1 source items</th>
<th>L1 approximations</th>
<th>L2 approximations</th>
<th>L2 written solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>draw (v) 21</td>
<td>paint (v) 7</td>
<td>(*ein-/auf-)malen 7</td>
<td>(*ein-)malen 8</td>
</tr>
<tr>
<td>colour (v) 5</td>
<td>draw (v) 11</td>
<td>schreiben 7</td>
<td>schreiben 5</td>
</tr>
<tr>
<td>put 1</td>
<td>write 3</td>
<td>*(an-)zeichen (v) 6</td>
<td>zeichnen 3</td>
</tr>
<tr>
<td>art 4</td>
<td>streichen 1</td>
<td>*(an-)zeichen (v) 2</td>
<td></td>
</tr>
<tr>
<td>colour (v) 1</td>
<td>Kunst 1</td>
<td>einfärben 1</td>
<td></td>
</tr>
<tr>
<td>put 1</td>
<td>kurz 2</td>
<td>ziehen 1</td>
<td></td>
</tr>
<tr>
<td>technical drawing 1</td>
<td>ziehen 2</td>
<td>streichen 1</td>
<td></td>
</tr>
<tr>
<td>show 1</td>
<td>technische *Zeich- 1</td>
<td>machen 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>schmieren 1</td>
<td>geben 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>zeichnen 2</td>
<td>stecken 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>anziehen 1</td>
<td>stechen 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>schieben 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>*peinten 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The distinction between types and tokens is here used to differentiate between lexical items in the sense of basic entries and their repeated occurrence as situationally modified forms.
Table 6.1 Distribution of activated items relating to the notion of DRAWING

The figures in Table 1 denote frequencies across the informants. If not obvious, syntactic word class is marked as follows: v=verb, n=noun, a=adjective. Interlanguage and incompletely retrieved forms are here marked with an asterisk (*).

Approximations include reactivations in longer search sequences and morphological variations.

The lexicalisations relate to the following activation sequences:

<table>
<thead>
<tr>
<th>subject</th>
<th>source item</th>
<th>associative chain</th>
<th>written translation product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(by) colouring</td>
<td>he colours – paints – streiche – er streicht – that's wrong</td>
<td>(er) streicht</td>
</tr>
<tr>
<td>2</td>
<td>(he) draws</td>
<td>---</td>
<td>(er) schreiben</td>
</tr>
<tr>
<td>3</td>
<td>(by) drawing</td>
<td>---</td>
<td>machen</td>
</tr>
<tr>
<td>4</td>
<td>(he) draws</td>
<td>I know malt is something along the lines of paints or draws</td>
<td>(er) malt</td>
</tr>
<tr>
<td>5</td>
<td>(by) colouring</td>
<td>painting - malen</td>
<td>malen</td>
</tr>
<tr>
<td>6</td>
<td>(by) colouring in</td>
<td>---</td>
<td>(er) &quot;colours&quot;</td>
</tr>
<tr>
<td>7</td>
<td>(Hobbes) colours in</td>
<td>---</td>
<td>(Hobbes) malt</td>
</tr>
<tr>
<td>8</td>
<td>(to) draw</td>
<td>---</td>
<td>(zu) schreiben</td>
</tr>
<tr>
<td>9</td>
<td>(and) draws</td>
<td>---</td>
<td>(und) schreiben</td>
</tr>
<tr>
<td>11</td>
<td>1. (to) colour</td>
<td>---</td>
<td>1. (zu) einfärben</td>
</tr>
<tr>
<td>12</td>
<td>(he) draws</td>
<td>er – schreib-</td>
<td>(er) schiebt</td>
</tr>
<tr>
<td>13</td>
<td>drawing</td>
<td>---</td>
<td>malen</td>
</tr>
<tr>
<td>14</td>
<td>(he could) draw</td>
<td>---</td>
<td>(zu) zeichnen</td>
</tr>
<tr>
<td>16</td>
<td>(Hobbes) draws</td>
<td>schreiben - writes</td>
<td>(er) schriebe</td>
</tr>
<tr>
<td>17</td>
<td>(by drawing)</td>
<td>malen - to paint - drawing - schreiben - technical drawing is - technische Zeich- - Zeich- - zu malen - I think would be the best</td>
<td>(zu) malen</td>
</tr>
<tr>
<td>18</td>
<td>no English text</td>
<td>und er – zeichnen – zeichnen -zeichnet</td>
<td>(er) zeichnt</td>
</tr>
<tr>
<td>19</td>
<td>(by) drawing</td>
<td>to draw – schreibt – oder - stecht</td>
<td>(er) stecht</td>
</tr>
<tr>
<td>20</td>
<td>no English text</td>
<td>don’t know the English verb to draw</td>
<td>(er) gibt</td>
</tr>
<tr>
<td>21</td>
<td>(to) draw</td>
<td>art is – kurz – to draw – kurz is art to draw – malen - okay</td>
<td>(zu) mahlen</td>
</tr>
<tr>
<td>22</td>
<td>(to) DRAW</td>
<td>anzuziehen – no ziehen – I can’t remember draw – ziehen – oh I'll try ziehen I’ve no idea – what's to put really – to put some hair on - yeah</td>
<td>(zu) ziehen</td>
</tr>
<tr>
<td>23</td>
<td>(he) draws (in)</td>
<td>---</td>
<td>er zeichnet</td>
</tr>
<tr>
<td>24</td>
<td>(of) drawing</td>
<td>draw – art – Kunst – draw – art – paint – schreiben – zu schreiben – to write – that’s – as close as I can get</td>
<td>(zu) schreiben</td>
</tr>
</tbody>
</table>
The table displays L1 source item, the sequence of lexical activations and a selection of relevant comments, and the L2 written solution. (The complete set of data relating to the processing of the central concepts of Situations 1-4 is presented in Addendum 1. It includes source items and translation products in their phrasal embedding and the unabridged chains-of-thought relating to their processing.) The data have been interpreted with reference to the above cited research questions. The processing activity of the subjects, in particular the dimensions of lexical search, as well as lexical errors were scrutinised for their informational value concerning aspects of conceptual-semantic organisation and bilingual lexical organisation and processing.

I will begin with a graphic illustration of the aggregated processing activity of the 27 informants. It displays the activated lexical items and the links between them as evidenced by the subjects' activation sequences. The number of lines drawn between items correspond to the number of times these items were associated in sequence.

Figure 6.1 displays the 26 items occurring in the subjects' processing activity in their search of a German equivalent for the verbs, draw, colour, and put. (Dotted lines and items in brackets indicate additional links relevant for the understanding of lexical errors.) Is the illustration a mere collection of individual associations, or can it be interpreted beyond that? Following Zimmermann (e.g., 1994), I will suggest viewing it as a representation of (part of) the subjects' collective conceptual frame associated with the notion of DRAWING, as represented by their aggregated search activity. Their processing activity is further seen as shedding light on the type of bilingual organization prevailing among the elements of the lexical field.
1.2.1.2 Bilingual Organisation

I will begin the discussion of the data by considering the question of bilingual organisation. In order to understand the subjects' processing activity, a few basic facts about the organization of the conceptual field associated with DRAWING and its lexicalisation patterns in English and German need to be introduced. They concern the notions of DRAWING, ZEICHNEN, PAINTING and MALEN, as represented by the corresponding verbs. Draw/zeichnen and paint/malen tend to be associated as being widely synonymous. There are,
however, important distributional differences. Draw and zeichnen generally denote the act of putting lines on a paper or other material by means of a writing instrument, while paint and malen refers to the application of colour on a surface. Compared with zeichnen, draw is slightly wider in meaning than the German term which cannot be applied to the artistic use of colour as in the given situation. Translating draw as zeichnen here, is therefore inappropriate. The correct term to be used would be malen. Malen thus covers conceptual aspects not attaching to paint, which is, on the one hand, associated with the creation of a piece of art and includes, on the other, the colouring of walls. This latter concept, in turn, is not captured by malen but represented by the item streichen.

Their processing activity suggests that the subjects are not aware of these differences, and that, instead of having stored draw, zeichnen, paint and malen coordinatively, i.e., such that each is associated with a separate concept, zeichnen is linked to the concept of DRAWING, and malen to that of PAINTING, i.e., they are stored in a compound manner. What leads to this conclusion are a number of indications.

To begin with, the subjects who selected the item zeichnen did not show any signs of hesitation as to the appropriateness of the translation. (Difficulties here relate to the correct identification of the lexical form, which will be discussed later.) However, for most of the informants, zeichnen was not available as a solution. This made them search the semantic environment of draw, in order to find a substitute, or in the hope eventually of arriving at the required item. In the wake of this process they activated either schreiben and write, or malen and paint, both of which were accepted only as makeshifts, with a preference of malen over schreiben.

Although malen is the translation equivalent of draw in the given context, most of the subjects appear hesitant to use it. The comment "okay, I'll just say malen - it's not right" (subject 15) expresses the informant's dissatisfaction with the solution and her belief that it is not correct. Like most of the other subjects who consider malen, she activates it together with paint, which indicates a close mental connection of the two items and, thus, presumably, an association of malen with the conceptual content of paint.

Most of the subjects' processing appears to be conceptually driven, as their activation of German items tends to proceed immediately, not mediated by English forms. English items appear to be accessed subsequently, apparently serving the function of cross-checking the semantic content of the German items. The German forms are therefore seen as in all likelihood being internalised in a compound manner.

5 This specific sense of drawing, of course, is only part of its general meaning of 'moving by pulling' which
In contrast to this, the activation of *paint* followed by *streichen* (subject 1) may well indicate subordinative storage, i.e., no immediate association with a conceptual content. The comment "that's wrong" seems to indicate an intuitive feeling that the item is inappropriate, but it does not seem to be known for its precise meaning, otherwise it might have been discarded even as a makeshift. A similar instance of subordinative storage is the selection of *ziehen* (subject 22) as being associated with *draw* (and later linked to *put*). *Ziehen* would be the translation equivalent of *draw* in its wider sense of 'moving by pulling', but it is not connected with the conceptual content in question.

1.2.1.3 Conceptual Organisation

It was suggested that the aggregated search activity of the 30 subjects might be seen as representing their collective mental representation of the conceptual frame of drawing. Although more than half of the informants activate (overtly) no more than two items (source item and written translation product), the overall distribution of lexical activations, i.e., how often the different items are associated and the number of lines drawn between them, is seen as being indicative of their position in the conceptual field and of their conceptual closeness. *Draw* is most readily associated with *write* and *paint* (and their German equivalents), the wider context of art being less closely connected, like that of colouring. It may also be mentioned at this point that the fact that the two source items *draw* and *colour* are associatively connected in the wake of their respective processing supports the validity of their common analysis. A weaker link connects the very specific notion of TECHNICAL DRAWING, and a similarly weak connection links up the general words *put, machen* ('make') and *geben* ('give'), and leads to wider meanings of *draw (ziehen)*, including *anziehen* ('put on clothes'). Also loosely conceptually connected is the notion of SCHMIEREN, whose basic meaning is 'smear', but which is colloquially used to refer to either scribbly writing or untidy drawing or painting. (The remaining German items relate to form-based associations which will be discussed later.)

The perspective of a collective mental representation is further supported by the fact that four subjects activate a relatively large part of the frame by themselves. Informant 11 uses two lexicalisations to describe relates to the German verb *ziehen.*
the scene in his English composition (colour and draw), activating six different, though semantically relatively close items in the translation process. Subjects 15, 17, and 24 each activate the central concepts of DRAWING, WRITING and PAINTING, and additionally one of the more peripheral notions, namely SCHMIEREN, TECHNICAL DRAWING, and ART. The search sequence of subject 15 is displayed in figure 6.2. It documents the lexical forms (tokens) as produced, and the search sequence indicated by numbers beside the arrows. It also shows the systematic search in three different sections of the conceptual-semantic environment of drawing.

![Diagram of associative chain for subject 15](image)

Figure 6.2 Subject 15: Associative chain of in search of a translation equivalent of draws

1.2.1.4 Formal Errors

A final point of interest are formal confusions occurring in the processing activity of the informants. They relate to the items schieben, kurz, and (an-)zeichnen. I will conclude this section by discussing these examples and their implications for lexical organisation.

To begin with, schieben is an orthographic error, which is evidenced by the TAP. The informant (12) pronounces the form schreibt (cf. table 6.2) but then misspells it as schiebt. The missing <r> can safely be
said to be a slip of the pen, while the substitution of <ie> for <ei> may or may not be a lapse, but is certainly motivated by the differing relationship of spelling and pronunciation in English and German\(^6\).

*Kurz* is simply explained as misdirected formal activation, the target having presumably been *Kunst*. This is clearly evidenced by the comments "art is -- kurz --...-- kurz is art".

A similar confusion is at work in the case of *zeichnen* and *anzeichen* (cf. subjects 18, 25, 30). The verbal protocol of one of the informants (30) confirms the intuitive-logical interpretation of the error: it relates to a relatively complex confusion of the formally similar items *zeichnen* ('draw'), *Zeichen* ('sign'), *Anzeichen* ('indication'), *zeigen* ('show'), and *anzeigen* ('indicate'). Her associative chain read as follows:

"zeicht -- zeichen I think is to show -- anzeichen is to draw -- or is it the other way round? -- maybe it's just zeichen -- und zeicht -- and draws"

With the activation of *zeichnen*, she associates *zeigen*, ignorant, however, of the actual relationship of the different terms, and not retrieving the correct target form at all. Subject 18, on the other hand, activates both forms, *Zeichen* (incorrectly as an inflected verb (*zeicht), though) and *zeichnen*, finally selecting the correct item.

12.1.5 Activation Spreading at Two Cognitive Levels

The mechanisms presumably responsible for the confusion of subject 30 (cf. above) can be illustrated by displaying the lexical items involved as representational structures across two cognitive levels and lexical processing as the flow of energy in this system.

\(^6\) In German, the phonetic qualities [ai] and [i:] relate to the spellings <ei> and <ie>, respectively, while in English [ai] is represented by <i> and [i:] is associated with a range of different spellings, including most prominently <e,ee,ea> but also, for example, <ei,ie>. It is therefore not surprising that the L2 learner of either language can have difficulties with the unfamiliar orthography.
ANZEICHEN

ZEICHEN

ZEIGEN

DRAH

show

zeichnen

zeigen

anzeichen

Figure 6.3: Lexical network associated with ZEICHNEN as representations at two cognitive levels

Figure 6.3. shows that the formal representations of the relevant German items are all clustered together.

Following the principle of spreading activation, which posits that activation automatically fans out from a selected structure stimulating its environment and connected structures, the selection of the semantic content ZEICHNEN leads to activation heading for the corresponding form zeichnen (if known), where it may overactivate its environment and accidently trigger a neighbouring form, or even two, in this case zeichen and anzeichen. Their activation, in turn, involves the further stimulation of the formal environment, which may include zeigen. Although not having been activated to the point crossing the output threshold, the stimulation of zeigen seems to have led to a backward flow of activation to the semantic level, reaching the concept ZEIGEN/SHOW. From here, again automatically, the English form show is activated - in this case above output level – leading the subject to believe that the lexical forms zeichen and anzeichen somehow relate to the notions of SHOWING and DRAWING – which, indeed, they do, but very differently from how she thinks.

This complex, apparently automatic and unconscious spread of activation in the lexical system could relate to the mechanism providing the language user with feedback about her lexical choices. In cases like this, where the system is not (yet) very well controlled, it can give rise to confusion and to production errors. The example also suggests that lexical processing involves a considerable amount of automatic processing that remains below the level of awareness of the language user, relating to the forward and backward flow of activation...
across the two representational levels (perhaps mediated by an intermediate 'switchboard unit', which fails to
map conceptual and formal structures appropriately; cf. Chapter 1; e.g., Damasio et al. 1996).
The example also gives an impression of the complex intertwining of the vocabularies of different languages
in the mind-brain and its consequences for crosslinguistic interactive processing.

Following the discussion of the processing activity around the notion of drawing, which has introduced the
main analytic dimensions relevant for the present discussion, I will now turn to the processing of emotion
terminology and focus on a range of selected aspects relevant to Situations 1-3.

1.2.2 WORRY

The concept of worry relates to a number of different scenes in the picture story and is most extensively
lexicalised for the situation in which Calvin gets suspicious while Hobbes is cutting his hair. I will here focus on
the lexicalisation of this situation, which involves not only verbalisations of Calvin's worries but also a few
items denoting a more neutral perspective on the scene, or even expressing Calvin's anger. The range of
lexicalisation patterns shows that the scene can be perceived in different ways; the subjects' choice of words
is seen as indicating their selective attention to specific aspects.

1.2.2.1 Overview of the Data

The situation is verbalised by 22 subjects, with a total of 42 English and 35 German lexical activations,
involving 21 English and 14 German items. They are distributed as follows:

<table>
<thead>
<tr>
<th>Source Items</th>
<th>Types</th>
<th>Tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1 source items</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>L2 written solutions</td>
<td>11</td>
<td>26</td>
</tr>
</tbody>
</table>
L1 approximations  types: 12  tokens: 15
L2 approximations  types: 7  tokens: 9

They relate to the following items:

<table>
<thead>
<tr>
<th>L1 source items</th>
<th>L1 approximations</th>
<th>L2 approximations</th>
<th>L2 written solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>worried</td>
<td>12</td>
<td>worried (a)</td>
<td>2</td>
</tr>
<tr>
<td>worry (v)</td>
<td>2</td>
<td>worry (n)</td>
<td>2</td>
</tr>
<tr>
<td>nervous</td>
<td>2</td>
<td>worry (v)</td>
<td>1</td>
</tr>
<tr>
<td>suspicious</td>
<td>2</td>
<td>afraid</td>
<td>1</td>
</tr>
<tr>
<td>dubious</td>
<td>1</td>
<td>fear (n)</td>
<td>1</td>
</tr>
<tr>
<td>disgruntled</td>
<td>1</td>
<td>apprehensive</td>
<td>1</td>
</tr>
<tr>
<td>maddened</td>
<td>1</td>
<td>suspicious</td>
<td>2</td>
</tr>
<tr>
<td>rage</td>
<td>1</td>
<td>suspect</td>
<td>1</td>
</tr>
<tr>
<td>anxious</td>
<td>1</td>
<td>uncertain</td>
<td>1</td>
</tr>
<tr>
<td>apprehensive</td>
<td>1</td>
<td>loose the cool</td>
<td>1</td>
</tr>
<tr>
<td>panic (v)</td>
<td>1</td>
<td>angry</td>
<td>1</td>
</tr>
<tr>
<td>throw a freak</td>
<td>1</td>
<td>unhappy</td>
<td>1</td>
</tr>
<tr>
<td>fear (v)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.3 Distribution of activated items relating to the notion of worry

The lexicalisations relate to the following activation sequences:

<table>
<thead>
<tr>
<th>subject</th>
<th>source item</th>
<th>associative chain</th>
<th>written translation product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>worried</td>
<td>Calvin hat Angst – it’s fear</td>
<td>(Calvin) hat Angst</td>
</tr>
<tr>
<td>3</td>
<td>worried</td>
<td>---</td>
<td>(Calvin) hat Angst</td>
</tr>
<tr>
<td>4</td>
<td>worried</td>
<td>---</td>
<td>(Calvin) besorgt sich</td>
</tr>
<tr>
<td>7</td>
<td>worried</td>
<td>ärgert – ist ärgert – sich ärgert? – ärgert sich</td>
<td>(er) ärgärt sich</td>
</tr>
<tr>
<td>10</td>
<td>1. worried</td>
<td>---</td>
<td>(Calvin fängt an ...) Angst zu haben</td>
</tr>
<tr>
<td>11</td>
<td>1. apprehensive</td>
<td>ängstlich – Ängst über – become apprehensive – ängstlich – fürchten – ängstlich</td>
<td>1. (Calvin) ängstlich (sein beginnt)</td>
</tr>
<tr>
<td></td>
<td>2. anxious</td>
<td>---</td>
<td>(Calvin) hat (immer mehr) Angst</td>
</tr>
<tr>
<td></td>
<td>2. worried</td>
<td>---</td>
<td>2. (er) wird besorgt</td>
</tr>
<tr>
<td>3. disgruntled</td>
<td>3. unhappy - unföhlich - unfroh</td>
<td>3. (Calvin wird) unfroh</td>
<td></td>
</tr>
<tr>
<td>12 nervous</td>
<td>---</td>
<td>(Calvin) wird nervös</td>
<td></td>
</tr>
<tr>
<td>13 suspicious</td>
<td>---</td>
<td>(Calvin) besorgt sich</td>
<td></td>
</tr>
<tr>
<td>14 worried</td>
<td>---</td>
<td>(Calvin wurde) besorgt</td>
<td></td>
</tr>
<tr>
<td>15 (to) panic</td>
<td>paniken - don't think that's right</td>
<td>(Calvin) hat ... Angst</td>
<td></td>
</tr>
<tr>
<td>16 (to) throw a freak</td>
<td>angry - looses the cool</td>
<td>(er) schrein</td>
<td></td>
</tr>
<tr>
<td>17 worried</td>
<td>worry - worried - Sorge</td>
<td>(Calvin) macht sich eine Sorge</td>
<td></td>
</tr>
<tr>
<td>19 worried</td>
<td>Sorge</td>
<td>(Calvin beginnt) die Sorge zu machen</td>
<td></td>
</tr>
<tr>
<td>21 fears for</td>
<td>hat Angst vor</td>
<td>(er) hat angst für</td>
<td></td>
</tr>
<tr>
<td>23 worried</td>
<td>Sorge - that's worry - worried - gets worries</td>
<td>(Calvin) bekommt Sorgen</td>
<td></td>
</tr>
<tr>
<td>24 nervous</td>
<td>---</td>
<td>nervos</td>
<td></td>
</tr>
<tr>
<td>25 worried</td>
<td>---</td>
<td>nervos</td>
<td></td>
</tr>
<tr>
<td>26 dubious</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>27 maddened</td>
<td>---</td>
<td>(Calvin) ist nicht froh</td>
<td></td>
</tr>
<tr>
<td>28 1. suspicious</td>
<td>1. unsicher - uncertain - suspicious - suspect - 1. (Calvin) wird unsicher</td>
<td>suspicious - unsicher</td>
<td></td>
</tr>
<tr>
<td>2. rage</td>
<td>2. ---</td>
<td>2. Zorn</td>
<td></td>
</tr>
<tr>
<td>29 1. (to) worry</td>
<td>1. afraid</td>
<td>1. (Calvin) hat Angst</td>
<td></td>
</tr>
<tr>
<td>2. (to) worry</td>
<td>2. ---</td>
<td>2. (er) hat Angst</td>
<td></td>
</tr>
<tr>
<td>30 worried</td>
<td>---</td>
<td>(er beginnt) Angst zu haben</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.4 Associative chains relating to the processing of Situation 1

I will again begin with a graphic illustration of the aggregated search activity of the informants.
Figure 6.4 displays the items activated by the 22 subjects in their efforts to verbalise Situation 1 in English and German. Although no search sequence involving a large number of different items is documented, together the informants activate a considerable number of items spread across a relatively wide conceptual area with a concentration on a range of apparently central items. The central question here will be whether the translation process of these different source items is comparable, and what it might tell us about lexical and conceptual organisation. In order to investigate this question, I will not exclusively focus on the process of translating, but consider the subjects' choice of words in both their English compositions and in the translation processes and results in a more global perspective. The discussion will build on the overview of the conceptual domain of emotions and its lexicalisation patterns presented in Chapter 1, section 2.2.5.

1.2.2.2 Conceptual Organisation and Lexico-Semantic Choice

Does the range of lexical items employed for verbalising the given scene, in particular the 13 English source items used in the story composition, represent 13 or more different conceptualisations of one and the same featured situation by 22 individuals of a relatively homogeneous group? This appears to be unlikely, and the
data suggest that, in fact, the opposite is the case; namely that the variety of lexicalisations represents a few central perspectives on the scene and individually preferred ways of expressing these. Figure 4.6 shows that the majority of activated items is centred on the closely related notions of WORRY and FEAR, and that their processing tends to involve the triggering of the corresponding central items worry and Angst ('fear') in English and German, respectively. It further shows that these two items are also associated together. This link and the fact that the activation of Angst dominates over that of besorgt ('worried') is seen as relating to the fact that German tends to express both FEAR and WORRY predominantly with Angst. The L2 learner would be confronted earlier and more frequently with Angst than with besorgt or related expressions (Sorge, besorgt, sich sorgen) and be more familiar with it, and might associate it as combining the notions of FEAR and WORRIED.

The data also single out further conceptual domains suitable to express the featured situation and associated with them a range of lexical possibilities. They include expressions of insecurity and uneasiness (nervous, suspicious, uncertain, unsicher), of anger (angry, disgruntled, rage (and ärgern, which, however, relates to a selection error as will be discussed later)), and of an extrinsic perspective on Calvin's emotional state, depicting his outwardly observable behaviour or looks (throw a freak, loose the cool, schreien, maddened).

The data can thus be interpreted as evidencing three different perspectives on the situation and the fact that different individuals appear to have their own preferred way of verbalising such perspectives from a broad variety of lexicalisations available to them. In their efforts to translate those choices, they then tend to move in the direction of a few central notions, mainly relating to Calvin’s worry. This process could be interpreted as suggesting that they start from similar if not identical conceptualisations of the situation and that their primary choice of words may have been relatively random. The information gained from the present set of data in support of such a hypothesis are admittedly only scarce. The distinction of automatic and reflective processing and an associated difference between random and reflected lexical selection will be discussed in more detail in connection with the processing of SHOCK-related terminology, which provides more differentiated data on the issue.

The verbal activity of subject 11 demonstrates that different perspectives and different lexicalisations of the same perspective are, indeed, compatible, and that they may relate to a foregrounding of different aspects or stages of the scene. In his account, Calvin "starts to become apprehensive" after Hobbes has started on his
work, which develops into Calvin being "worried and disgruntled as he has no mirror". Similarly, subject 28 accounts for the development of Calvin's mood, changing from happiness to suspicion and anger: "Calvin begins to get suspicious. His enthusiasm turns to rage". The examples suggest that the subjects perceive the scene in a similar way but that their selective attention is focussed on different aspects, which they then verbalise. On the whole, subtle lexicalisation differences across the subjects are seen as relating to a relatively random or individually preferred choice of words, and as reflecting different viewpoints on the scene.

Concerning their conceptualisation of the situation, the informants' aggregated processing activity appears to suggest that their lexical choices do not represent a wide range of highly specific concepts but a few central ones.

1.2.2.3 Form-Based Errors

I will conclude this section with a look at some production errors and their causes. It was mentioned already that the translation of worried as sich ärgern (incorrectly spelt *ärgern) is seen as a selection error, relating to the confusion of Angst and Ärger/ärgern due to phonetic similarity. This and similar errors are documented a few times and will be scrutinised for their structural foundations in section 1.2.3.2.3.

Another production error evidenced repeatedly (cf. subjects 4 and 13, also 4 in Situation 2) involves the incorrect use of the verb besorgen ('get'; in its reflexive use sich (etwas) besorgen ('provide oneself (with something)')). In the phrase Calvin besorgt sich (über), it is substituted for Calvin ist besorgt ('worried'), presumably due to the formal identity of the inflected verb and the adjective. What is interesting here is the fact that the reflexive pronoun is activated along with the verb. It may suggest that the adjective besorgt as an individual item is not as well anchored in the lexical system as the formulaic sequence sich besorgen, which is retrieved whole upon the activation of besorgt, despite the missing conceptual context. In relation to its communicative value it can be said that the incorrect phrase still serves its purpose in the given context, i.e., that it is understood by the native speaker in the sense intended.
I will now turn to Situations 2 and 3, which are centred on the state of shock experienced by Calvin and later by his mother upon seeing his bald head, and investigate their verbalisations. As in Situation 1, they involve the activation of a broad variety of lexical items possibly representative of a few underlying conceptual perspectives.

1.2.3 SHOCK

The concept of shock relates to two scenes from the picture story:

Situation 2: Calvin being horrified by the outcome of the haircut

Situation 3: His mother being aghast at his bald head

I will consider the two situations separately but also try to draw a line between them, and finally ask about the relationship of all three emotional situations.

1.2.3.1 Situation 2

1.2.3.1.1 Overview of the Data

As in Situation 1, the scene in which Calvin reacts upon the discovery of his bald head involves a range of aspects and allows for adopting different viewpoints in describing it. Most generally, an intrinsic perspective accounting for Calvin's feelings and an extrinsic one describing his behavioural reactions can be distinguished. His emotional state involves a moment of perplexity, dismay with his looks and with his friend, and fear of his mother.

The situation is verbalised by 28 subjects, involving a total of 79 English and 61 German lexical activations, which relate to 33 English and 30 German items. They are distributed as follows:
L1 source items types: 24 tokens: 44
L2 written solutions types: 27 tokens: 41
L1 approximations types: 18 tokens: 35
L2 approximations types: 12 tokens: 20

They relate to the following items:

<table>
<thead>
<tr>
<th>L1 source items</th>
<th>L1 approximations</th>
<th>L2 approximations</th>
<th>L2 written solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>shocked</td>
<td>10</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>shock</td>
<td>2</td>
<td>1</td>
<td>*geschrecken 3</td>
</tr>
<tr>
<td>worried (a)</td>
<td>4</td>
<td>7</td>
<td>schockiert 2</td>
</tr>
<tr>
<td>worry (v)</td>
<td>4</td>
<td>1</td>
<td>geschrockt 2</td>
</tr>
<tr>
<td>freak (out)</td>
<td>3</td>
<td>4</td>
<td>schocken 1</td>
</tr>
<tr>
<td>fear (v)</td>
<td>2</td>
<td>1</td>
<td>Schock 1</td>
</tr>
<tr>
<td>horrified</td>
<td>2</td>
<td>2</td>
<td>erschrecken 1</td>
</tr>
<tr>
<td>horror</td>
<td>1</td>
<td>1</td>
<td>sorgen 2</td>
</tr>
<tr>
<td>disbelief</td>
<td>1</td>
<td>2</td>
<td>erstaunt 1</td>
</tr>
<tr>
<td>go mad</td>
<td>1</td>
<td>1</td>
<td>enttäuscht 1</td>
</tr>
<tr>
<td>scream</td>
<td>1</td>
<td>1</td>
<td>ungeundulig 1</td>
</tr>
<tr>
<td>petrified</td>
<td>1</td>
<td>1</td>
<td>böse 1</td>
</tr>
<tr>
<td>not happy</td>
<td>1</td>
<td>1</td>
<td>furchtbar 1</td>
</tr>
<tr>
<td>fearful</td>
<td>1</td>
<td>1</td>
<td>ungeundulig 1</td>
</tr>
<tr>
<td>panic (v)</td>
<td>1</td>
<td>1</td>
<td>böse 1</td>
</tr>
<tr>
<td>afraid</td>
<td>1</td>
<td>1</td>
<td>sich ärger 1</td>
</tr>
<tr>
<td>terrifying</td>
<td>1</td>
<td>1</td>
<td>erstaunt 1</td>
</tr>
<tr>
<td>panic-attack</td>
<td>1</td>
<td>1</td>
<td>schreien 1</td>
</tr>
<tr>
<td>astonished</td>
<td>1</td>
<td>1</td>
<td>(wie) verrückt 1</td>
</tr>
<tr>
<td>incredulously</td>
<td>1</td>
<td>1</td>
<td>erschrocken 1</td>
</tr>
<tr>
<td>damage</td>
<td>1</td>
<td>1</td>
<td>*Schrickt 1</td>
</tr>
<tr>
<td>awful</td>
<td>1</td>
<td>1</td>
<td>Lärmm 1</td>
</tr>
<tr>
<td>angry</td>
<td>1</td>
<td>1</td>
<td>wütend 1</td>
</tr>
<tr>
<td>think of</td>
<td>1</td>
<td>1</td>
<td>überrascht 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>enttäuscht 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>*paniken 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>fürchten 1</td>
</tr>
</tbody>
</table>

Table 6.5 Distribution of activated items relating to the notion of SHOCK/Situation 2
The lexicalisations relate to the following activation sequences:

<table>
<thead>
<tr>
<th>subject</th>
<th>source item</th>
<th>associative chain</th>
<th>written product</th>
<th>translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. shocked</td>
<td>1. surprise – surprised - erstaunt 2. er hat Angst über – he's afraid of</td>
<td>1. ---</td>
<td>2. (er) hat Angst über</td>
</tr>
<tr>
<td></td>
<td>2. (he) fears</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1. disbelief</td>
<td>1. ---</td>
<td>1. ---</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. horror</td>
<td>2. angry – horror – angry – annoyed – ungeduldig – that could be impatient – I think it's unhappy</td>
<td>2. ungeduldig</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1. shocked</td>
<td>1. enttäuscht is not the word - - go for enttäuscht – that's surprised</td>
<td>1. enttausched</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. worried</td>
<td>2. ---</td>
<td>2. ---</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1. has a minor panic-attack</td>
<td>1. Calvin panics - making a literal translation replacing a &lt;&gt; with a &lt;k&gt;</td>
<td>1. panikt</td>
<td>2. (er) besorgt sich über</td>
</tr>
<tr>
<td></td>
<td>2. worrying</td>
<td>2. ---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>(Calvin) goes mad</td>
<td>Calvin is like mad</td>
<td>(Calvin) ist wie verrückt</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1. angry</td>
<td>1. very sad</td>
<td>1. &quot;angry&quot;</td>
<td>2. (er) hat Angst vor</td>
</tr>
<tr>
<td></td>
<td>2. fearful</td>
<td>2. ich habe Angst vor is I'm afraid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>panics</td>
<td>no idea</td>
<td>panikt</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>horrified</td>
<td>---</td>
<td>(er) ist angst</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>freaks out</td>
<td>---</td>
<td>(Calvin) ist Lärm</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1. freaks</td>
<td>1. böse – no – böse? okay I wanna say he's furious so I think that's böse</td>
<td>1. böse</td>
<td>2. hat Angst</td>
</tr>
<tr>
<td></td>
<td>2. worries</td>
<td>2. ---</td>
<td>2. ---</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>1. shocked</td>
<td>1. schockt – schockt? – shocked</td>
<td>1. shockiert</td>
<td>2. (er) sorgt über</td>
</tr>
<tr>
<td></td>
<td>2. worries about</td>
<td>2. ---</td>
<td>3. (er) ärger sich</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. afraid</td>
<td>3. ---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(he) surveys the damage</td>
<td>---</td>
<td>(er) sieht sein Haar</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>shocked</td>
<td>---</td>
<td>1. nicht zufrieden</td>
<td>2. verschockt</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3. hat Angst</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>astonished</td>
<td>---</td>
<td>erstaunt</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(he) screams</td>
<td>schreit</td>
<td>(er) schriet</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>awful</td>
<td>---</td>
<td>schlecht</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>1. he is shocked</td>
<td>1. er sieht schockiert aus - to appear shocked</td>
<td>1. (er) sieht shockiert aus</td>
<td>2. (er) macht sich viele Sorge</td>
</tr>
<tr>
<td></td>
<td>2. worried</td>
<td>2. ---</td>
<td>2. ---</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>English text</td>
<td>German text</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>no English text</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>shocked</td>
<td>erschrocken</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>1. shocked</td>
<td>1. er hat ein Schreicht bekommt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. terrifying</td>
<td>2. schlecht</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>1. (Calvin) freaks</td>
<td>1. (Calvin) hat Angst</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. worried</td>
<td>2. besorgt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>1. horrified</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. petrified</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>shocked</td>
<td>schockiert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>1. shocked</td>
<td>1. er schockt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. worried</td>
<td>2. (er) hat Angst</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>1. (he) looks</td>
<td>1. (er) sieht</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>incredulously</td>
<td>2. wütend</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a shock</td>
<td>3. (er) hat Angst (vor seine Wut)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. thinking (of his mother's wrath)</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>1. shocked</td>
<td>1. überrascht</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. (he) fears</td>
<td>2. (er) fürchtet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1. (he) gets a shock</td>
<td>1. (er bekommt) ein Schock</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. not happy</td>
<td>2. nicht zufrieden</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. worries</td>
<td>3. (er) hat Angst über</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.6 Associative chains relating to the processing of Situation 2

A range of points is interesting here. The subjects activated a broad variety of lexical items, which identify the conceptual domain of discomfort with its different shades of meaning and perspectives and the connections that hold between them (cf. figure 6.5). I will in this section primarily focus on conceptual-semantic processing, further consider mechanisms of L2 lexical access and their implications for bilingual organisation along with some examples, and finally discuss a few formal errors.
1.2.3.1.2 Conceptual Organisation, Lexical Processing, and Bilingual Connectivity

The verbalisation of Situation 2 gives again rise to the question if the multitude of lexical choices employed to verbalise the scene is reflective of a multiplicity of distinct perceptions of it. Do 24 different English lexicalisations in the compositions, and 27 different German translation products across 28 subjects represent highly individual conceptualisations of the same situation, or how can the variability of the verbalisations be explained?

As in Situation 1, the informants' lexical choices are seen as reflecting their focal attention on specific aspects of the scene, which include either a description of Calvin's inner state or of his behaviour. The former relates to the notion of PERPLEXITY expressed by items denoting SURPRISE or SHOCK, to the notion of FEAR or WORRY, and to the notion of DISMAY or ANGER. The latter involve verbalisations reflecting an outside
perspective, accounting for Calvin's reactions either neutrally (e.g. Calvin surveys the damage) or indicating his inner uproar (Calvin screams, goes mad, etc.).

Of interest here is not so much the mere identification of these conceptual realms, but the direction the subjects' processing takes in translating their English verbalisations. In connection with the verbalisation of Situation 1, it was suggested that the informants' initial choice of words seems to be relatively casual and arbitrary, relating to similar if not identical underlying conceptualisations of the situation. Their processing of the present situation is seen as furnishing support for the hypothesis of a relatively random and unconscious selection of lexical items in casual language production, as opposed to more thorough processing in reflecting production (cf. Aitchison 1994). The composition of the English source text is seen as representing unreflecting language use, given the fact that the tight time frame did not leave much room for contemplation, and also because the subjects were under the impression that the task was relatively insignificant (cf. Chapter 5). The performance of the translation task would then, of course, involve careful reflection.

As was mentioned above, the situation allows for different perspectives. They can be divided into specific accounts of Calvin's anger and fear and emotion-unspecific descriptions either of the pre-emotional state of shock or surprise, or of Calvin's behavioural reactions. A range of compositions (cf. subjects 2, 3, 4, 6, 10, 11, 17, 21, 22) include two perspectives, usually an emotion-unspecific and an emotion-specific one; one composition (subject 30) even takes into account for Calvin's shock, his discontent with Hobbes and the fear of his mother. Interesting in this connection is a change of focus between the English and the German versions across the informants (cf. table 6.7). In English, 26 verbalisations avail of lexical items expressing SHOCK and related notions or representing an observer's perspective, i.e., they are neutral in terms of specifying Calvin's state of emotion. 18 specify his emotional reaction in terms of ANGER or FEAR. In German, this distribution of lexical choices is reverse: there are 13 'neutral' as opposed to 28 'emotional' lexicalisations (including a few errors which can be identified as being intended to belong to one of the categories; cf. later discussion).
Table 6.7: Categorisation of lexical choices

<table>
<thead>
<tr>
<th>Category</th>
<th>English</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>emotion-unspecific</td>
<td>descriptive (e.g., scream/schreien)</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>perplexity (e.g., shock(-ed)/schockiert)</td>
<td>19</td>
</tr>
<tr>
<td>emotion-specific</td>
<td>fear (e.g., worried, Angst)</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>anger (e.g., angry, wütend)</td>
<td>3</td>
</tr>
</tbody>
</table>

The increase of emotion-specific lexical items is seen as a specification of meaning upon careful reflection. Many pre-emotional or descriptive verbalisations were qualified in the direction of either ANGER or FEAR or both. This suggests that the informant's initial choice of words in these cases started from relatively general conceptualisations and an observer's perspective which availed of emotion-unspecific lexical items, and that the second time they were confronted with the situation, they seemed to develop a more differentiated view and to feel the need for specifying their perspective, or rather, for adopting Calvin's perspective more explicitly.

An impressive example of such processing is given by subject 10. From her English phrase "he freaks", she immediately associates the German item böse ('angry, annoyed'), then hesitates and, contemplating her choice of words, arrives at the interpretation "okay, I want to say he’s furious, so I think that’s böse". This comment suggests that, indeed, her lexical activations were unconscious and arbitrary in the first place, and that upon reflecting upon them she realises, however, what she actually had in mind using both the phrases he freaked and er war böse. Without hesitation, she accepts böse as equivalent to freak, having identified the latter as representative of the concept of FURY. In other words, freak is viewed as a way of expressing FURY, and so is böse: her prelinguistic conceptualisation of Calvin’s feeling allows for different lexicalisations. These lexicalisations, in turn, involve a modification of her prelinguistic conceptual representation. In relation to her organization of L2 vocabulary, the example indicates that the subject's choice of words in German is conceptually driven. The adjective böse seems to spring immediately from the concept of FURY, which is not only supported by her comments, but also by the fact that she does not reject it as a translation equivalent of the verb freak. Had her choice been lexically mediated, she would presumably have aimed for a more general, descriptive term and presumably also for a verb in the first place.
A similar example of specifying the verb _freak_ is given by subject 22. His chain-of-thought reads as follows:

(source phrase: *Calvin freaks*; translation product: *Calvin hat Angst*)

"Calvin – has fear – gets worried – zu – sorgen – sorgt – daß Calvin – Angst – it's no surprise that Calvin has – uh – fear"

In this case it remains speculative whether the informant specifies the meaning of _freak_ because he lacks a translation equivalent or because he feels the need to do so. More likely, however, is that he cannot translate _freak_ and therefore scans the semantic environment for a suitable substitute. As opposed to the previous case, however, his interpretation goes in the direction of FEAR. Across the two informants, this shows that _freak_ represents a relatively wide conceptual content which allows for different specifications. It depicts a level of conceptual representation at which the notions of ANGER and FEAR meet. Concerning the translation efforts of subject 22, it can be said that his processing of L2 vocabulary, at least in this case, is L1-mediated. His semantic approximations (_has fear, gets worried_) proceed in English, followed by the activation of related German items. _Angst_ is not immediately triggered upon the activation of _fear_ but again cross-checked against it before selected as a solution.

Not only _freak_, but also _shock_ and related items present themselves as relatively unspecific verbalisations which allow for and lead to specification upon reconsideration. This is evidenced impressively by three subjects, who interpret their initial choice of words in more than one way. Species of SHOCK are differentiated as relating to either ANGER or FEAR, depending on the perspective adopted.

Informant 13 translates her original sentence

> He's shocked by the result and by the reaction he anticipates from his mother.

as

> Er sieht sein Haar und mit es ist er gar nicht zufrieden. Er ist verschockt. Er hat auch Angst vor seiner Mutter.7

(‘He sees his hair and with it he is not happy/content at all. He is shocked. He is also afraid of his mother.’)

She interprets the notion of SHOCK as relating to both Calvin’s haircut and to his mother’s anticipated reaction in terms of DISCONTENT and FEAR, and even retains the element _shock_ as a linking concept. Its
placement between the verbalisation of DISMAY AND FEAR may suggest that both these feelings are regarded as species of SHOCK. This would imply that the state of shock (and similarly that of surprise) is not necessarily just a precursor to more specific emotional states as proposed by Johnson-Laird (1988) and Wierzbicka (1992) (cf. Chapter 1), but that it can, indeed, be perceived as appearing simultaneously with emotions like FEAR and ANGER.

Informant 23 describes Calvin as being horrified by the outcome of the haircut and petrified by the thought of his mother. In the German version, he finds his hair furchtbar ('awful') and hat große angst ('is very much afraid') thinking of his mother.

In informant 26's story, Calvin looks incredulously in the mirror and gets a terrible shock thinking of his mother. DISBELIEF and SHOCK are specified as FURY and FEAR in German: seeing his short hair, Calvin is wütend, and thinking of his mother, er hat angst of her fury.

1.2.3.2.3 Formal Errors and Uncontrolled Spreading Activation

I will conclude the discussion of the processing of Situation 2 with a look at some errors and the way the TAPs can shed light on their quality and structural foundations.

Subject 4 produces the interlanguage form (er) *panikt as equivalent of (he) panics. Her comment "making a literal translation, replacing a <c> with a <k>" shows that it is a reflected act of foreignisation, rather than an automatic process. Such instances of crosslinguistic transfer will be discussed in more detail later.

A solution like enttäuscht ('disappointed'; misspelt as entausched (subject 3)) in the translation of shocked may, looking at the result only, be interpreted as an accepted modification of meaning in search of a translation equivalent of shocked. The TAP, however, reveals that, although the informant is insecure, he relates enttäuscht to surprised (presumably having the phonetically related erstaunt in mind), which, in turn, he associates with shocked and therefore selects as a solution ('enttäuscht is not the word -- go for enttäuscht -- that's surprised, isn't it -- shocked okay'). In other words, enttäuscht, (misspelt as entausched) is the result of misdirected activation at the formal level.

7 The grammatical errors contained in the sentences are irrelevant for the present discussion and will not be
A similar lapse or lack of control is involved in the translation of horror as ungeduldig ('impatient'). Subject 2 here provides the almost complete 'explanation' of his error himself. Scanning the semantic environment of ANGER, he activates the item ungeduldig, immediately followed by the comment "that could be impatient" and the contemplation "I think it's unhappy". The mechanisms responsible for these associative chains are likely to be the same as discussed in connection with the processing of zeichnen and formally related items, relating to an uncontrolled automatic flow of activation between the conceptual and the formal level of representation. In search of an expression for dismay ("angry – horror – angry – annoyed"), he presumably aims at activating unglücklich ('unhappy'), accidentally retrieving the neighbouring form ungeduldig. This immediately provides him with feedback about the actual meaning of ungeduldig, mediated by the English form impatient. As was suggested above, this processing activity can be seen as indicative of the bidirectional flow of energy in the system and of the complex interconnectivity and interactive activation of the vocabularies of different languages.

The subject's processing activity involves another not immediately obvious error, namely that of regarding unglücklich as equivalent to unhappy. Unhappy, has two major connotations, SADNESS and DISCONTENT. Unglücklich, on the other hand hardly ever represents the latter notion, and would certainly not be understood this way in the given context. The translation product ungeduldig thus evidences not only a lack of phonological control, but also a semantic error, namely an ignorance of the semantic and collocational restriction of unglücklich as opposed to unhappy.

I will proceed with further examples of the processing of SHOCK-related vocabulary, this time in connection with Situation 3.
1.2.3.2 Situation 3

The processing of Situation 3 is in many ways similar to that of Situation 2. It involves the activation of a broad variety of lexical items representative of certain conceptual perspectives and revealing about the conceptual frame of SHOCK, in this case, however, not associated with FEAR but only with ANGER. The situation, Calvin's mother being aghast at the sight of his head, obviously, does not involve a conceptualisation of FEAR. I will refrain from dealing extensively with aspects discussed in the previous section and instead primarily focus on two specific issues which suggest themselves for special attention. These are the recurring confusion of the items Ärger (\textquoteleft anger\textquoteright) and Angst (\textquoteleft fear\textquoteright) and the question whether the aggregated processing activity of the informants can be regarded as giving evidence of their collective conceptualisation of the present and of other situations. I will again begin with a survey of the data.

1.2.3.2.1 Overview of the Data

The situation is verbalised by 22 subjects, involving a total of 57 English and 49 German lexical activations, which relate to 29 English and 25 German items. These are distributed as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>L1 source items</th>
<th>L2 written solutions</th>
<th>L1 approximations</th>
<th>L2 approximations</th>
<th>L2 written solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>20</td>
<td>20</td>
<td>17</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Tokens</td>
<td>27</td>
<td>27</td>
<td>30</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

They relate to the following items:

<table>
<thead>
<tr>
<th>L1 source items</th>
<th>L1 approximations</th>
<th>L2 approximations</th>
<th>L2 written solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>shocked</td>
<td>horror</td>
<td>(sich) ärgern</td>
<td>Schock</td>
</tr>
<tr>
<td>shock</td>
<td>horrified</td>
<td>*anger</td>
<td>böse</td>
</tr>
<tr>
<td>go berserk</td>
<td>surprised</td>
<td>*sich ängern</td>
<td>wütend</td>
</tr>
<tr>
<td>go wild</td>
<td>1</td>
<td>surprise</td>
<td>2</td>
</tr>
<tr>
<td>scream</td>
<td>2</td>
<td>angry</td>
<td>2</td>
</tr>
<tr>
<td>furious</td>
<td>1</td>
<td>angered</td>
<td>2</td>
</tr>
<tr>
<td>go mad</td>
<td>1</td>
<td>annoyed</td>
<td>1</td>
</tr>
<tr>
<td>react strongly</td>
<td>1</td>
<td>not happy</td>
<td>1</td>
</tr>
<tr>
<td>outraged</td>
<td>1</td>
<td>go mad</td>
<td>1</td>
</tr>
<tr>
<td>(she) gasped</td>
<td>1</td>
<td>go red</td>
<td>1</td>
</tr>
<tr>
<td>not happy</td>
<td>1</td>
<td>scream</td>
<td>1</td>
</tr>
<tr>
<td>aghast</td>
<td>1</td>
<td>raging</td>
<td>1</td>
</tr>
<tr>
<td>argue</td>
<td>2</td>
<td>jump</td>
<td>1</td>
</tr>
<tr>
<td>upset</td>
<td>1</td>
<td>shock</td>
<td>1</td>
</tr>
<tr>
<td>horror</td>
<td>1</td>
<td>horror film</td>
<td>1</td>
</tr>
<tr>
<td>horrified</td>
<td>1</td>
<td>argue</td>
<td>1</td>
</tr>
<tr>
<td>sceptical</td>
<td>1</td>
<td>discuss</td>
<td>4</td>
</tr>
<tr>
<td>angry</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>give out</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>start at</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.8 Distribution of activated items relating to the notion of SHOCK/Situation 3

The lexicalisations relate to the following activation sequences:

<table>
<thead>
<tr>
<th>subject</th>
<th>source item</th>
<th>activation sequence/chain-of thought</th>
<th>written product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>shocked</td>
<td>---</td>
<td>böse und nicht glücklich</td>
</tr>
<tr>
<td>2</td>
<td>goes berserk</td>
<td>annoyed – nicht zufrieden – not happy</td>
<td>nicht zufrieden</td>
</tr>
<tr>
<td>6</td>
<td>goes wild</td>
<td>angry</td>
<td>&quot;angry&quot;</td>
</tr>
<tr>
<td>7</td>
<td>furious</td>
<td>---</td>
<td>böse</td>
</tr>
<tr>
<td>8</td>
<td>screams</td>
<td>sie ist nicht – sie ist blöd mit Calvin</td>
<td>blöd</td>
</tr>
<tr>
<td>9</td>
<td>goes mad</td>
<td>sie gehen mad – sie gehen rot – she goes mad – she goes red</td>
<td>sie gehen rot</td>
</tr>
<tr>
<td>10</td>
<td>(gets) a shock</td>
<td>I think Schock is there the same as in English</td>
<td>(sie kriegt) eine Schock</td>
</tr>
<tr>
<td>11</td>
<td>reacts strongly</td>
<td>---</td>
<td>seine Mutter starke reagiert</td>
</tr>
<tr>
<td>13</td>
<td>outraged</td>
<td>---</td>
<td>böse!</td>
</tr>
<tr>
<td>14</td>
<td>she gasped</td>
<td>überrascht – erstaunt und wütend – surprised and angry</td>
<td>überrascht und wutend</td>
</tr>
<tr>
<td>15</td>
<td>not happy</td>
<td>---</td>
<td>nicht glücklich</td>
</tr>
<tr>
<td>16</td>
<td>aghast</td>
<td>---</td>
<td>sie hat eine große Überraschung</td>
</tr>
</tbody>
</table>
Table 6.9 Associative chains relating to the processing of Situation 3

| 17 | shocked | --- | shockiert |
| 18 | no English text | she screams | (sie) hat Angst |
| 19 | shocked | --- | erschocken |
| 20 | no English text | sie hat große anger – she screamed | (sie hat) große anger |
| 21 | 1. in the shock | 1. surprise – spring is to jump – I jump | 1. (sie) bekommt eine Spring |
| 2. (they both) | 2. --- | 2. sie arger miteinander |
| argue | 3. --- | |
| 22 | very upset | angered – sich ängern – this is a long shot | (seine Mutter) ängert sich |
| 23 | 1. (she)reacts | 1. sie schreit | 1. sie schriet |
| 2. (with) shock | 2. --- | 2. mit Schock |
| 3. and horror | 3. --- | 3. und Horror |
| 26 | 1. starts at | 1. to get a surprise | 1. ärgert sie sich |
| 2. sceptical | 2. --- | 2. --- |
| 3. and angry | 3. --- | 3. ganz wütend |
| 2. (she) gives out | 2. sie beklag- beklagen is to give out | 2. sie beklagt ihm |
| 3. (gives up) arguing | 3. she argues no more – sie - ärgert sie - nicht mehr - ... [later:] sie ärgert – sie - sie ärgert sich – that’s – she’s angered – sie ärgert sich – what’s to argue – to argue is – diskutieren – ha, that’s to discuss – to argue is - I think it’s ärgern – weiß ich nicht – sie ärger sich – sich ärgern | 3. sie ärgert nicht mehr |
| 30 | shocked | surprised - gets a shock | (sie) bekommt ein Schock |

The informants' aggregated search activity is represented in figure 6.6. Again, the subjects activated a large variety of different items associated with a range of descriptive viewpoints and perspectives, centred on a few key items. I will here primarily focus on the discussion of recurring production errors in connection with the processing of ANGER-related vocabulary and scrutinise the question whether the aggregated processing activity of the informants can be related to a collective conceptualisation of the given situation(s). To begin with, however, a few words may be spared for the implications of semantic processing for conceptual organisation.
1.2.3.2.2 Conceptual Organisation and Lexical Selection

In the previous section, the tendency towards modifying a descriptive viewpoint in the direction of adopting the protagonist’s perspective was discussed. It involved an increase in emotion-specific terminology in accounting for Calvin’s reaction. A similar tendency can be found in Situation 3, the translation of which involves a range of qualifications of emotion-unspecific terms. The most interesting ones are the following:

1. (subject 1) shocked translated as böse und nicht glücklich (‘angry and not happy’)

Here, the informant seems to opt for emphasising the mother’s negative reaction by specifying both ANGER and DISCONTENT. A speculative interpretation of this double qualification would be to relate it to her reaction upon the sight of Calvin’s head on the one hand, and to her anger with her son on the other.
other. In this view, it would resemble Calvin's earlier double perspective which depicted his dissatisfaction with, or anger about his friend and the outcome of the haircut, and his fear of his mother.

2. (subject 14) she gasped translated as sie war überrascht und wütend ('she was surprised and angry')

The example resembles the previous one, in this case specifying the description of the mother's physical reaction in terms of its underlying emotional state.

Further instances specify an extrinsic perspective in terms of ANGER (involving a few errors):

3. (subject 6) go wild transposed as "angry"

Subject 6 obviously associates go wild with angry, but gives up on the attempt to retrieve a translation equivalent.

4. (subject 7) she screams translated as sie ist böö (pronounced as blöö)"

Here, the target item was presumably böse; the erroneously triggered form blöö ('stupid') is misspelt as böö.

5. (subject 22) upset translated as ärger sich

Example 5 involves a transfer of the formal quality of angry ("ärger instead of ärger"), which will be discussed in more detail later.

6. (subject 26) she starts at translated as ärger sie sich

Finally, the rendition of start at as sich ärger results in a correct German utterance.

As in Situation 2, the modification of the narrative viewpoint is seen as a specification of meaning upon reflection. The relatively frequent occurrence of this process is interpreted as furnishing support for the hypothesis that reflecting language production involves more careful lexical selection than casual production.
1.2.3.2.3 Lexical Confusion Due to Insufficient Contrasts

The first point of interest concerns recurring confusion in the processing of anger and worry, or rather, in the incorrect use of the German terms *Angst* and *sich ärgern*, and the related error of translating the verb *argue* as *(sich) ärgern*. These difficulties are, indeed, frequently encountered in L2 learners across English and German. The following six examples are reported in the data under investigation:

1. subject 7 (Situation 1)
   
   source phrase: *Calvin is getting worried.*
   
   written translation: *Calvin ärgert sich.*
   
   no relevant chain-of-thought

2. subject 11 (Situation 2)
   
   source phrase: *he is afraid*
   
   written translation: *er ärgert sich*
   
   no relevant chain-of-thought

3. subject 22 (Situation 3)
   
   source phrase: *she becomes upset*
   
   written translation: *seine Mutter ärgert sich*
   
   chain-of-thought: "angered – sich ängern – this is a long shot"

4. subject 18 (Situation 3)
   
   no English version
   
   German version: *sie [Calvin’s mother] hat Angst*
   
   no relevant chain-of-thought
In the first two examples, sich ärgerm is used to express FEAR, the third transfers the phonetic quality of anger(ed) to the German verb. In the fourth example, Angst haben is produced to express ANGER. The last two cases use the verb ärgern for argue. The cause of these errors is obvious: it relates to the formal similarity of both source and target language items. But what exactly are the structural foundations that give rise to the frequent difficulty of keeping the respective items apart? In order to elucidate the mechanisms involved, I will again avail of the model of illustrating lexical items as representational structures at two cognitive levels.
DISCOMFORT

DISCUSS

DISKUTIEREN

ARGUE

ÆRGER(N)

ANGST

FURCHT

ANGER

RAGE

WUTEND

ANGST

AFRAID

 Ärger - anger - Angst
argern - angry - anxious

rage

wütend

Figure 6.7 Lexical network of ANGER and FEAR as representations at two cognitive levels

Figure 6.7 displays a selection of items representative of the conceptual domains involved. It shows a cluster of similar forms at the formal level, constituting a continuum of representational structures with anger/angry similarly close to Ärger/sich ärgern and angst/anxious, and (sich) ärger(n) likewise located between anger/angry and argue. This alone, however, does not explain the frequency with which the items are confused. After all, they are embedded in a larger field of similar forms, such as English angle or German angeln (‘fish’ (v)), which do not tend to be retrieved erroneously as much. The answer is seen as lying in the fact that the items are not only formally similar but also, being species of DISCOMFORT, semantically more closely related than may appear at first sight (cf. the processing of freak above, and the discussion of emotion terminology in Chapter 1). The present context of use, moreover, tends to involve the activation of several different perspectives on the given scenes and on the protagonists’ reactions. This suggests that the arising confusion is further encouraged by the fact that, due to an automatic spread of activation from the semantic to the formal level, lexical forms corresponding to activated concepts - even if not selected for production - are likely to be at an increased level of activation already.
The confusion not only relates to substitutions of *Angst* and *Ärger* but can also involve English forms. Example 3 shows the readiness with which *anger(ed)* is derived into a German verb, but also the uncertainty involved, without there being present the capacity to detect the error. As in examples 5 and 6, it could be interpreted as indicating an overexpectation of formal similarity between English and German. Subject 28 (example 6), it seems, wants to believe that *sich ärgern*, which he identifies as relating to *angered*, stripped off its reflexive pronoun could be equivalent to *argue*, after all. He also activates *diskutieren*, which would, indeed be acceptable as a translation of *argue* in the given context. However, associating it with *discuss*, and apparently with its meaning, he discards it immediately. The example is a further instance of the forward and backward flow of activation between the conceptual and the formal level, providing feedback upon the validity of lexical choices. It may be added that another option for translating *argue* here would have been *streiten* (*quarrel*), which none of the subjects arrives at.

The examples show that the given lexical field requires a high level of control for distinguishing English and German items, and that the complex formal and semantic intertwining of the items involved appears to encourage form-oriented lexical processing, even in individuals with a relatively high standard of L2 proficiency.

1.2.3.2.4 A Collective Mental Representation of Emotion Concepts and Terminology?

I will conclude the discussion of the processing of emotion terminology with a look at the question of whether the above illustrations of the aggregated processing activity of the subjects could be viewed as the collective mental representation of their conceptualisation of Situations 1-3. Following Zimmermann (1994), such a hypothesis would be supported if the processing activity of the informants overlaps to a considerable extent and if some subjects alone activate larger parts of the lexical field. Figure 6.4–6.6 show that the overlap of lexical activations across the informants is more extensive than may be assumed in the light of the multitude of items used. Not surprisingly, it is stronger between central items of the fields, which are frequently activated and appear to serve as a point of orientation in the processing activity. Detecting extensive and connected processing activity within individual informants across the different conceptual domains is a more difficult task.
Subject 28 provides an impressive account of mental connections holding between the different emotional domains and of possible perspectives in accounting for them. Moreover, his processing activity represents a fairly wide range of processing phenomena found across the informants, and different types of intra- and crosslinguistic connections. I will discuss his processing of Situations 1-3, beginning with his attempt to account for Calvin's mother's shock upon the sight of Calvin's head.

Informant 28: Lexical search sequences, conceptual structure, and bilingual organisation

Figure 6.8 Associative chain of subject 28 in search of a translation equivalent of horrified

Figure 6.8 illustrates his search sequence, starting from the source item horrified. His first association is horror, which he selects as the pivot of his search in different directions, together with horrified. The two items could be seen as representing the central notion of his concept. From there, he activates Wut, but seemingly dissatisfied, returns to horror and to the source item horrified. He begins his search again, this time arriving at Angst, presumably erroneously activated in confusion with anger/Ärger, since Angst is conceptually inadequate. He returns to horrified, trying his luck again in the direction of ANGER, this time associating wütend and the close equivalent raging, which he discards as "not the same". He leaves the problem for a
while and, returning to it later, starts again from *horrified* and *horror*, this time with a German pronunciation, followed by a new strategy, the retrieval of the required German form through a context of use, namely that of horror films, first with a German, then with an English pronunciation. Back at *horror*, he muses that it could be the same word in German and tries a German pronunciation again. Apparently not trusting this thought, he returns to *horrified* and scans the more immediate semantic environment, which takes him to *geschockt* ('shocked', colloquially) and finally to the incorrectly derived form *geschocl<er*, which he selects as a solution. Unlike many others, the informant is not prepared to accept a modification or change of meaning in his German translation, presumably due to the task instruction to translate as closely as possible, which is not followed by all the subjects in the same way, as can be seen from the data. His repeated and apparently automatic search in the direction of ANGER (erroneously triggering *Angst*) and RAGE (*Wut, wütend*) indicates, however, that he also tends to interpret his initial choice of words in terms of ANGER. His TAP provides an impressive account of the systematic scanning of the semantic environment of his source concept. His retrieval of German forms appears to be predominantly conceptually driven, as he triggers them immediately, associating their English equivalents only afterwards, which seems to provide him with feedback about their meaning. The sequence "horror – wütend – raging – it's not the same" suggests that the English item *raging* mediates the insight that *wütend* is unsuitable as a solution. Unsuccessful with his strategy of semantic approximation, he approaches the problem in a different way, trying to retrieve the missing form in association with a specific context of use. His activation of *horror film* reminds one of the activation of *technical drawing* in Situation 4, which resulted in a TOT state of the subject. In this case, it leads the informant to contemplate the possibility of cognates across English and German, but he does not seem to trust this idea. The approach, however, brought both individuals closer to the solution, which suggests that lexical items can sometimes be more readily available as part of a specific context of use, i.e., if learned in context-dependent manner. Unfortunately, not many such instances are found in the data under investigation. An example not listed above, because it does not relate to Calvin's but to the anticipated reaction of his mother in Situation 2, is an approach to accessing a German equivalent of *surprised*. Subject 24 recalls the phrase "heute Abend haben wir eine –" ("tonight we are having a –", obviously relating to some sort of announcement of a surprise), which, however, does not yield the required result.
I will return to the processing activity of informant 28. Unsuccessful in his previous attempts, he finally activates the concept of SHOCK as closely synonymous with that of HORROR, which then takes him to his final (though morphologically incorrect) solution. On the whole, his search for HORROR is seen as evidencing the spread of activation in various directions, both uncontrolled (cf. Angst) and controlled. He uses a range of processing strategies activating different domains of knowledge, and he also evidences different types of errors (inappropriate compound storage of L2 items, crosslinguistic phonetic transfer, and intralinguistic morphological transfer (which will be discussed more extensively later)). His chain-of-thought may be seen as representative of the aggregated processing activity of the 22 subjects – which, in turn, could be interpreted as their collective mental representation of the different facets of the situation.

A further look at informant 28's processing activity of emotion concepts and items across the three situations, suggests that his data can, indeed, be regarded as representative of the overall processing activity of the 30 subjects in terms of lexical activations, processing strategies, bilingual organisation, and lexical errors. Verbalising Situation 3, he continues accounting for Galvin's mother's reaction by writing that she gives out to him but eventually gives up arguing, translated into German as *sie beklagt ihn and later *ärgert sie nicht mehr. The error involved in translating argue as ärgern has been discussed earlier. The use of beklagen (sich beklagen = 'complain') is a semantic error, indicating that the German item is associated with the conceptual content of give out, presumably derived from a specific context of use and generalised, in ignorance of distributional differences. His documented processing activity involves the association of the German form, a brief hesitation and a semantic cross-check with the English term: "Sie beklag – beklagen is to give out", which suggests that his processing of the German item is again conceptually driven, relating to a compound memorisation with an English item. In terms of his choice of words, the use of the items give out/*beklagen and argue/*ärgern represents an extrinsic perspective on the scene, implying without explicitly labelling the mother's emotional state.

The compound organisation and a conceptually mediated processing of L2 vocabulary, as identified above, seems to prevail in the informant's mental lexicon. Further examples include his efforts in translating the verb fear in Situation 2, which involve the association of Angst cross-checked against afraid; and, in Situation 1,
the description of Calvin’s unease as suspicious, leading to the association of unsicher, again cross-checked against the English equivalent uncertain.

In total, subject 28’s verbalisation of the three situations involves 15 English and 12 German items (plus one morphologically incorrect form), relating to 7 source and target items each, and another 14 lexical approximations. These lexicalisations represent the variety of conceptual perspectives evidenced across the 30 subjects and identify the three basic emotional domains of SHOCK/HORROR, ANGER, and FEAR with a range of lexicalisation possibilities, and their interconnectivity (cf. figure 6.9). Their processing documents a range of organisational principles with regard to both conceptual structure and bilingual connectivity.

On the whole, the processing activity of subject 28 can be said to mirror the aggregated processing of the 30 informants and to identify a range of central principles of (bilingual) lexical organisation. It appears justified to say that his cognitive activity provides an insight into the architecture of the three featured emotion concepts and their lexicalisation patterns. What follows is the question of whether the aggregated processing of the 30 subjects can then be seen as a collective mental representation of the three emotional situations and of the interconnectivity of the concepts of SHOCK, FEAR, and ANGER. The overall distribution of activation peaks
and of lexical connections and their representation in a single individual appears to support such a hypothesis, but it cannot be regarded as sufficient evidence for it. The results, however, constitute encouragement to follow up this question in perhaps more specifically designed data elicitation tasks.

1.2.4 Summary

The discussion of the verbalisation activity associated with the four featured situations has suggested that the aggregated processing activity of a relatively homogeneous group of informants can shed light on principles of lexical organisation, in particular of conceptual-semantic structure and bilingual connectivity, even if most of the informants by themselves only contribute a limited amount of information on scattered aspects. Verbal protocols have been shown to provide useful insight into the principles and mechanisms of lexical processing, by tracing routes of lexical access and by reporting metalinguistic knowledge. Where the informants' chain-of-thought documents extensive sequences of lexical associations, it appears to be a useful data source for reconstructing lexical networks and associated conceptual fields. The verbal protocols were further shown to be useful for detecting the mechanisms of errors by reporting intermediate steps on the way to an incorrect solution. Finally, associative chains were interpreted as being indicative of types of bilingual connectivity, documenting routes of lexical access. The examples analysed confirm the Weinreich-de Groot hypothesis that L2 vocabulary can be organised differently and in a mixed way by different individuals (Weinreich 1953, de Groot 1993; cf. Chapter 2). It has been shown that an individual can have learned different items in different ways (cf. subject 28, whose processing activity was suggested to evidence both compound and coordinative bilingual organisation), and that the same item can be stored and processed differently by different subjects (the most striking difference here relating to conceptual versus form-based associations).
1.2.5 Multilingual Organisation

It may be recalled that the multilingual study involved four university students of Germanic languages with a varying degree of proficiency across their second languages. It was conducted in the wake of the bilingual study and was launched as a pilot study of exploring the peculiarities of multilingual organisation. The languages involved were English, German, Dutch, and Swedish, and, in one case, Norwegian.

The informants involved were following, in their undergraduate degree programme, intensive courses in German, which they had already learned at school, and Dutch and Swedish, which were introduced in the first and second year of study, respectively. The group consisted of two second-year students and two fourth-year students. One of the fourth-year students was a native Norwegian, who had lived in Ireland for many years; the others were Irish nationals. The second-year students had a very good command of German, advanced skills in Dutch, and a basic knowledge of Swedish. The fourth-year students, after prolonged study periods abroad, were fluent or almost fluent in at least two of the languages, with a very good knowledge of the third.

The particular situation of the Norwegian national will be discussed later. The tasks to be performed in the data collection were the same as in the bilingual study, i.e., the composition of a story on the basis of a series of pictures in their mother tongue, a translation of the same story into the respective second languages, and think-aloud verbal protocols on performing the translation task. The series of tasks were carried out in one session, with the translation being performed in the order German - Dutch - Swedish, and Swedish - German - Dutch in the case of the Norwegian student.

1.2.5.1 Overview of the Data

The data obtained were analysed with a particular focus on multilingualism-specific issues, namely on the question of the relationship of multiple languages in the mind and associated processing peculiarities, and of possible differences between individuals with varying linguistic backgrounds. Two aspects have been given particular attention, namely, processing across languages other than source language (mother tongue) and target language, and evidence of third language interference in translation results or intermediate solutions.
Lexical associations across multiple languages will be discussed in this section, while L3 interference will be
scrutinised later.

Table 6.10 shows a selection of associative chains as documented by the think-aloud protocols. On the left,
the student number and the source item are given, in the centre the target language (D=Dutch, G=German,
S=Swedish) and the associative chain leading to the translation product, which is shown on the right. Formally
incorrect or non-existent items are identified by an asterisk; they will be discussed below. The language of
each item is given in brackets, so that notations like (G→*D) mark cases of cross-linguistic lexical transfer, in
this case a transfer from German to Dutch, which may be identified by pronunciation or spelling.

<table>
<thead>
<tr>
<th>Source Item</th>
<th>Target Language: Associative Chain</th>
<th>Translation Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>(English)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. (31) he complains</td>
<td>D: or gives out (E) – or beschwert sich (G) – hij - maybe criticise (E) - he complains about his hair being stupid - hij zegt (D) – uh stupid - complains (E) - hij zegt (D) - or kritiseert (D) - brings in the negative aspect</td>
<td>hij kritiseert</td>
</tr>
<tr>
<td>2. (32) to comb</td>
<td>G: *komen (E→*G) – brush (E) his hair – zu *kommen– bürsten (G) is it – to brush (E) – zu – saubermachen (G) – is clean (E) – what’s to tidy (E) – opruimen (D) tidy (E) - no that’s Dutch</td>
<td>zu *kommen</td>
</tr>
<tr>
<td>3. (31) he refuses</td>
<td>D: sich weigern (G) – I’ll turn that into *wijeren – hij *wijert zich (G→*D)</td>
<td>Calvin *wijert zich</td>
</tr>
<tr>
<td>4. (32) he colours</td>
<td>D: to place (E) – stellen (G) – hij *stellt (G→*D) – no hij – to place (E) – or to put (E) – stellen (G) – to put (E) – he draws (E) – he marks (E) – he creates (E) – scheppen (D) - Hobbes schept (E→D)</td>
<td>hij schept (nieuw Haar)</td>
</tr>
<tr>
<td>5. (31) they realise</td>
<td>D: erkennen (G) – feststellen (G) – what’s that in Dutch –totdat zij – bemerken (G) – no, that’s German – merken (D)</td>
<td>zij merken</td>
</tr>
<tr>
<td>6. (32) he freaks out and worries</td>
<td>D: er is – hij is sorry (E) – hij is - niet blij (D) – hij is *zorn (G→*D) – angry (E) – hij is - hij heb - bang zijn (D) – angst (G→*D) – ‘heeft angst (angst G→*D) – hebt – heeft – hij heeft angst</td>
<td>hij *heeft angst (zijn moeder *wordt zorn)</td>
</tr>
</tbody>
</table>
Table 6.10 Associative chains across more than two languages

1.2.5.2 Multilingual Crosslinguistic Consultation

The associative chains reveal that lexical selection in situations of the non-accessibility of an item in demand involves both automatic and deliberate consultation of several languages in both semantic search and form retrieval. Whether or not third language consultation happens deliberately is not always clearly discernible, but often metalinguistic comments or erroneous solutions shed light on the question. I will consider the processing mechanisms of the examples one by one.

Examples 1-8 are from the two second-year students, whose dominant second language is German, followed by Dutch and Swedish. In the first example, the informant aims at translating the English item *complain* into Dutch. Obviously lacking the Dutch translation equivalent, she activates an English synonym (*give out*), arrives at the German equivalent of *complain*, *sich beschweren*, returns to English to look for another
alternative expression (criticise), tries the Dutch form zegt ('says'), and eventually, presumably mediated by the earlier activated English form, accepts the Dutch form kritiseert as semantically closer than zegt as it "brings in the negative aspect".

In the second example, the target language is German. The associative sequence starts with a non-existing foreignisation of the source item (*komen), which seems to be discarded and is followed by semantic approximations across English, German, and Dutch. In the case of opruimen, the comment "no, that's Dutch" suggests that Dutch was here involuntarily activated. Apparently lacking a better solution, the informant eventually returns to her first association komen. Apart from the intermediate search activity, the TAP does not provide any information on whether this solution is assumed to be correct or not.

Example 3, on the other hand, shows strategic foreignisation of an immediately associated third language item ("sich weigern – I’ll turn that into "wijeren "). This strategic transfer can be considered partly successful, as a similar Dutch item, indeed, exists. The correct Dutch form would have been Hij weigert, i.e, the result, *Hij wijert zich is incorrect with regard to spelling and reflexiveness.

Example 4, with the target language again being Dutch, once more evidences an extensive semantic search, primarily in L1, but also involving a third language (German) consultation and an erroneous foreignisation attempt of the retrieved verb stellen ('place'; hij *stellt)). The final solution is mediated by a first language item, and is incorrect insofar as it disregards the distributional restriction of the Dutch item. Schepen can only refer to creation by God. A similar error is documented in example 2, where opruimen, which means tidying up a room, is activated in connection with hair styling.

Example 5 consists in a relatively extensive semantic search exclusively in a third language (German), which the informant appears to be aware of, as her comment "what's that in Dutch" suggests. Her apparently strategic search in German eventually leads her to a related target language, i.e., Dutch form (bemerken – merken).

Example 6 involves a semantic search across L1 English, target language Dutch, and L3 German, and two cases of incorrect lexical transfer. *heeft angst is a loan translation of the German phrase hat Angst; the corresponding Dutch phrase would be is bang. *wordt zorn is similarly derived from German. Both examples will be discussed in more detail later.
In Examples 7 and 8 the target language is Swedish. Again the search activity involves third language consultation, which in the case of mirror/Spiegel/spegel leads to the correct target language form. In the case of head, no translation equivalent is found, and the concept is abandoned.

Examples 1-8 show that semantic search activity seems to exploit any language available, while lexical transfer and borrowing – with the exception of *komen – is restricted to the Germanic languages, which are linguistically closer to each other than English. Most of the examples relate to difficulties in a relatively weak language (Dutch and Swedish), where L3 consultation might have been expected. Example 2 shows that L3 items may also be – involuntarily – activated in the case of a relatively high degree of proficiency in the target language (German). This furnishes support for the hypothesis that L3 interference is a system-inherent mechanism relating to the complex intertwining of the vocabularies and lexical structures of different languages (cf., e.g., Möhle 1989; Meara 1999a).

Examples 9-14 document the approximation strategies of the Norwegian fourth-year student, which feature an interesting peculiarity. Although English is neither the subject’s mother tongue, nor perceived as closer to either target language than the other Germanic languages, she repeatedly resorts to English in her search for translation equivalents (cf. examples 9, 11, 12, 13). This phenomenon could be explained by the fact that she lives in an English-speaking environment and studies Germanic languages through the medium of English. The intermediary function of English appears to lead to strong associative connections, which, in her case, seem to outweigh perceived linguistic distance.

Of further interest is example 12. Here, again, her first association in search of a translation of tegner (‘draws’) into German is the English equivalent, which leads her to the German form zeichnen, retrieved as part of the phrase ich will etwas zeichnen (‘I want to draw something’). She then hesitates, in a similar manner to some of the bilingual subjects, and checks zeichnen against Zeichen (‘sign’). Also here, she uses Zeichen in a phrase (‘das ist ein Zeichen’ (‘that is a sign’)), i.e., embedded in a formal context, which seems to help her in telling the two forms apart. Her final decision for machen (‘make’), however, indicates that she is not sure about the correctness of zeichnen after all.
1.2.5.3 Conceptual-Semantic Structure

Examples 2, 4, and 5 illustrate the spread of activation at the conceptual level, i.e., the scanning of the semantic environment of the source item in different languages. Comb triggers brush, clean, and tidy and their respective German or Dutch equivalents. The semantic environment of colour is shown to include place, put, draw, mark, and create, and some of their second language equivalents. Realise evokes a series of three close synonyms in German, erkennen, feststellen, and bemerken. I will refrain from discussing conceptual organisation here, since the samples are too limited to allow for generalisations. Example 4, however, may be mentioned as fitting in nicely with the conceptual frame of DRAWING identified in the bilingual study.

1.2.5.4 Multilingual Lexical Connectivity

Some of the associative chains document the difference between semantic search and form retrieval. The latter is repeatedly evidenced by - strategic or non-strategic - derivations of non-target language forms as in example 3 ("sich weigern - I'll turn that into weijeren"). Further instances are found in examples 4, 6, and 10. The examples could also be interpreted as being indicative of different types of cross-linguistic connectivity holding in the subjects' mental lexicons and as hinting at certain developmental sequences. Considering the limited amount of data, however, such inferences must be regarded as tentative interpretations only. A distribution of subordinative, compound, and coordinative storage of lexical items according to the level of proficiency in a second language appears to be reflected in the processing of the second-year students (examples 1-8). Their strongest language, German, appears to be readily accessed conceptually, irrespective of the target language. Some Dutch items are evidenced as being associated with L1 conceptual contents (opruimen, schepen), and triggered upon the activation of the respective English forms, which indicates subordinative storage. On the whole, Dutch items seem to be memorised and processed in a mixed fashion, depending on their degree of familiarity. Items like zegen ('say') and bang zijn ('be afraid') are immediately retrieved in Dutch, i.e., accessed conceptually, while the retrieval of others is mediated by L1 or L3 (German) forms.
In the cases of the target language being Swedish, both the German and the Dutch lexicon are consulted to supply items assumed to exist in a similar form in Swedish. This strategy, however, is seen as reflecting more on the subjects' metalinguistic knowledge than on their lexical organisation, because many of the missing target elements were simply not known to them, so they had to have recourse to other available knowledge sources.

The Norwegian fourth-year student (examples 9-14) shows little evidence of subordinative organisation, a certain degree of compound arrangement (for example in the case of *zeichnen* used synonymously for *tegne/draw*), but predominantly a coordinative organisation of all her second languages. The latter statement obviously does not get supported by the given examples, but becomes evident from the high degree of direct, unmediated and non-erroneous translation into either of her second languages. Only in translating into Dutch, she does tend to activate a third language (German, which is perceived as linguistically close) in cases of difficulty (cf. the relevant verbal protocol in Addendum 2).

The other fourth-year student, unfortunately, did not provide much introspective information. She verbalised hardly any of her processing activities; however, as will be shown later, she produced several errors which allow conclusions to be drawn about cross-linguistic influence, in particular from a third language.

1.2.5.5 Multilingual Confusion and Lexical Connectivity

A few translation products reveal confusion across several languages. One such example is the translation of Norwegian *bord* ('table') into German *Tafel* ('(black)board'), where the correct item would have been *Tisch*. (The fact that *Tafel* can also mean 'table' in the context of a festive occasion can be left out of consideration here, as the subject did not know *Tafel* in that sense, and instead confirmed that she simply confused the different languages.) Figure 6.10 shows the complexity and asymmetry involved in the form - meaning correspondence of the respective lexical fields across the four languages involved. On the left we find the respective words for 'board', on the right for 'table'. They originate in three different etymons of related meaning, which took a different development in the Germanic languages, resulting in lexical asymmetries and false friends.
Possibly relevant for the present example are several associations. Most notably, the Dutch item *tafel* ('table') is a false friend of *Tafel*. On the other hand, German *Tafel* corresponds to Norwegian *tavle*, which might have been expected to overrule the confusion with Dutch, in particular since Dutch had not recently been activated.

Another aspect relates to a possible underlying association with English, as English and Dutch — contrary to Norwegian — share the distribution of the two lexemes. Williams and Hammarberg (1998; cf. Chapter 2) observed that a third language learner had the tendency to suppress her native language in favour of a related second language in situations of cross-linguistic lexical consultation, even in cases where mother tongue and target language structures were similar. They proposed two explanations for this behaviour: an automatic activation of other second languages in the context of second language learning (or, we may add, second language use), and the desire to suppress the first language in the belief that an inherently 'foreign' language would serve better as a point of reference for another 'foreign' language (ibid:323). In the light of these findings, the Norwegian informant's tendency to consult English in cases of uncertainty (cf. above), and the fact that both English and Dutch display the same lexicalisation pattern, the translation of *bord* into *Tafel* could be explained as a case of overgeneralisation of expected formal similarities in foreign languages.

Although a final explanation of the error is not available, the example demonstrates the complex intertwining of lexical knowledge structures across several languages, and the confusion it can lead to.
1.2.5.6 Multilingual Connectivity at Two Cognitive Levels

A neurolinguistic perspective on the example may elucidate the complexity of the associations involved from a different viewpoint. Displaying the lexical items as semantic and formal representations at two different levels (cf. figure 6.11), each intertwined in their respective environment as well as connected with each other, with antagonistic links across languages, illustrates the sources of confusion.

![Diagram of multilingual network as representations at two cognitive levels](image)

As in the example of the confusion of ANGER- and FEAR-related vocabulary or that of zeichnen and Zeichen, the illustration reveals the cognitive structures that give rise to processing difficulties in the system. Why an individual lacks control over the system, however, cannot be answered conclusively here. A tentative explanation would be that L2 structures are not as familiar as L1 structures, and that L2 processing is to a lesser extent automatized than L1 processing; consequently, L2 intralinguistic links are not as stable and may in particular be confused across related languages.
1.2.5.7 Summary

In summary, the data discussed furnish support for the notion that the vocabularies of multiple languages are intertwined in a complex way, both semantically and formally. Perceived linguistic distance, proficiency of the user, and classroom language have suggested themselves as factors of interconnectedness, determining the nature and strength of crosslinguistic links and the function a non-target language can have in crosslinguistic consultation. L3 consultation and influence were shown to happen both deliberately and involuntarily, the latter suggesting that the spread of activation automatically exploits all the pathways available, which can result in erroneous productions if the system is not well-controlled.

2. LEXICAL INFORMATION STRUCTURE, ERROR ANALYSIS AND GRAMMATICAL PROCESSING

The previous section has scrutinised lexical processing phenomena and errors relating to the formal and semantic substance of lexical items. I will now turn to investigating L2 production in a wider scope, including knowledge structures that relate to their combinatorial behaviour.

It was suggested that, in a psycholinguistic perspective, the entirety of linguistic knowledge can be related to the information structure of lexical items. Chapter 3 proposed to model lexical information structure in the form of a conceptual frame, which integrates the different levels of linguistic knowledge and analysis, relating substantive and combinatorial information and elucidating the different dimensions of grammatical knowledge.

It was suggested that the model might be useful in comparing the knowledge structure and contextual behaviour of lexical items, in particular in a crosslinguistic perspective. It was further used to explain the role of predicative items in phrase structure and phrasal construction. I will here avail of the component structure model to explain a range of production errors as relating to incorrectly supplied lexical frames, and to discuss aspects of L2 phrasal construction. The examples used in this section are taken from the above set of data and a selection of other scenes from the picture story.
2.1 Production Errors and Lexical Frame Knowledge

It may be recalled that the component structure model defined lexical knowledge as a set of attributes relating to the different dimensions of lexical knowledge and specifying their interrelation (cf. Chapter 3, section 2.3.1). It accounts for lexical information structure as including semantic word knowledge, formal word knowledge consisting of phonological and orthographic information, and an item's semantic and syntactic valency structure, which relates to different aspects of grammatical structure, or lexical relations. Each of the component properties, or knowledge attributes, allows for a range of specifications of their values, which identify the specific character of lexical items in contrast to each other and determine their contextual behaviour. On this view, lexical and grammatical errors are seen as relating to incorrect value specifications, often due to crosslinguistic or intralinguistic transfer. I will consider a range of such errors at both word and phrase level.

2.1.1 Word Level Errors

The most basic word level errors are perhaps those relating to selection errors such as blends or substitutions and to the production of non-systematic nonwords, evidencing, for example, slips of the pen or deficient formal knowledge (e.g., *zeichnt (instead of zeichnet) or *ärgerl (instead of ärgerl)). I will refrain from discussing such relatively simple and straightforward errors here, and instead focus on those which display transfer of specific knowledge structures from other items in the form of crosslinguistic influence or intralinguistic transfer.

2.1.1.1 Crosslinguistic Transfer

A few examples of crosslinguistic influence on L2 forms have already been discussed. They include a transfer of partial structures such as L1 orthographic conventions as in *shockiert for schockiert (subjects 11 and 17),
or *ängert (for ärger, subject 22) where English conventions are imposed on the German equivalent. A more complicated adaptive process is involved in the foreignisation of *paint into *peinten (subject 26), which borrows an L1 form but adapts it to the orthographic conventions of the L2 system. The examples evidence the interaction of basic semantic and formal knowledge structures in English and German.

A similar type of transfer but involving morphological knowledge is involved in the translation of take off (referring to Calvin’s hat at the dinner table) as aufnehmen (‘take up’; correct form: abnehmen; subjects 6 and 22), where an incorrect German prefix (auf) is triggered due to its formal similarity with an English postposition (off).

Subject 22 retrieves both German forms and selects the wrong one, presumably misled by the formal similarity of off and auf (‘take off – aufnehmt must be – abnehmt – aufnehmt’). His translation result *aufnehmt is further incorrect for its missing umlaut and the missing separation of word stem and prefix. The correct form would have been nimmt ab.

Subject 6, on the other hand, constructs a compound by putting together verb and preposition (”to take is nimmt – take out – aus – auf – auf is off I think – I have to make up a word – aufzunimmt – aufzunehmen – that’s a bit make-up”).

Again, the translation result *aufzunimmt includes further grammatical errors, which, however, are irrelevant here.

In sum, the error leading to the selection of the wrong prefix is the same in both cases, but the TAPs prove to be useful in detecting subtle differences in the subjects’ processing.

Further cases of crosslinguistic influence relate to items’ semantic quality and their associated collocational environment. Such examples were discussed in connection with the translation of draw as zeichnen or paint as streichen. The information structure model is here seen as being useful for defining the precise character of the errors by pinpointing the incorrect specification of the component aspects of the items’ lexical frame, in this case of the semantic quality and its associated collocational environment.

Erroneous products do not necessarily involve L1 influence. Intralinguistic transfer is particularly common in morphological processing and will be discussed in the following section.
The complicated German inflectional system with its variety of pre- and suffixes poses particular difficulties for the language learner. The examples of *geschocken (subject 28) and *verschockt (subject 13) are just two of many incorrect constructions evidencing a transfer of affixes familiar from other items. *Geschocken employs the past participle ending -en instead of -t, perhaps in analogy to an item like erschrocken ('frightened'). *Verschockt uses an incorrect prefix, whose motivation remains unclear. Ver- is a common derivational prefix, but not an inflectional one. It is thus conceivable that it was erroneously used as a participle prefix instead of ge-, or that the informant constructed an infinitive verschocken, perhaps in analogy to similar sounding words like verstecken ('hide') or verschicken ('send'). In any case, important to note here is that the prefix is borrowed from other German items, i.e., the frame of the target item has been supplied with corresponding information from other target language items.

More complex confusion is associated with the translation of reaction (German: Reaktion). In one case (subject 14) it is translated as Regierung ('government'), i.e., a seemingly straightforward selection error based on formal similarity. The errors of other subjects, however, reveal that it may relate to a more complex cognitive operation involving morphological processing. Subjects 4, 11, and 28 construct the form *Reagierung, derived from the verb reagieren ('react'). The corresponding chain-of-thought of subject 11 reads as follows:

"his mother's reaction – the way his mother reacts – über – reagieren – no – die – Re – no – die Reagierung (laughs)"

His hesitations and laughing indicates that he is not sure about the solution. The reason why he and other subjects accept the solution despite hesitation and uncertainty may be explained by its similarity with Regierung, i.e., a lexical form that would be expected to be known by the informants but perhaps not readily associated with the right meaning. In terms of lexical transfer, the nominal suffix -ung, or rather, the change of meaning associated with the formal modification, has been borrowed from items like Regierung as derived from regieren ('reign').
The same error is involved in the translation of attempt (German: Versuch) as Versuchung ('temptation'; subject 5 and 7). Again, the suffix -ung has been applied erroneously to derive a verb into a noun, as the TAPs report:

(5) "attempt - versucht - versuchen - versucht - Versuchung"
(7) "effort - attempt - versuchen is to attempt - to make an effort is versuchen - als Versuchung (laughs) - making up - versuchen - no - als Versuchung"

The latter example documents the informant's uncertainty and the fact that his lexical creativity involves the reflecting application, or transfer, of explicit morphological knowledge.

How does morphological knowledge relate to lexical information structure? Formal modifications as specified in the syntactic valency structure of lexical items were said to represent an item's semantic valency (cf. Langacker 1987; Lutjeharms 1994), i.e., its semantic role or function as associated with its specific meaning in a given context. In need of meaning specification or modification, the language user avails of morpho-syntactic adaptations, in the above cases of pre- or suffixes, whose function tends to be applicable to a range of semantic items of similar character. Such functors are seen as being immediately associated with an item's semantic as well as formal structure, and incorrect formal adaptation can result in unidiomatic or incomprehensible solutions or in an involuntary change of meaning. Morphological transfer however, need not result in incorrect products. Formal adaptations as relating to semantic modification in both inflectional and derivational morphology tend to be regular and associated with particular types of (paradigmatically related) lexical items. They are thus seen as an important factor of lexical connectivity and building block of lexical creativity. Derivational morphological information as in the case of nominalisation connects different syntactic categories, i.e., different functions of one and the same word stem. Morphological knowledge is therefore seen as a central factor of lexical connectivity between different types of items at different levels of description.

I will conclude this section with two relatively peculiar errors, produced by the same informant (21), which involve incorrect transfer at different linguistic levels. The first relates to the translation of the noun thought (German: Gedanke) as *dacht. Here, the correspondence of the past tense form of the English verb think with its associated noun has been transferred to German, in ignorance of the fact that such similarity is not regular in either language. Particularly interesting in this case is the informant's chain-of-thought. It shows that her
The first association is, in fact, the item *Gedanke*, which she discards when relating *thought* to *think* and *think* to *denken*:

"the thought of what his mother will say is also terrifying – aber – thought – Gedank – no it’s – to think

is denken the thought would be – thought would be – dacht – die dacht"

The example identifies a phenomenon frequently encountered across the informants, namely that immediate correct target language associations are discarded and replaced by unidiomatic or ungrammatical solutions upon careful reflection. This is not the place to follow up this issue, but it seems worth suggesting in this context that language teaching might want to be aware of such phenomena, and aim to ensure that obviously correctly proceduralised knowledge is not overruled in the learner’s awareness and language use by analytic processing.

I will return to the processing activity of subject 21 and discuss a further outstanding error. She translates the phrase *in the shock* (relating to Situation 3) as *"sie bekommt ein Spring*, elucidated by the associative chain "surprise – spring – is to jump – I jump". In search of a translation equivalent of *shock*, she activates the more general item *surprise*, which has a similar semantic and syntactic valency. Seemingly unable to translate this, either, she scans the semantic environment and arrives at *"Spring*, through the mediation of *jump*, which is only loosely linked to *shock* or *surprise*, closely synonymous only in its figurative sense. Ignorant of the fact that the corresponding German noun (whose correct form is *Sprung*) does not share the semantic structure of its English counterpart, she selects it for production – or rather, she selects what she thinks of as a noun. As in the example of *dacht*, she erroneously derives an inflected verb form into a noun, in analogy to a coincidental correspondence of the associated English forms. The informant has thus constructed an interlanguage item in a multi-step process, in which a number of attribute specifications from different source and target language items have been gathered together. The result is an entirely incomprehensible translation product.

The examples so far have demonstrated how the different component attributes of lexical knowledge can be erroneously supplied with values derived from associated items, both intra- and crosslinguistically, resulting in predominantly but not necessarily incorrect lexical forms. The semantic and formal associations underlying such transfer shed light on the complex interconnectivity and interaction of lexical knowledge structures.
I will now proceed with a look at the possible impact of a deficient lexical frame on phrase structure.

2.1.2 Phrase Level Errors

Predicative items were argued to provide, by virtue of their argument structure, an outline framework for phrasal structure. I will here discuss how phrase level errors can be explained with reference to incorrectly supplied predicative frames. Examples relate, for instance, to the use of the noun Angst ('fear') as associated with the phrase Angst haben (vor etwas) ('be afraid (of something)').

Subject 8 translates Calvin is horrified as *Cavin ist angst. The error involved is relatively simple, relating to an incorrect identification of the target item's semantic role or function, as associated with syntactic category. It is specified as an adjective, presumably analogous to the English source item or to the item afraid, triggering the verb sein as associated with the syntactic valency structure of adjectives. The adjective status further determines that the item is not capitalised, as the noun would have been. (A missing capitalisation of nouns, however, is a general problem in many texts and should not be overinterpreted.)

A more frequent error associated with Angst is the use of the wrong prepositions to link up the cause of the fear. Subject 21 translates fears for as hat angst *fur, and subjects 1 and 30 translate fears (for) and worries about as hat Angst *uber. The use of fur and uber is again seen as involving L1-transfer, in the case of fur based on the formal similarity of for and fur, in the case of uber motivated by the frequent correspondence of about to uber. This type of error, which is met frequently, is seen as relating to the isolated acquisition of lexical items in L2 classroom learning. If items, in particular predicative items, are not memorised in connection with the phrases they usually appear in but are stored analytically, such organisation is seen as encouraging their suppletion in analogy to familiar structures.

More complex confusion is at work in the phrase *Calvin besorgt sich (uber) to express worry (subjects 4 and 13). Correct would have been Calvin ist besorgt or Calvin macht sich Sorgen (uber), more idiomatic, however, Calvin hat Angst (vor). Perhaps most likely, the target phrase of the informants was besorgt sein as relating to the adjective besorgt ('worried'). A closer look at the incorrect solution reveals a predicative frame which is supplied with values from a range of different items. The following discussion tries to reconstruct the
mechanisms that may have led to the incorrect solution. It is not seen as a description of clearly discernible cognitive processes but as an attempt to illustrate the complex interconnectivity of lexical knowledge structures and how they can give rise to erroneous transfer.

I will assume that the target item was the adjective besorgt. The triggered form besorgt seems to have activated – via a paradigmatic shift – the verb besorgen ('get, supply'), due to its identity with the third person singular form of the verb. This, in turn, seems to be familiar in its reflexive use and activates the pronoun sich as part of its argument structure. Finally, the preposition über is attached, perhaps in analogy to sich Sorgen machen über, or motivated by the English preposition about in worry about. The result is a lexical frame constructed with the values of up to four different items of both source and target language.

Although the discussion may not be able to provide an ultimate explanation of the error, it furnishes another example of how lexical items are connected at different levels of description on the basis of their structural properties.

It was argued that formulaic sequences provide the language user with prefabricated linguistic patterns, which reduce the cognitive load involved in analytic processing and render language use more idiomatic (cf., e.g., Perkins/Wray 2000). Flexible formulaic sequences (as, for example, governed by predicative items) were suggested to provide a structural framework for expressing specific concepts in varying contexts. To conclude this section, I will discuss an example of confusion arising from having to adapt a flexible formulaic sequence to situational conditions. It relates to the scene in the picture story in which Hobbes apologises for the bad haircut. Most of the informants had difficulties translating apologise into German. I will present a few interesting processing sequences and results, which demonstrate the complexity of the grammatical information that can be associated with predicative items.

The German item that poses the difficulties is the adjective leid, which is primarily used in the sense of sorry in the phrase leid tun ('be sorry'). Its argument structure specifies the actor, i.e., the regretful person, as a dative object, and the cause of the regret either as the sentence subject or as a subordinative clause qualifying an impersonal subject. L2 learners, however, tend to learn primarily the phrase es tut mir leid ('I am sorry') and remain ignorant about its underlying structure. This situation is documented by the processing activity of, for example, subjects 17, 23, and 30. Their associative chains read as follows:
I will refrain from scrutinising the grammatical subtleties of the errors and instead point out the general difficulties involved in the subjects' processing. All three informants associate the phrase *es tut mir leid* and try to derive their target phrase from it.

Subject 23 seems to be completely ignorant of the grammatical structure of the phrase and simply extracts *leid* in search of a verb – according to her comment and in the light of the morphological adaptations that seem to have aimed to turn the form into a past participle. Her translation product suggests that she tried to construct a phrase analogous to *Hobbes says that he is sorry*. She further associates the form *leider* ('unfortunately'), but it remains unclear if she knows the item for its meaning or if it is just accidentally activated due to its formal similarity with *leid*. 
The other two informants seem to be able to analyse the German construction, in particular realising the function of the dative object (mit), but then fail to change the phrase adequately. Subject 17 does not manage to turn it into a relative clause, while subject 30 makes the mistake of treating the entire phrase as corresponding to the verb *apologise*, arriving at a complete change of meaning.

The examples are seen as showing that phrasal structure is closely associated with the argument structure of predicative items, which determine a wide range of morpho-syntactic specifications within a sentence. The following section will take a closer look at the process of phrasal construction as documented by the TAPs.

### 2.2 Phrasal Construction

Phrasal construction was defined as the process of arranging the semantic items selected to represent a given conceptual configuration in a meaningful way, which includes their serial ordering and the activation of functors as appropriate to link them up. This process tends to be automatised in L1 use and is therefore difficult to trace. In L2 use, however, in particular in learner language, it often involves reflective processing and a series of more or less discernible processing stages, which may perhaps be seen as indicative of the mechanisms underlying sentence planning. The following examples will scrutinise a selection of associative chains for processing mechanisms and procedural steps of phrasal construction and their relation to the information structure of predicative items.

1. (subject 12) 
   - **source phrase:** later Hobbes apologises
   - **associative chain:** apologises – uh – er entschuldig – entschuldigen – Hobbes sich
   - **entschuldigen** – reverse the word order I think – entschuldige sich
   - **Hobbes**
   - **translation result:** später entschuldige sich Hobbes
The examples are relatively straightforward and they all display the same overall processing pattern: a predicative item is selected and the phrase built around it, involving the activation of dependent items, serial ordering, and morphological specifications.

In the first instance, the infinitive entschuldigen is first retrieved on its own, then the reflexive pronoun sich is associated, and finally, the elements, including the actor who is situationally determined, are brought into the right order and the verb is inflectionally modified.

Examples 2 and 3 are similar, irrespective of the fact that an incorrect target form has been selected. The informants construct their phrases in correspondence with the frame of the retrieved form. Subject 7 activates ärgert, then aims at supplying dependent items (ist, which is discarded again, and sich), and finally arranges them sequentially.
Subject 11, after overcoming his difficulties with the target form, activates the items consistent with it step by step, thus constructing his target phrase.

Example 4 resembles example 1, involving the retrieval of a verbal infinitive, followed by a dependent preposition, the morphological adaptation of the verb, and the sloting in of actor and experiencer (which were, again, situationally given).

Example 5 is from the multilingual study and the target language is Dutch, the target item boos (‘angry’; sauer auf is German, meaning ‘cross with’). The informant here associates the preposition met (‘with’) immediately with boos, then retrieves the complete formulaic sequence boos zijn met iemand (‘be angry with someone’), which provides her with all the items required to construct her phrase. These are finally brought into the right order and specified morphologically, and the arguments are slotted in, with the indefinite pronoun iemand being replaced by the experiencer.

The examples are certainly not extensive enough to be regarded as representative, but they nevertheless provide insight into the mechanisms of phrasal construction in L2 production and allow for tentative conclusions about the executive operations involved and their relation to predicative frame structure.

In the given contexts the arguments, i.e., the protagonists, are situationally determined. Their relation needs to be specified by a predicative item, which is the first item to be activated, often in its basic form. Then, supplementary and dependent elements are triggered, sometimes one by one, sometimes together in a basic formulaic sequence as it may have been learned from a vocabulary book. Finally, word order and morphological adaptations are sorted out and the arguments are filled in.

This list of component processes is not regarded here as a general procedural sequence but as the identification of analytic operations and associated cognitive operations in reflecting sentence planning. Nevertheless, the processing steps documented in the examples are interesting with regard to the organisation and application of predicative frame knowledge in a second language. They suggest that at the centre of a lexical frame there is a basic, i.e., non-inflected form (for example a verbal infinitive) which is selected on the basis of its semantic quality. It is associated with a certain collocational and colligational environment, the knowledge of which triggers other items consistent with it into activity. These specify its meaning and link it up with its arguments. They include unbound and bound morphemes, the latter relating, for example, to inflectional endings. The predicative item further determines a framework of serial ordering,
which may be explicitly represented by a basic formulaic sequence that can, or rather, has to be adapted to situational conditions (cf. also the translation attempts of apologise above).

Examples 2 and 3 show that the activation of inflected forms is not necessarily (explicitly) mediated by a basic form. However, the earlier discussion demonstrated that the procedural sequences documented by the TAPs are more likely than not incomplete, in particular in the light of the fact that lexical structures are often activated below output threshold level, or below the level of awareness of the language user. Selection errors based on formal confusions were argued to involve intermediate processing stages not articulated. In the same way, inflected forms may have been mediated by the activation of basic forms. This question, however, cannot be solved on the basis of the present data. Nevertheless, the subjects' recurring reference to basic forms and formulaic sequences where available seems to be indicative of the way these items have been learned and memorised and tend to be processed.

I will conclude the discussion of the data with a look at some of the above arguments in relation to multilingual organisation.

2.3 Production Errors and Grammatical Frame Knowledge in Multilingualism

2.3.1 Overview of the Data

In the discussion of the multilingual data, I will again concentrate on translation results and processing phenomena that evidence multilingual interaction and L3 influence or transfer. Table 6.11 presents results which evidence cross-linguistic influence from languages other than the mother tongue. Most often this relates to borrowing or loan translation, either deliberately or automatically, based on perceived structural similarity. From left to right, source language and source item are given, target language and erroneous translation result, correct target form, and the borrowed form and its language.
### Table 6.11 Production errors evidencing L3 influence

<table>
<thead>
<tr>
<th>Source Item</th>
<th>Target Language/ Translation Result</th>
<th>Correct Form</th>
<th>Borrowed Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (32) E: suggests</td>
<td>S: *föreslägger</td>
<td>föreslär</td>
<td>G: vorschlagen</td>
</tr>
<tr>
<td>2. (33) E: suggests</td>
<td>D: *schlagt voor</td>
<td>stelt voor</td>
<td>G: vorschlagen</td>
</tr>
<tr>
<td>3. (33) E: conceal</td>
<td>S: *förberga</td>
<td>döja</td>
<td>G: verbergen</td>
</tr>
<tr>
<td>4. (33) E: gutted and shocked</td>
<td>S: *jättebös</td>
<td>jättearg</td>
<td>G: böse</td>
</tr>
<tr>
<td>5. (32) E: cuts</td>
<td>S: *knippar</td>
<td>klipper</td>
<td>D: knippen</td>
</tr>
<tr>
<td></td>
<td>D: *mots</td>
<td>muts; hoed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S: *moets</td>
<td>mössa; hat</td>
<td></td>
</tr>
<tr>
<td>7. (32) E: his mother's reaction</td>
<td>D: zijn moeder wordt *zorn</td>
<td>boos, razend, woedend</td>
<td>G: Zorn</td>
</tr>
<tr>
<td>8. (32) E: he worries</td>
<td>D: hij*heeft angst</td>
<td>is bang</td>
<td>G: hat Angst</td>
</tr>
<tr>
<td>9. (31) E: he complains</td>
<td>S: *han spreker inte brå över</td>
<td>han taler inte bra om</td>
<td>D: spreken over</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(G: sprechen über)</td>
</tr>
<tr>
<td>10. (31) E: angry with</td>
<td>S: bös med</td>
<td>arg på</td>
<td>G: böse (auf)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E: (angry) with</td>
</tr>
</tbody>
</table>
2.3.2 Third Language Interference

The first three examples are cases of an apparently involuntary use of German terms, which are, it seems, adapted to the Dutch and Swedish phonological and orthographic system. It could be said that the frame as a whole has been borrowed from German and the formal structure of the item modified such that it resembles other target language forms.

The fourth example is similar, except that the German adjective is combined into a mixed German-Swedish compound. Here, it could also be argued that the frame underlying the construction is that of a Swedish adjective, because the applied prefix is Swedish.

Example 5 is a conscious loan, accompanied by the comment "att knippa - I believe that exists in any language", which clearly indicates the subject's awareness of cognates existing across the Germanic languages, and her application of that knowledge. She borrows the Dutch word stem and inflects it with a Swedish ending, i.e., slots a basic L3 form in a target language frame.

Examples 6 demonstrates how the existence of similar items across three languages can give rise to an overgeneralisation about their formal similarity. In this case, all three translation products have been inspired by the Dutch form. Although Dutch is the informant's strongest Germanic language and in this case obviously most readily associated, she relates the retrieved form to German and derives an incorrect Dutch one from it.

The error involved in example 7 is twofold: *zorn is an item borrowed from German where it means FURY or RAGE. The form is transposed into Dutch and used with a different semantic-grammatical specification, namely as an adjective.

Examples 8, 9, and 10 illustrate that transfer can go beyond the word level.

In example 8, a German item is borrowed along with its valency structure and formally adapted to the Dutch system, not capitalising Angst and replacing haben with its Dutch counterpart.

Example 9 is an attempt to circumvent the missing item 'complains' in Swedish by resorting to what would correspond to the phrase 'does not speak good about', borrowing verb form and preposition from Dutch (possibly also in knowledge of the corresponding German item). The solution, it may be remarked, is unidiomatic in any of the languages.
2.3.3 Crosslinguistic Influence of More than One Language

Example 10 evidences lexical creativity involving the construction of a target language phrase on the basis of values borrowed from two of three languages. In the translation of *angry with* as *bös med*, a German adjective has been adapted to Swedish orthography and supplied with the preposition of its English counterpart, or rather, the Swedish translation of it. The result is an incomprehensible interlanguage phrase, which evidences the complex intertwining of the knowledge structures of multiple languages at different linguistic levels.

2.3.4 Factors of Language Mixing

Factors of language mixing and individual variables have been investigated only marginally in the present study. The above examples seem to confirm the earlier findings that crosslinguistic consultation and borrowing happens across all Germanic languages, with German playing a slightly more important role than Dutch as a supplier language, in the sense of providing lexical material for the other languages (cf. Williams/Hammarberg 1998). It is tempting to conclude that this relates to the fact that German is the most familiar second language as it has been studied considerably longer than the others. However, in the case of subject 33, the 4th-year English-speaking student claims that she is more familiar with Dutch and has a better command of the language than of German. Nevertheless, as can be seen from the above examples, her Dutch shows considerable transfer from German, and so does her Swedish. In her particular case, stress seems to be an important factor of L2 performance. Independent of the question whether Dutch or German is her dominant L2, she could be considered almost fluent in all three languages; yet, she appears to have had major difficulties avoiding or even controlling L3 interference. Not only did she find herself increasingly unable to focus her mind on one language, she also seemed to be relatively unaware of the strong third language element in her translations. Her translation results contain a comparatively high degree of errors involving third language influence, despite her advanced skills in the different languages. It appears that her particular way of experiencing the experiment as an exam situation, which she mentioned, led to a lack of control over
her language system. Contrary to the other informants, she was apparently nervous and mentioned that she was worried about her performance.

The processing activity of the Norwegian informant provides a relatively differentiated insight into the relationship of her different languages and their interaction. As was mentioned above, it singles out English as the most important point of reference in her L2 processing, but it also shows that German and Dutch are closely associated. In cases of difficulty in Dutch, German is readily activated and used as a supplier of lexical material.

Another interesting finding relates to the comment of one of the 2nd-year students (subject 31, referring to her translation efforts into German) "the more I think in German the more Dutch is coming out of me." Most interesting about this is not the mere fact that she has difficulties controlling L3 interference, but that it is her first translation task, and she had not used Dutch (which is a weaker language for her, anyway) recently, so that interference cannot be due to recent activation or dominant knowledge, as might be assumed. This could be seen as supporting Mearas's (1999a) hypothesis that third language interference is a mechanism emerging from the structure of the system itself. It could be explained by the fact that perceived linguistic similarity has led to strong associative connections, which are automatically triggered as activation cascades through the system. It also seems that the informants' awareness and expectation of having to use their three second languages one after the other has raised their level of activation, which makes it difficult for the subjects to focus on the required language. In other words, it appears that the particular task situation evokes a higher degree of language mixing in the informants than would be present in their normal L2 use.

2.4 Summary

The second part of this chapter has scrutinised a selection of aspects of lexical processing and production errors that involve knowledge structures extending beyond the word level, relating to information about the contextual behaviour of lexical items. The data discussed were seen as furnishing support for the perspective of viewing grammatical knowledge as an integral part of lexical information structure. Morphological knowledge was argued to be immediately associated with both semantic and formal aspects of the items it
concerns; it was suggested to be an important factor of lexical creativity and lexical connectivity between different types of items at different levels of description. Information about phrase structure was argued to be centred on predicative items, which were documented as the pivot of phrasal construction in L2 production. The lexical component structure model introduced in Chapter 3 was seen as a useful device for elucidating semantico-grammatical processing in the light of the interdependence of the various dimensions of knowledge. It was further found useful for defining the precise character of production errors by relating them to deficient lexical frame knowledge. The conclusions were primarily based on information gained from the bilingual data, but similar findings were derived from the multilingual data. Their analysis focussed again on the peculiarities of multilingual organisation, in particular on L3 influence on L2 productive processing. Beyond the earlier-discussed factors of crosslinguistic interaction and language mixing, two situationally determined psychological factors appeared to interfere with the subjects' ability to focus on a required target language. The expectation of having to use all three Germanic languages was suggested to have raised their respective level of activation, enhancing the likelihood of an erroneous activation of an unwanted language. In the case of one of the informants, stress of performance seems to have been an additional interference factor.

3. CONCLUSIONS

Based on data on productive processing in the performance of L1-L2 translation, Chapter 6 investigated a selection of issues of lexical organisation in relation to the three hypotheses put forward in the course of the thesis. Semantic processing in lexical selection was scrutinised for its implications for conceptual organisation; grammatical knowledge was discussed with reference to lexical information structure, with a particular focus on the role of predicative items for phrase structure and the process of phrasal construction; the relationship of multiple languages in the mind was investigated in the light of crosslinguistic interaction. The data were analysed within the framework of the lexical organisation model proposed in Chapter 3, which aimed to elucidate linguistic structure and linguistic processing with reference to their underlying cognitive structures. The first hypothesis, which suggested that lexico-semantic knowledge is embedded in general conceptual knowledge, and that, conversely, conceptual structure is mirrored in semantic organisation and should be
traceable in semantic processing activity, was explored by tracing associative chains in cases of the unavailability of required target language items. The results of the analysis were seen as supporting this hypothesis; of particular interest was the subjects' semantic search activity, which was found to be indicative of the conceptual frame associated with the semantic content of the source item.

The routes taken in lexical selection were also found revealing in relation to Hypothesis 3, which suggested that the plurilingual lexicon is an integrated system characterised by the dynamic interaction of different languages in the mind, whose relationship is flexible and variable. Crosslinguistic consultation and influence in L2 production was interpreted in terms of types of lexical connectivity and associated mechanisms of lexical access. These were found to vary across the informants and within the informants across different lexical items.

Hypothesis 2, which suggested that the major part of grammatical knowledge can be related to the information structure of semantic items, was investigated by analysing grammatical errors and steps taken in L2 phrasal construction. Grammatical errors could be traced back to incorrect lexical information, in particular of predicative items, whose processing suggested that they could be regarded as the pivot of phrase structure and phrasal construction. Grammatical errors often evidenced crosslinguistic or intralinguistic transfer and were as such also found indicative of intra- and crosslinguistic lexical connectivity.

The data of the multilingual study were analysed with a specific focus on the relationship of multiple languages in the mind. Of particular interest were deliberate and involuntary L3 consultation and transfer. The results obtained furnish support for the notion of a complex intertwining of the languages in the multilingual mind. Perceived linguistic distance, proficiency of the user, and classroom language have presented themselves as factors of interconnectedness, determining the nature and strength of crosslinguistic links and the user's ability to process multiple languages separately. The results further suggested that in the case of closely related languages and in a situation where multiple languages are successively or simultaneously activated, language learners seem to have difficulties keeping the different languages apart, independent of their level of proficiency.

In relation to the lexical organisation model proposed in Chapter 3, it is concluded that it appears to provide a valuable framework for accounting for various aspects of language use, as it elucidates their underlying cognitive structures in a way that is both psycholinguistically explicit and neurolinguistically plausible.
CHAPTER 7: CONCLUSION

I will conclude this study with a summary of the main arguments presented in the course of the discussion, which concern a range of aspects of lexical organisation. The discussion was centred on questions of semantic and grammatical organization and processing in a plurilingual perspective. I will briefly recapitulate the main issues raised in the theoretical part of the thesis (Chapter 1-3), summarise the central findings of the data analysis (Chapter 6), and draw some conclusions in terms of an outlook to possible future research interests.

1. PURPOSE OF THE STUDY

The thesis set out to investigate productive processing in the light of the cognitive structures underlying language use. Three hypotheses were of central interest, relating to different aspects of lexical knowledge.

Hypothesis 1 concerns the relationship of general conceptual and lexico-semantic structure. It was suggested that semantic knowledge is embedded in conceptual knowledge, and that, conversely, conceptual structure is mirrored in semantic organisation. Consequently, it was argued, semantic processing activity should be able to provide an insight into conceptual knowledge organisation.

Hypothesis 2 suggested that grammatical knowledge can be related to the information structure of lexical items, and, more specifically, that phrase or sentence structure is widely determined by the information structure of predicative items. In the light of this perspective, grammatical errors and the process of phrasal construction were expected to shed light on lexico-grammatical organisation and lexical connectivity beyond semantic and form-based associations.

Hypothesis 3 relates to plurilingual organisation and aspects of plurilingual processing. It suggests that the plurilingual lexicon is an integrated system characterised by the dynamic interaction of different languages in the mind. The relationship of these languages is seen as being variable, depending on a number of structural and psychological factors. It was argued that crosslinguistic consultation and influence in L2 production allows for conclusions about plurilingual lexical organisation.
In the light of the overall research goal to explain linguistic knowledge and language behaviour in a way that is both psycholinguistically explicit and neurolinguistically plausible, it appeared desirable to develop a model of linguistic organisation which integrates different theoretical perspectives and positions. Its pivotal component is the notion of lexical information structure, whose various facets are relevant for the variety of issues raised by the hypotheses. The empirical study designed to investigate these hypotheses was also seen as a device of testing the validity and usefulness of the proposed model.

2. THEORETICAL CONSIDERATIONS

It was suggested that, in order to be maximally relevant, a psycholinguistic perspective on language use would have to make reference to the cognitive structures that give rise to it. Chapter 1 therefore provided an overview of the cognitive foundations of linguistic competence and argued that the language faculty is subject to the structural and processual principles of general cognition (cf., e.g., Gazzaniga et al. 1998). A useful approach to representing these principles was found in the connectionist paradigm, which models cognitive knowledge organisation in a manner analogous to neural network structure (cf., e.g., Rummelhart et al. 1986). Information units are here represented in the form of multifariously interconnected nodes. In this way, the mental lexicon is modelled as a highly complex lexical network system. It was suggested that linguistic competence involves declarative and procedural knowledge, the former relating to form and meaning of lexical items, the latter to the ability to coordinate them in a meaningful manner. On the basis of neurolinguistic evidence, lexical form and meaning were said to correspond to primarily independent neural activation patterns at different cognitive levels which are conventionally associated together. Of special interest were principles of cognitive knowledge representation, in particular of conceptual structure, which was found to be reflected in lexico-semantic organisation. Their parallel configuration was argued to suggest that semantic knowledge can be regarded as being embedded in conceptual knowledge, relating to the same representational substance. This cognitive semantic perspective, as, for example, represented by Jackendoff (1983, 1990), is supported by neurolinguistic findings concerning the connection between sensorimotor processing associated with specific conceptual contents and lexico-semantic processing (cf., e.g., Gazzaniga...
et al. 1998; Damasio et al. 1996). In the light of this perspective, it was deduced that a study of lexicosemantic processing should be able to provide insight into conceptual organisation.

Concerning the organisation of multiple languages in the mind-brain, neurolinguistic research suggests that they avail of the same cortical structures and follow the same representational and procedural principles. Differences in the distribution of cortical activity between L1 and L2 processing were attributed to different degrees of attention and conscious processing and, in particular in early stages of L2 learning, to the application of explicit grammatical knowledge in language production (cf., e.g., McCrone 1999).

Against the background of these arguments, the organisation of the mental lexicon was discussed from a psycholinguistic viewpoint.

Chapter 2 investigated the information structure of lexical knowledge, the relationship of lexical and grammatical knowledge, and principles of lexical processing in language production, in both a mono- and a plurilingual perspective. Lexical items were defined as multidimensional knowledge structures, consisting of representational substance (relating to semantic and formal knowledge) and combinatorial potential (relating to distributional properties). The latter was equated with the notion of semantic and syntactic valency, referring to an item’s capacity to combine into meaningful stretches of language on the basis of its semantic and formal quality (cf., e.g., Langacker 1987; Lutjeharms 1994). This combinatorial potential was associated with different types of connections and with various aspects of grammatical knowledge. Grammatical knowledge was seen as relating to generalisations about an item’s contextual behaviour, associated with coordinative procedural knowledge rather than abstract linguistic rules. Following Bybee (1988) and Ellis (1997), grammatical rules were argued to be no more than an abstract formal description of generalisations about distributional patterns of lexical items, which have no independent standing or causal role in linguistic processing. Contrary to this position, processing models associated with Levelt’s (1989) Speaking model propound a complex hierarchy of abstract grammatical operations and corresponding levels of representation. These were argued to be implausible in the light of cognitive functioning. They were criticised for being too strongly oriented by structural linguistic analysis, and failing to set linguistic structure in relation to cognitive structure. It was suggested that a comprehensive, explanatory model of language processing needs to pay more attention to the neuro-cognitive foundations of linguistic competence in order to be maximally relevant. It was suggested that the entirety of linguistic knowledge, including grammatical organisation, can be explained with reference
to the information structure of lexical items. The descriptive categories of structural-linguistic analysis were found useful for identifying the perceived psychological reality of lexical information structure, relating to different dimensions, or components, of knowledge, and for characterising the analytic processes involved in phrasal construction.

Language production was discussed with reference to lexical knowledge organisation. Special attention was paid to the mechanisms of utterance formulation. A useful approach to describing utterance formulation was found in Aitchison’s (1989) model of sentence planning, which distinguishes two procedural stages, relating to the selection and sequential arrangement of certain key words (here associated with semantic items) and the completion of the target phrase or sentence involving morphological modifications and the activation of grammatical, or function words. With a view to the later data analysis, the formulation process was split up in a slightly different way, with a distinction being made between lexical selection and phrasal construction. This was done in order to provide a framework that allows for focussing on the processing of individual concepts, represented by individual lexical items, in distinction to larger conceptual configurations, represented by lexical sequences.

Lexical selection as the process of activating semantic items representative of a given conceptual content was described in the light of the cognitive organisation of lexico-semantic and lexical-formal knowledge, and with reference to the spread of activation across the two representational levels. The cognitive processing principle of spreading activation, which holds that the activation of a given structure involves the stimulation of its immediate environment and other connected structures, is widely regarded as being responsible for the flow of energy in the nervous system, also governing various aspects of linguistic, or lexical processing (cf., e.g., Aitchison 1994).

Phrasal construction was defined as the sequential arrangement of the selected semantic items and an insertion of functors to specify their interrelation. It was seen as being determined by the valency structure of the semantic items, with a key role being assigned to the argument structure of predicative items, which provides the structural framework for the target utterance.

The suggested principles of lexical organisation were related to the peculiarities of the plurilingual mind. The latter was accounted for as a complex system characterised by the dynamic interaction of different languages (cf., e.g., Hyltenstam/Viberg 1993; Jessner 1997). It was suggested to be based on the same organisational
principles as the monolingual mind, but with an exponentially growing complexity the more languages are involved, because of their complex intertwining at various linguistic levels. L2 production was said to involve a higher degree of analytic lexical storage and of analytic and reflecting processing (cf., e.g., Perkins/Wray 2000), in particular by the language learner, and to involve the likelihood of crosslinguistic and intralinguistic transfer due to incomplete lexical (grammatical) knowledge.

Chapter 3 set out to develop a model of lexical knowledge organisation, whose purpose is to elucidate linguistic structure and linguistic processing with reference to their underlying cognitive structures. In the light of the argument that the entirety of linguistic knowledge can be related to lexical knowledge, the model is centred on lexical information structure. It aims at integrating the various dimensions of linguistic knowledge and levels of analysis in a way that is at the same time transparent and comprehensive, and satisfies a psycholinguistic, a neurolinguistic, and a structural-formal perspective alike. Two complementary frameworks were used to account for different aspects of lexical organisation and utterance formulation.

The mechanisms of lexical selection were discussed with reference to lexical network structure and the flow of activation in this system. In order to disentangle the confusing complexity of lexical network organization and to illustrate selection mechanisms transparently, lexical items were modelled as bipolar entities whose representational substance is spread across two distinct cognitive levels. This perspective discloses the mental lexicon as a triple associative network of semantic, formal, and semantic-formal connections. It was found useful for elucidating the spread of activation in lexical access, and for shedding light on potential error sources.

Grammatical knowledge and grammatical processing in connection with phrasal construction were accounted for in a more abstract way. They require an integration of the representational substance and combinatorial potential of lexical items, in order to allow for a comprehensive understanding of the mechanisms involved. This was approached by adopting a frame model as applied in conceptual semantics, which explicates the interrelatedness and interaction of the different dimensions of linguistic knowledge. The model renders possible a unified view of the attributes of lexical knowledge as represented in the component structure of lexical items; it retains the multidimensionality of their informational content, while at the same time presenting 'words' as psychologically unified entities. With regard to phrasal structure, the model allows for delineating the variety of aspects of morpho-syntactic knowledge with reference to the valency structure of semantic and
in particular of predicative items. The process of phrasal construction was thus explained in the light of the interaction of the different dimensions of knowledge involved, and grammatical errors were related to deficient lexical knowledge.

The model was further shown to provide a framework for illustrating the perceived psychological reality of lexical network organization. The perspective of lexical items as integrated knowledge structures renders it possible to explain lexical connectivity as links between different lexical attributes, thus allowing the mental lexicon to be seen as a single comprehensive network.

The perspective on lexical organization adopted in Chapter 3 was used as a framework of reference in the analysis of the empirical data in Chapter 6.

3. EMPIRICAL STUDY

Chapter 6 investigated issues of lexical organization relating to the three hypotheses in the light of productive processing in L1-L2 translation. The data analysis was divided into two parts. The first part focussed on the processing of individual items or individual concepts. It scrutinised mechanisms of lexical selection, the organization of conceptual-semantic knowledge, and plurilingual connectivity. The second part investigated a selection of production errors in the light of lexical information structure, and aspects of grammatical processing in phrasal construction. Both parts discussed bi- and multilingual issues separately.

For the bilingual study in part 1, four situations, three of which featured related emotional reactions, were singled out from the stories, and the corresponding data - an L1 lexicalisation, its L2 rendition, and the documented translation process - were set in relation to each other. More specifically, the informants' choice of words in both L1 and L2 and their intermediate processing activity were analysed with reference to the conceptual content to be verbalised. Particular attention was given to semantic processing and its implications for conceptual organization and bilingual lexical connectivity. The associative chains documented by the TAPs rendered possible the reconstruction of lexical networks and an identification of the processing mechanisms at work in lexical selection. It was argued that the informants' aggregated semantic processing activity could be seen as representing their collective conceptualisation of the given situations, or, more precisely, of the
conceptual frame associated with the featured concepts. Following Zimmermann (e.g., 1994), this was justified with the argument that their processing activity evidenced a considerable amount of overlap, and because for some situations a number of subjects alone activated larger parts of the entire frames. The identified conceptual frames were found to include a range of key items representative of certain central concepts, and further lexicalisation possibilities representing specific perspectives on those concepts. The data analysis also compared the semantic quality of the informants' lexical choices in their L1 compositions to that of their L2 translations. In connection with the verbalisation of the emotional situations, this resulted in an interesting observation. It appeared that in their L1 accounts, which are seen as representing relatively casual, unreflected language use, the subjects' choice of words was relatively random, often emotionally unspecific and/or depicting an observer's perspective. In their L2 translations, which are characterised by carefully reflected processing, many of them opted for interpreting their initial lexical choices in terms of specifying the protagonists' emotional reaction. It appeared that being confronted with the same situation a second time, they developed a more specific understanding of it, which is reflected in more specific lexicalisations and also documented by a few explicit comments. At the same time, the overall variety of lexical choices suggested that different individuals have their own preferred way of verbalising the same conceptual content, provided that the associated lexical field allows for such variation.

Concerning bilingual organization, the routes taken in L2 lexical retrieval gave evidence of different types of crosslinguistic connectivity, including subordinative, compound, and coordinative memorisation of L2 vocabulary. Types of lexical connectivity and mechanisms of lexical access were found to vary across the informants and within the informants across different lexical items. This confirms Weinreich's (1953), de Groot's (1993), and Paradis' (1985, 1987) perspective of mixed and changeable systems.

Lexical errors relating to the confusion of similar lexical forms were explained with reference to the spread of activation in the triple associative network of lexico-semantic and lexical-formal knowledge. It was shown that seemingly simple errors can involve a highly complex forward and backward flow of information, much of which apparently remains below the level of awareness of the language user. This was argued to suggest that lexical selection generally involves the interactive activation of semantic and formal structures.

The multilingual data were analysed with a specific focus on multilingualism-specific issues. These include the question of the relationship of multiple languages in the mind and associated processing peculiarities, and
possible differences between individuals with varying linguistic backgrounds. Of particular interest was lexical processing across languages other than source language (L1) and target language, i.e., deliberate or involuntary L3 consultation. The data evidenced a considerable amount of L3 consultation and interference, which furnishes support for the notion that the vocabularies of multiple languages are intertwined in a complex way, and that structurally similar languages tend to be closely associated. Perceived linguistic distance, proficiency of the user, and classroom language suggested themselves as factors of interconnectedness, determining the nature and strength of crosslinguistic links and the function a non-target language can have in crosslinguistic consultation.

Part 2 investigated aspects of grammatical organization and phrasal construction with reference to the lexical information structure model proposed in Chapter 3. Production errors were related to lexical frame knowledge in the sense that they were shown to be associated with incorrectly specified lexico-grammatical attributes, including both collocational and colligational properties. Incorrect values, which ranged from incorrect distributional information via deficient phonological or orthographic knowledge to inadequate functor specifications, were found to evidence crosslinguistic or intralinguistic transfer. This was seen as indicative of the complex intertwining of lexical information structures and of the multidimensional connectivity of lexical items, both intra- and crosslinguistically.

L2 phrasal construction was found to follow a certain procedural pattern, beginning with the selection of a predicative item and followed by the construction of a phrase or sentence around it. A range of component processes were singled out, including the activation of dependent items, serial ordering, morphological specifications, and the slotting in of arguments. The processing steps documented in the given examples were argued to be indicative of the organisation and application of predicative frame knowledge in a second language. They were not, however, regarded as a general procedural sequence, but instead as the identification of analytic operations in reflecting sentence planning.

The multilingual data were again scrutinised in relation to multilingual interaction and to L3 influence or transfer. On the whole, they evidenced the same procedural mechanisms and organisational principles as the L1 data, with the tendency to draw more on information derived from linguistically close third languages than from the mother tongue. An unexpectedly strong L3 interference even in the processing of almost fluently mastered second languages was explained by the fact that all three languages were at a very high level of
activation because of their (expected) subsequent use. In the light of the limited amount of data, these findings can, of course, only be regarded as tentative conclusions, which would be interesting to be followed up in a large-scale investigation.

4. SUMMARY AND RESEARCH OUTLOOK

In the conclusion to the findings of the empirical study, it was stated that the suggested perspective on lexical knowledge organisation appears to provide a valuable framework for accounting for various aspects of language use, as it elucidates their underlying cognitive structures in a way that is both psycholinguistically explicit and neurolinguistically plausible. The three hypotheses put forward in the course of the discussion were found to be supported by the results of the data analysis, within the limits of the investigation.

A special concern of the data collection had been to elicit information on as many aspects of language use as possible, in order to develop a comprehensive picture of linguistic organisation on the basis of a single, coherent set of data. The methodology used is seen as being highly successful in that respect. The results were not only found to be a rich source of information on the issues under investigation, but also on a range of other facets of linguistic competence and language behaviour, such as strategic processing or individual variation, which could not be followed up here.

A few words may be spared for the value of TAPs, which is known to be a controversial issue. The verbal protocols were found to provide valuable information on cognitive processing activity going beyond information inferable from a comparison of translation source and product. Of course, TAPs are incomplete, and they are also alienated documentations of cognitive processes, linearised verbal outputs from which underlying cognitive mechanisms can only be inferred. Nevertheless, they are seen as a useful device for reconstructing thought processes and with them principles of linguistic organisation.

I will conclude this study with a few suggestions in relation to possible future research directions.

As was mentioned above, the data elicited for the present study could be used to follow up further research questions, such as individual variation or strategic processing, in order to differentiate and extend the present perspective on lexical and linguistic organisation.
With regard to the central research questions of this thesis, a range of issues might be of interest for further investigation.

It was suggested that the present findings furnish support for the hypothesis that lexico-semantic structure and processing is indicative of conceptual organisation. The field of emotions was taken as an example of highly differentiated conceptualisation reflected in a wide range of lexicalisations. More specifically designed semantic processing tasks could be used for a comprehensive investigation of the conceptual structure of emotions and other complex conceptual fields, which might further be related back to their neuro-cognitive foundations.

Concerning the organisation of grammatical knowledge and the mechanisms of phrasal construction, it would be interesting to investigate L1 grammatical processing. L1 processing is known to proceed highly automatically, which renders it difficult to trace operational procedures. In order to elicit data on the L1 formulation process, subjects could, for example, be asked to reformulate a given text for a specific purpose. This would be expected to lead to careful lexical selection and sentence planning, and perhaps shed light on L1 formulation mechanisms and grammatical processing.

Plurilingual organisation has here been studied in the context of closely related languages only. It would be interesting to include structurally distant languages in a similar project and to investigate the interaction of different types of languages. Of further interest could be longitudinal studies, which investigate developmental issues and their relevant factors.

A final suggestion towards future research concerns the lexical information structure model and its usefulness for elucidating linguistic organisation and language processing. It was here used to illustrate aspects of utterance formulation, in particular of phrasal construction; it would be interesting to apply it to other aspects of both language production and comprehension and to a structural linguistic analysis of the dependencies between the elements of sentences.

In conclusion to the present study, I hope the results of the investigation can make a useful contribution to current linguistic research, and that, perhaps, a few issues that have been raised may be of interest for future research.
REFERENCES


246


The Appendix presents the central data on which the empirical study is based, and a range of additional information for the interested reader.

Addendum 1 shows the data associated with the processing of the central concepts of Situations 1-4 in their co-textual embedding, as produced by the bilingual informants. It includes the L1 source items and L2 translation products in their phrasal embedding and the unabridged chains-of-thought relating to their processing. The relevant data were extracted from the corpus and grouped together under the heading of the situation they relate to, in order to present them clearly, thus facilitating the access for the reader.

Addendum 2 gives three examples of the complete set of data elicited in the empirical study, consisting of L1 composition, L2 translation, and think-aloud protocol. They include two sets of data from Group A (subjects 21 and 26, translating from English into German) and one from Group B (Subject 34, translating from Norwegian into Dutch). The examples were selected because they provide an insight into the diversity
- of the L1 compositions in terms of writing style (formulation)
- of the informant’s approach to translating and problem-solving
- of the informants’ L2 competence

The example of the performance of the Norwegian informant was further chosen to illustrate the peculiarities of her processing activity and multilingual organisation, as discussed in the data analysis in Chapter 6.

The following conventions were adopted in the transcription of the TAPs (cf. also the relevant discussion in Chapter 6).
- Interlanguage forms were spelt in accordance with target language orthographic rules.
- A phonetic transcription was opted for in certain cases where it was unclear what language or item was aimed at, for example, in some cases of fragmentary items.
- Pauses, which were not analysed qualitatively, were not quantified. In order to impose some structure on the verbal protocols, a distinction was only made between ‘relatively short pauses’ (up to a few
seconds, represented in the transcriptions by 1 dash) in which the informant *seems* to have been concerned with his current difficulties, as opposed to 'longer pauses' (2 dashes) where it is impossible to decide what he might have thought about. This classification admittedly involves a certain degree of vagueness and subjective judgement, but it is not seen as distorting the informational content of the transcriptions for the present purposes.

- Unintelligible passages are represented by dots.

- Comments by the transcriber are given in brackets.

Finally, Addendum 3 shows the written task instructions given to the informants immediately before carrying out the respective tasks.
### Situation 1: Calving getting suspicious while Hobbes is cutting his hair

<table>
<thead>
<tr>
<th>Subject 1</th>
<th>Source Phrase</th>
<th>Calvin becomes worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin hat Angst</td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>it's fear – don't know what worried is</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 3</th>
<th>Source Phrase</th>
<th>As his hair gets progressively shorter, Calvin begins to get worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Aber wann seine Haare kürzer und kürzer bekommt, hat Calvin Angst</td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>uh – okay – angst – bekommt – no isn’t bekommt Angst – he has Angst – hat Calvin Angst – okay</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 4</th>
<th>Source Phrase</th>
<th>Calvin becomes worried about his hair</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin besorgt sich über seine Haare</td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 7</th>
<th>Source Phrase</th>
<th>Calvin is getting worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin ärgert sich</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 10</th>
<th>Source Phrase</th>
<th>1. Calvin starts to get a little worried as does Hobbes ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>1. Calvin fängt an ein bisschen Angst zu haben und Hobbes auch ...</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>1. ---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 11</th>
<th>Source Phrase</th>
<th>1. Calvin then starts to become apprehensive ...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>1. Calvin becomes worried</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>3. and disgruntled as he has no mirror</td>
</tr>
</tbody>
</table>
1. Dann Calvin ängstlich sein beginnt ...
2. Calvin wird besorgt
3. und unfroh weil er keinen Spiegel hat

2. ---
3. disgruntled - und - unhappy - uh - unfrohlich - und unfroh - und becomes - unfroh

Calvin gets more nervous

Calvin bekommt nervös
nervös - nervös - nervöser - nervös - nervös - now - doesn't matter - nervös - okay

Calvin begins to get a bit suspicious

Calvin besorgt sich auch
no recording

But as Hobbes was cutting Calvin became very worried

Während Hobbes es machte wurde Calvin sehr besorgt

... he begins to panic

... Calvin hat langsam angst
Calvin fängt an - zu panic - don't think that's right - zu paniken - not really make sense - paniken - aber Calvin hat - langsam - Angst - okay

Calvin ... starts to throw a freak
er schrein
und er - he's angry he looses the cool - er habe er cool verloren ich glaube nicht - und er schrein - schrein
<table>
<thead>
<tr>
<th>Subject 17</th>
<th>Source Phrase</th>
<th>Calvin, after a while gets worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Später macht Calvin sich eine sorge</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>gets worried - worry - becomes worried - no werden - to become - später wird - uh - no no no no - he is worried - er - macht - sich - Sorge - - (repeats English phrase) - später macht - Calvin - sich - machen - er macht sich - eine Sorge - macht sich eine Sorge - can have a noun with it - I think - it is - an article - später macht Calvin sich eine Sorge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 19</th>
<th>Source Phrase</th>
<th>Calvin begins to get worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin beginnt die Sorgen zu machen</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>die Sorge - Calvin beginnt die Sorgen zu machen - die Sorge machen - Sorge machen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 21</th>
<th>Source Phrase</th>
<th>Calvin ... fears for the result of Hobbes attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin .. hat angst für was Hobbes getun hat</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>hat - Angst - vor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 23</th>
<th>Source Phrase</th>
<th>Calvin begins to get worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin beginnt um Sorgen zu bekommen</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>I don't know how to say begins to get worried so I'll say becomes worried - Calvin - wird - no Sorge I just know the word for worry - not that he's worried- gets - worries - bekommt - Sorgen</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 24</th>
<th>Source Phrase</th>
<th>Calvin become more nervous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calin bekommt sehr nervos</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>sehr nervös - nervös</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 25</th>
<th>Source Phrase</th>
<th>Calvin becomes worried</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin ist nervös</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>---</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 26</th>
<th>Source Phrase</th>
<th>Calvin soon decides that he needs to see it for himself as he seems dubious as regards being called a Punk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Translation Product</td>
<td>Calvin möchte eine Glas sehen weil er Hobbes nicht glaubt</td>
</tr>
<tr>
<td></td>
<td>Chain-of-Thought</td>
<td>'cos he doesn't believe him</td>
</tr>
</tbody>
</table>
Subject 27
Source Phrase
Hobbes tells Calvin that he looks like a punk. Calvin maddened by Hobbes last comment...
Translation Product
Hobbes sagt zu Calvin daß er ist gleich ein punk. Calvin ist nicht froh mit die letzte dinge
Chain-of-Thought
Hobbes hat gesagt

Subject 28
Source Phrase
1. After a while Calvin begins to get suspicious
2. His enthusiasm turns to rage
Translation Product
1. Nach einer weile, wird Calvin unsicher
2. Sein Lustigkeit wird Zorn
Chain-of-Thought
1. uh - suspicious - suspicious - uh - unsicher uncertain - suspicious - suspect - uh - nach
einer Weile - wird - he becomes suspicious wird er - unsicher
2. wendet in Zorn - (laughs) - wendet ins or in den Zorn - there's probably no article actually
- sein - Lustigkeit - wird - Zorn - becomes - rage

Subject 29
Source Phrase
1. Calvin begins to worry
2. Once again Calvin begins to worry
Translation Product
1. Calvin hat Angst
2. ... noch einmal Calvin hat Angst
Chain-of-Thought
1. I'm gonna say he's afraid - hat Angst
2. ---

Subject 30
Source Phrase
Calvin starts getting worried
Translation Product
Calvin beginnt Angst zu haben
Chain-of-Thought
begins to be worried

Situation 2: Calvin being horrified by the outcome of the haircut

Subject 1
Source Phrase
1. Calvin is shocked on seeing the result,
2. and fears his mother's reaction
Translation Product
1. Calvin ist sehr (shocked) wenn er seine Haare gesehen hat,
2. und er hat Angst über die Meinung seine Mutter
1. don't know what shock is - Calvin ist sehr ... - shocked - surprise - s- - i ʃ - is surprised - Calvin ist sehr surprised - erstaunt - don't know what shocked is - Calvin ist - sehr - I don't have a clue ...
2. ---

Subject 2
Source Phrase 1. ... he cannot believe his eyes, he is practically bald.
2. His disbelief turns to horrors, as he wonders what his mother will do
Translation Product 1. er kann nicht ihr Augen glauben. Er ist bald.
2. Aber er ist sehr ungeduldig weil er denken was ihren Mütter will machen

Subject 3
Source Phrase 1. Shocked by his hair
2. and worried about what his mom would say
Translation Product 1. Er ist Entausched
2. und dann meint er über was seine Mutter sagen

Subject 4
Source Phrase 1. Calvin has a minor panic-attack upon seeing his hair,
2. particularly worrying about what his mother will think
Translation Product 1. Calvin panikt wenn er seine Haare sieht.
2. Er besorgt sich in besonderen über was seine Mutter denken wird

Subject 5
Source Phrase Calvin goes mad when he sees the result
Translation Product Calvin ist wie verrückt, wenn er das Ergebnis sieht

Subject 6
Source Phrase 1. Calvin ... sees his hair, he gets very angry
2. and also fearful of his mother’s wrath
1. Dann sieht Calvin einen Spiegel und er ist sehr "angry".
2. Er hat auch Angst vor seiner Mutter.

Source Phrase
When he sees himself he panics
Translation Product
Als er sich sieht, ___
Chain-of-Thought

1. When he sees the hair he is horrified
2. when he sees the hair he is horrified

Translation Product
... wenn er hat die Haare gesehen es ist angst

1. He freaks out when he sees his bald head
2. and worries about what his mother will think

Translation Product
1. Calvin ist Lärm wenn er seine kurze Haare sehen
2. und denke über seine Mutter und was sie denken will

Translation Product
1. Wann Calvin sieht an seine Haare an ist er böse ...,
2. dann hat er Angst weil er kennt, daß seine Mutter sich ärgern wird

1. böse? – I wanna say he’s furious
2. ___

Translation Product
1. Calvin, seeing himself in the mirror, is immediately shocked
2. and worries about his mother’s reaction ...
3. Calvin ... is afraid of what his mother will do

Translation Product
1. Calvin, als er ihn selbst in dem Spiegel sieht, sofort ist er shockiert,
2. und er sorgt über Reagierung seiner Mutter
3. er argert sich über was seine Mutter machen wird
1. shocked - schockiert - uh - schockiert - ist - er schockiert - schockiert? - no - uh - uh -
   shocked - uh - schockiert - yeah
2. ---
3. is afraid - er - eigert - ärgert - eigert - ärgert - ... - ärgert - er ärgert sich über he's afraid

Subject 12
Source Phrase Calvin ... surveys the damage
Translation Product er sieht was Calvin hast an seinen Kopf gemacht
Chain-of-Thought what's damage - and he sees what happened - how close do we have to be -- okay -
surveys the damage - und sieht - was hast an seinen Kopf gemacht - what has happened to
his head - on his head - no - what Calvin has done to his head

Subject 13
Source Phrase ... he's shocked by the result and by the reaction he anticipates from his mother
Translation Product Er sieht sein Haar und mit es ist er gar nicht zufrieden.
Chain-of-Thought no recording

Subject 14
Source Phrase Calvin was astonished when he looked mirror
Translation Product Calvin war erstaunt, als er seine Haare sah

Subject 15
Source Phrase Calvin ... screams at his own image
Translation Product Calvin ... schriet wann er ihm selbst sieht

Subject 16
Source Phrase He thinks its awful
Translation Product Er glaubt das seine Haare sehr schlecht ist

Subject 17
Source Phrase 1. He is shocked
2. and very worried what his mother will say
Translation Product 1. Er sieht schockiert aus
2. und er macht sich viele Sorge weil, er über was seine Mutter sagen wird denkt

261
1. he's shocked - er sieht - schockiert aus - how do you spell schockiert - s-h-o-c-k-i-e-r-
t I think - er sieht schockiert aus - to appear shocked
2. I got to stick to the thing I decided on - er macht sich eine Sorge - viele - viel - viel Geld -
much money - wie viele how many - I think viele

Subject 18
Source Phrase
no English text
Translation Product
er sieht ihre Haare und hat Angst vor seinem Mutter
Chain-of-Thought
---

Subject 19
Source Phrase
... he is shocked, all his hair is practically gone
Translation Product
... er ist erschrocken, alle seine Haare ist wirklich verschwunden
Chain-of-Thought
---

Subject 21
Source Phrase
1. Calvin ... is quite shocked to say the least when he sees the result.
2. But the thought of what his mother will say is also terrifying
Translation Product
1. Calvin ... hat ein Schreicht bekommt wenn er Ihre haare gesahen hat.
2. Aber die dacht von was Ihre Mutter sagen wurde ist auch schlecht
Chain-of-Thought
1. shocked - uh - to be shocked - shock - surprised - he's quite shocked - (repeats English
sentence) - is quite shocked - shocked - he's surprised - afraid - erschrickt - shocked -
surprise surprise - quite shocked to say the least when he sees the result - und hat - ein
Schrickt? - bekommt
2. terrifying - scary - bad

Subject 22
Source Phrase
1. Unsurprisingly Calvin freaks
2. and becomes increasingly worried about what his parents will think
Translation Product
1. Es ist keine Uberraushung, daß Calvin Angst hat
2. und er wird sehr besorgt, über was seine Eltern denken werden
Chain-of-Thought
1. has fear - that Calvin gets worried - no zu - sorgen - sorgen - sorgt - da Calvin - Angst -
uh fear
2. it's a guess besorgt - I can't think uh worried

Subject 23
Source Phrase
1. When Calvin sees the result he's horrified.
2. When he thinks of his mother's reaction he is petrified
Translation Product
1. Als Calvin seine Haare sieht, findet er sie furchtbar.
2. Als er über seine mutter denkt, hat er große angst
1. Calvin is shocked at how short his hair is.
2. He is worried about what his mother will think.

Translation Product

1. ... er schockt wie kurze seine Haare sind
2. Er hat Angst vor seiner Mutter und was sie denken wäre

Chain-of-Thought

1. to be shocked - schocken - und er ist - no you can't say that he's shocked - und er schockt - schocken - that sounds German - but I don't think so
2. ---
Situation 3: Calvin's mother being shocked by Calvin's bald head

**Subject 1**

**Source Phrase**
... his mother is shocked at the sight of his bald head

**Translation Product**
... sie ist böse und nicht glücklich mit seine Kopf ohne Haare

**Chain-of-Thought**

---

**Subject 2**

**Source Phrase**
... she goes berserk, commenting on the state of his hair

**Translation Product**
... sie ist nicht zufrieden

**Chain-of-Thought**

I don't know the word for berserk or annoyed or anything – unless I say – sie ist nicht zufrieden – not happy

**Subject 6**

**Source Phrase**
... when his mother demands that he take his cap off, she goes wild

**Translation Product**
Wenn seine Mutter sieht seine schlechte Haare sie ist auch sehr "angry"

**Chain-of-Thought**

she gets angry – what's the word for angry

**Subject 7**

**Source Phrase**
She is furious when she sees it

**Translation Product**
Als sie es sieht ist sie böse

**Chain-of-Thought**

---

**Subject 8**

**Source Phrase**
She screams at Calvin when she see his hair

**Translation Product**
Sie ist böld mit Calvin wenn sie ihre Haare gesehen hat

**Chain-of-Thought**

---
<table>
<thead>
<tr>
<th>Subject 9</th>
<th>Source Phrase</th>
<th>She goes mad when she sees his bald head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>Sie gehen rot wenn sie seine Haare sehen</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>she goes mad – she goes red</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 10</th>
<th>Source Phrase</th>
<th>She gets quite a shock that he's cut his [hair]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>Sie kriegt ein Shock, daß er sich die Haare geschnitten hat</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>I think that shock there is the same as in English</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 11</th>
<th>Source Phrase</th>
<th>The mother reacts strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>Die Mutter starke reagiert</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 13</th>
<th>Source Phrase</th>
<th>... his mother ... is outraged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>Sie ist böse!</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>no recording</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 14</th>
<th>Source Phrase</th>
<th>She gasped when he removed it.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>Sie war überrascht und wütend</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>sie war überrascht – she war erstaunt und wütend – she was surprised and angry</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 15</th>
<th>Source Phrase</th>
<th>... his mom wasn't in the least bit happy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>... sein mutter war nicht so glücklich</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject 16</th>
<th>Source Phrase</th>
<th>... she ... is aghast at his disastrous haircut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation Product</td>
<td>... sie hat eine große Überraschung wenn sie seine schlechte Häare gesehen hat</td>
<td></td>
</tr>
<tr>
<td>Chain-of-Thought</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
Subject 17
Source Phrase: She's very shocked
Translation Product: Sie ist shockiert
Chain-of-Thought: ---

Subject 18
Source Phrase: no English text
Translation Product: Sie hat Angst wenn sie seine Haare seht
Chain-of-Thought: sie - uh - aber - uh - she screams - aber sie hat Angst

Subject 19
Source Phrase: She is shocked when she sees it
Translation Product: Sie ist erschrocken wenn sie es sieht
Chain-of-Thought: ---

Subject 20
Source Phrase: no English text
Translation Product: Wenn sie hat die haar gesehen sie hat große anger
Chain-of-Thought: sie hat - uh - sie - anger - sie hat - sie hat großen - anger

Subject 21
Source Phrase: 1. in the shock
2. they both argue
Translation Product: 1. Aber sie bekommt ein Spring.
2. Die beiden beginnen zu arger mit einander
Chain-of-Thought: 1. su- surprise - surprise - spring - is to jump - I jump
2. ---

Subject 22
Source Phrase: His mother becomes very upset
Translation Product: Seine Mutter sich ängert
Chain-of-Thought: what is ups- very - angered - sich ängern - uh - this is a long shot - angert - I think it is -
can't actually remember

Subject 23
Source Phrase: 1. She reacts ...
2. with shock
3. and horror
Translation Product: 1. Sie schreit ...
2. mit Schock
3. und Horror
Subject 26
Source Phrase
1. She starts at the sight of her son's baldness ... Calvin demonstrates that it was not his fault, rather that of Hobbes.
2. His mother remains sceptical and angry

Translation Product
1. Wenn sie seine Haare sehen, sie ärgert sich. ... Calvin sagt daß Hobbes es geschnitten hat und nicht sich selbst.
2. Seine Mutter ist noch ganz wütend

Subject 28
Source Phrase
1. ... his mother is horrified at the sight of his head.
2. She gives out to him for cutting his own hair, and when he insists that Hobbes cut it
3. she gives up arguing

Translation Product
1. ... sein Mutter ist geschreckt, wenn sie seinen Kopf sieht.
2. Sie beklagt ihm, weil er seine eigene Haare geschnitten hat, und wenn er sagt daß Hobbes sie geschnitten hat,
3. ärgert sie nicht mehr

Chain-of-Thought
1. She starts at the sight of her son's baldness ... Calvin demonstrates that it was not his fault, rather that of Hobbes.
2. His mother remains sceptical and angry
3. to get a surprise uh - wenn sie - uh - his - seine - Haare - sehen - ist sie - wenn sie seine -
   ist - sie - sehr - sie ärgert sich - wenn sie seine Haare sehen ist sie - sie ist sehr. sie ärgert
   sich - ich ärgere - ärgern - sich ärgern - sie ärgern - sie ärgert sich - sie ärgert sie - sie
   ärgert sich - ärgert sie sich - ärgert sie sich - ich ärgere ich - sie ärgere - oh yeah
... she is totally shocked

... sie bekommt ein Shock

nie total - sie ist total - surprised even - uh - so maybe I could say again sie

... sie wird - sie bekommt she gets a real shock - und sie bekommt - ein - Schock

Situation 4: Hobbes drawing hair onto Calvin’s head

Hobbes tries to ... regain their friendship by colouring Calvin’s head

Hobbes ...er (tries) ihre Freund machen. Er streichst Kopf Calvin

don’t know what that is - he colours - he paints - streiche - er - streicht

He ... draw[s] hair on Calvins head

Er schreiben ... auf Calvin kopf

---

Hobbes ... promises to make it up to him by drawing some hair with a yellow marker

Aber er kann Haare mit einen Stift machen

---

... and draws hair onto Calvin’s head

... und malt Haare auf den Kopf Calvin

I know malt is something along the lines of paints or draws
Subject 5
Source Phrase: He ... will cover up the bald patches by colouring his head
Translation Product: Er ... wird seine Kopf malen, um die ___ zu stecken
Chain-of-Thought: painting - malen

Subject 6
Source Phrase: Hobbs tries to make up to Calvin by ... colouring in Calvin's head
Translation Product: Hobbs möchte wieder gutzumachen. ... er "colours" Calvin's Kopf
Chain-of-Thought: ---

Subject 7
Source Phrase: ... Hobbes colours in Calvin's hair
Translation Product: ... malt Hobbes Haare für Hobbes
Chain-of-Thought: ---

Subject 8
Source Phrase: ... a magic yellow marker which he uses to draw on Calvin's head
Translation Product: ... ein magic yellow marker daß er benutzen zu schreiben an der Kopf von Calvin
Chain-of-Thought: uh - draw – zu – schreiben - schreiben

Subject 9
Source Phrase: ... and draws hair on Calvins head
Translation Product: ... und schrieben Haare auf des Kopfes Calvin
Chain-of-Thought: ---

Subject 11
Source Phrase: 1. Hobbes ... tries to make it up to Calvin by offering to colour-in his head with a marker.
2. Hobbes then draws some hair on
Translation Product: 1. ... er versucht Calvin wieder zu bezahlen mit dem angebot seinen Kopf mit einem Farbstift zu einfärben.
2. Dann Hobbes ein blächen Haare einmal
Chain-of-Thought: 1. ---

Subject 12
Source Phrase: ...he draws hair on Calvin's bald head
Translation Product: ... er schiebt Haar an Calvins stärke Kopf
Chain-of-Thought: er schreib – Haar – and Calvin's Kopf
Hobbes then comes up with his second suggestion: - drawing on hair with a yellow marker

 Dann hat Hobbes eine zweite Idee: - das Haar mit einem Marker auf Calvins Kopf zu malen

... thinking he could draw hair on his head

... er hatte vor, Haare auf seinen Kopf zu zeichnen

Hobbes draws on his head


Hobbes draws Calvin some "new" hair

Er schreibe ein bisschen "neue" Haare

draw – uh – er schreibe - writes

Hobbes ... tries to make things better by drawing hair on Calvin’s hairless head

... er beschließt Haare auf Calvins Kopf zu malen

malen – to paint – drawing – schreiben – uh – technical drawing is – technische Zeich- Zeich- zu malen – I think malen would be the best

no English text

... er zeichnet der von Calvin

zeichnen – Calvins Kopf – er zeichnt – zeichnen - zeichnet

Hobbes ... tries to make it up to him by drawing hair on

... er versucht wieder Calvins Freund zu sein, er steckt Haare am (seinem) Kopf

<table>
<thead>
<tr>
<th>Subject</th>
<th>Source Phrase</th>
<th>Translation Product</th>
<th>Chain-of-Thought</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>no English text</td>
<td>Er gibt ihn haare mit ein stiff</td>
<td>don't know the word to draw – er – er – er – gibt ihn - Haare</td>
</tr>
<tr>
<td>21</td>
<td>He ... begins to draw some artistic hair drawings on Calvin's hair</td>
<td>... er beginnt zu mahlen manche manche geschicht von Haare on der Kopft von Calvin</td>
<td>---</td>
</tr>
<tr>
<td>22</td>
<td>... he offers to DRAW some hair on</td>
<td>... damit bietet er an, einige Haare auf den Kopf von Calvin zu ziehen</td>
<td>anzuziehen no ziehen – zu ziehen – I can’t remember – draw ziehen – oh I’ll try ziehen – to put really – to put some hair on - yeah</td>
</tr>
<tr>
<td>23</td>
<td>He ... draws in new hair for Calvin</td>
<td>Er ... zeichnet neue Haare für Calvin</td>
<td>---</td>
</tr>
<tr>
<td>24</td>
<td>He comes up with the idea of drawing some new hair onto Calvins head</td>
<td>Er bekommt die Idee einige neue Haare auf den Kopf von Calvin zu schreiben</td>
<td>---</td>
</tr>
<tr>
<td>25</td>
<td>He .. offers to draw some hair on Calvin’s bald head</td>
<td>Er ... bittet Haare an Kopf Calvins zu zeichnen</td>
<td>draw – uh – art – what is art – kunst – so to draw – okay – to draw – zu ... – draw – art – paint – [j] – schreiben – zu schreiben – to write – that’s as close as I can get</td>
</tr>
<tr>
<td>26</td>
<td>He draws some yellow hair on his head</td>
<td>Er peinten sein Kopf</td>
<td>macht - to paint – painten – no er – er – painten – er painten seinen Kopf</td>
</tr>
<tr>
<td>27</td>
<td>Hobbes puts yellow line on Calvin’s head</td>
<td>Hobbes stecke geble ___ auf Calvins kopf</td>
<td>---</td>
</tr>
</tbody>
</table>
Subject 30

Source Phrase: He ... draws some hair onto Calvin's head

Translation Product: Er ... zeicht an Calvins Kopf etwas Haare

Chain-of-Thought: zeicht – zeichen I think is to show - anzeichen is to draw - or its the other way round - uh - maybe it's just zeichen - und zeicht - etwas Haare - Haare - onto Calvin's head - zeicht - no I think it's anzeicht - an Calvin' head etwas Haare - that should be the other way round - so und zeicht - an - Calvin's head
ADDENDUM 2 COMPOSITION, TRANSLATION, AND VERBAL PROTOCOL: SAMPLES OF THE COMPLETE SET OF DATA ELICITED FROM THE INFORMANTS

Subject 21

1. L1-Composition (English)

Calvin sits in front of the mirror

trying desperately to reach his hair.
Yet no matter how he tries it seems
to stick all over. Hobbes his
friend suggests that it's a haircut
that Calvin needs. But what is it
what Calvin wants because he
never feels happy with the barber's
result.

So Hobbes comes up with idea
that he'll transform Calvin's head.
So he begins to cut and cut
continuously until the hair is

quite short. During this time
poor Calvin has no mirror and
fears for the result of Hobbes
attempt.

Calvin demands to have a
mirror and is quite shocked
to say the least when he
sees the result.

But he though of what his
Mother will say is also terrifying.

At dinner with his mother she asks that he removes his hat and in the shock they both argue and she doesn’t believe Calvins side of the story. Hobbes feels quite guilty and knows that he must undo the damage. He tells Calvin of the new yellow crayon he bought and begins to draw some artistic hair drawings on Calvins hair to replace the baldness. With that the both become friends again and Calvin is quite pleased with his new hairstyle.
or die Frage von Cailtin Wexlmo.

Hedding hor die Ford Cap.

Gummy.

Die Schocklock mit Dunm Fokum.

Nira Cailtin bevor wird, weil es

Cailtin. Because. Over als ist nicht

Es ein Hanne Schénungen, wir, dop

Heddon. The Friend, uneschien, dop

Es war 'Open und Unre.

zu Kommen. Ford mit Alien ex (quasi)

Hier

freilek Zandlich Stand was für harent

Cailtin sitzt vor Sean Greedal und er

2. Translation into German
wurde.
(Sollte) Dann begann er schreiend
und schreiend ganz ohne Pause bis
die Haare ziemlich kurz
ist.
(Während)(er) Durch dieses Zeit.
Calvin hat kein Spiegel und hat
angst für das Koloben gehen hat.
Calvin will ein Spiegel und
hat ein schrecklich Bekenntnis, weil
er (das) Ihre Haare gesehen hat.
Aber die dachte (da) war
Ihre Mutter sagen wurde ist
auch schlecht.
Hobbes empfiehlt, daß ein Hut eine gute Idee für das Haar Schneiden würde.

Macken muß Er zeigt Calvin die
neue gelbe Crayon daß er gekauften
hat, und er beginnt zu malten
manche geschick von Hanne on

der Kopf von Calvin. Mit das sind
Sie freundlich wieder (ano) und
Freut Calvin (auf) sehr auf die
neue haarmode.
okay translating that — okay — it can be hard — Calvin sits in front of the mirror trying desperately to comb his hair — (laughs) — Calvin is — ich — sitz- no — sitzen- ich sitzt- sitzt vor dem Spiegel — Calvin sitzt — s-i-t-z- vor dem Spiegel — to try — to trei- oh bull- sorry — try — I try — Sport treiben — - und — er treibt — desperately — sehr — very hard — - desperately — des-pe — oh — vor — dem — vor dem — vor dem Spiegel — und — vor dem Spiegel — und er — treibt — treibt — ziemlich sch- ziemlich schlecht — schlecht s-l-e-c-h-t — sehr schlecht — schlecht — um — ihre — ihr — um seine — his — ihr — um — ihr — Haare — zu comben — Calvin sitzt vor dem Spiegel und er treibt ziemlich schlecht um ihre Haare zu kammen — yeah — - yeah no matter how hard he uh tries it seems — he tries — no matter how — aber — French — no matter how hard he tries it seems to stick out all over oh god — aber — aber — aber — no matter how he tries — aber — how he tries — it seems — aber no matter — no matter how it is — aber — aber — how he — sorry — no matter how he tries — aber — - ... is effort — how he tries it seems to stick — sticken is it [tick] stick — out — stickt — out — es stickt aus — all over all over — over — [umb] — üb- ob- über no matter — über — oh god — no matter how he tries it will stick out — but — was — no matter no matter — no matter — no matter — ho he tries — right — now matter how he tries — - - - es gibt — - Hobbes his friend — Hobbes — ihr Freund — suggests — empfehle — is recommend — - decides — entschieden — entschi- ent- s-c-h- -entschied daß — what means ... — the verb to the end — daß — es — ein — haircut — [fisiu] — Fris- Haare — schnitzen — schnitz — s-schnitz — - - - - daß es ein Haarschnitzen — it is — das Calvin — braucht — he needs — but that's not what Calvin wants — aber — das ist — das ist — - aber das — ist — - - - - - - nich — - Calvin — braucht — no what he wants — shit — uh — Calvin w- wollt- ich will du willst er willt — - er wird — weil — because — he never feels happy — mit — mit dem F- der Friseur — - — - - fühle — - Hobbes comes up with the idea that he'll transform Calvin's hair — so — uh — ja ... no — ja — ja — so uh — so Hobbes comes up with the idea — Idee — ja — - Hobbes — gets the idea — ich ge- ich get — to get — geben to give to get — Hobbes has he has — ich habe du hast — hat — die Idee — daß — er — die Haare — von — Calvin — abwechseln no — - to change — ich welche — welchen — daß ihr die Haare können welchen — I will — he will — will is — ich will it's want really — - I will do — he will — - Hobbes has the idea daß er die Haare von Calvin welchen — he will change the hair — will is to want — Ich will du will er will ... — - will that's future — future — will — - (whistles) — - future tense uh — - he should? — - — - - - so he begins to cut and cut continuously until the hair is quite short — dann — beginnt — er — schnitzen — schnitz-en s-c-h- am schnitzen — schnitzen begins to cut cut cut — ganz — continuously —
continuously - without stopping ganz - without - ohne - o-h- ohne Pause - bis - die Haare - bis die Haare -
ziemlich - short - kurz - kurz-e-r- kurzer ist - - kurz - k-u-r-t- kurz - ist - during this time - during this time -
during - während - while während er - während - during - - durch - diese - Zeit - during this time - poor Calvin - poor - uh - ... - poor Calvin uh - - ich - poor Calvin - poor - poor Calvin - - Calvin hat - kein Spiegel -
und fears for the result of Hobbes’ attempt oh my god- und - hat - Angst - für - the result of Hobbes’
attempt - the result - für was - Hobbes - getun hat - - Calvin demands to have a mirror - demands -
demands - - Calvin demands - demand he wants - he wants a mirror - Calvin says I want - ich will - ich will
du willst er willt - - willt ein Spiegel - und - quite shocked to say the least oh my god - shocked uh - to be
shocked ... shock - surprised - uh - he's quite shocked - uh uh - - he's quite shocked to say the least when
he sees the result - ... - ... is quite shocked - shocked - he's - surprised - afraid - erschrickt - shocked -
damn - surprise surprise - quite shocked to say the least when he sees the result - Calvin will ein Spiegel -
und - hat - und hat - win Schrickt? - - bekommt - wenn er - das - ... - his hair - yeah - saw ich habe -
gesehen hat - he sees the result - the thought of what his - the thought of what his mother will say is also
terrifying - aber - thought - Gedank- no it's to think denken - so to think is denken the thought would be -
thought would be - dacht - aber die Dacht - die Dacht - ... - aber die Dacht - von - was - ihre Mutter -
dagen - würde - ist - ist auch - - terrifying - scary - bad - - wurde - 'kay - Hobbes suggests that a hat would
be a solution - suggests - I don't think suggest - Hobbes - suggests empfehlen is to recommend -
recommends - empfehlt ich - daß - der ein hat - Hatte - Hat - ein Hat - eine gute - Idea
für - das - Haare - schnitz - würde would be - At dinner time with his mother she asks that he removes his
hat - dinner time - a - am Abendessen - uh - Abendessen - with his mother - mit - ihre muter - empfehlt sie
- daß er - what's the verb - seine - Hatte - Hat - remove - to remove? - to take off - to remove - - to
remove his hat - ... to move - god ... - he should remove his hat - am Abendessen mit ihre Mutter empfehlt
sie daß er - seine Hat - to take off - - would undress ... anzeigen - - zeigen - aber sie - bekommt - ein su-
surprise - surprise - - spring is to jump - I jump - they both argue and she doesn't believe Calvin's side of the
story oh my god - die beiden - begin b-e-g- beginnen - zu - [e:gar] - miteinander - and she doesn't believe
Calvin's - to believe - glauben - und sie - glaubt - glaubt nicht - die Seite - von Calvins - Geschichte -
Hobbes feels quite guilty and knows that he must undo the damage - guilty - tut mir leid - tut mir leid es tut
mir leid - guilty - guilty - guilty - guilty es tut mir leid I'm sorry - es tut mir leid - - Hobbes - fühlte - ziemlich -
tut mir dir - mir leid - and knows that he must undo the damage - die falsch- Sache - he must - undo the
damage - that - daß er die falsche Sache the false thing - to undo - the time oh god - to fix - kor-ig - rig - rig
- oh great - okay - korrigieren how to spell (yawns) - he must make it correct - daß er die falsche Sachen
korrigieren - that he - must - machen - machen - muß - ich muß du muß he must - he tells Calvin of the
new yellow crayon he bought - he tells Calvin - what's to tell - he tells Calvin of the new yellow crayon - he
tells Calvin - uh - he tells - oh god (yawns) - he tells Calvin of the new yellow crayon he bought - tells what's
to tell - tell me - he tells Calvin or he shows Calvin - he shows - yeah shows - er zeigt - zeigen - die neue -
gelbe - Crayon - das - das er - gekauft - hat - hat gekauft - und - er - beginnt - to draw some artistic hair
drawings (laughs) - er beginnt - zu - to draw - artis- what's art - art is kurz to draw - to draw - kurz is art to
draw - malen - okay - to draw - am - manche - manche - picture - Geschichte no - Geschichte - what's a
picture - Geschichte - von Haare - von on Calvin’s head - head - Kopft - der Kopt - von Calvin - - with that
they both become friends again and Calvin - mit das - mit das - sind sie - Freundenen - wieder - und - und
- freut - sehr - auf - die - neue - hairstyle - Haare - Haare - no I'm not (talks to her neighbour) -
Haarmode okay - der Haarmode
Calvin and Hobbes.

Calvin feels that hair is unsightly as he tries to brush it in the mirror. Hobbes suggests that he get a haircut, but Calvin retorts that the barbers after him seem to give him satisfaction. Hobbes decides to take the barber's place on this occasion and will measure and cut in hand out about the task of styling Calvin's hair. Everything goes quite well at the beginning until Hobbes realizes that he has been a bit severe as regards the length of hair on the back of Calvin's head. Although Hobbes tries to reassure Calvin of his attractiveness while sporting this style, Calvin soon decides that he needs to see it for himself as he seems dubious as regards being called a Punkstalist by Hobbes, whose finished product does not daze what with the few tufts of stubble that remain on the back of Calvin's bald pate.

And decides that in order to disguise the fact that Calvin cannot to wear a hat, Calvin asks incredibly in the mirror and gets a dazed terrible shock, thinking perhaps of his mother's want.
Later at the dinner table his mother very
demands him to remove his hat as it is impolite. She
starts at the sight of her son baldness demanding
to know why he cut his own hair. Calvin demonstrates
that it was not his fault rather that of Hobbes.
His mother remains skeptical and angry when
next the table, Calvin is told
Hobbes apologizes profusely and offers to make it
up to Calvin. Hobbes who remains angry
he draws some yellow hair on his head with
a mother. They are good friends again.
Calvin und Hobbes.

Kannst jetzt trotz der Haare schon kurz ist. Es arbeitet weiter. Trotz der Komplimenten

Später ist er am Tisch zum Abendessen und seiner Mutter fragt sagt ihm seine Hute nicht am Möbel intransparent ist.
Wenn sie seine Haare sehen, fährt sie sehr ängstliche sie sich. Sie fragt ihn, warum er seine Haare geschnitten hat. Calvin sagt, dass Horst es geschnitten hat und nicht er selbst.

Seine Mutter ist noch draußen und geht zurück, wenn sie treffan, Calvin ist aufgewühlt zu Hölter. Hölter meint, das Zeiten sich selbst entschuldigen und Horst es gibt immer noch.

Er hat eine neue Bleistift, das Geld hat er freuten sein Kopf mit der Bleistift.

Sie sind gute Freunde danach.
3. Associated Think-Aloud Protocol

Hüte - would that be hat - eine Hüte - tragen - soll - daß puts the verb to the end of the sentence - in the
infinitive - er soll - oh no er soll - uh - and incredibly uh - uh - Calvin - I - sehen to look - to sehen - ich
sehe er - sie - sieht - ich sehe du siehst er sie es sieht - sieht - in der Glas daß - daß seine Haare sehr kurz
ist und - ist geschockt - geschreckt - (laughs) - und - und - er - er und - uh ist wütend - I hope that's the
word I really don't know this word - (hums a tune) - ist wütend - und - er hat - er - hat - er denkt an - er
is er ist - er - an - ist er - table - the table - come on ... - zum Tisch ist er - uh no uh - an - an - ist er der
Tisch das - das Tisch - die Tisch das Tisch - der Tisch - der am - am Tisch - am Tisch - zum -
Abendessen - uh - und - er - was seine Mutter - und er - uh - fragt - no to request - fragen is to ask
information uh - und - ...frage ich frage - to ask Fragen - so asks frage - ask information to ask directions - to
ask directions uh - suchen - sucht - suchen directions to look for directions - fragt no - to - tells him tells him
uh - to tell - to tell to tell to tell - to tell a story - eine - uh - seine Mutter - uh - sagt ihm - sagt ihm - sagt -
ihm - seine - Hut - uh - to oh Jesus to take off - tragen to put on - an - stecken - an - to remove - uh
anstecken - anstehen - an - antragen an - ich - annehmen - ich nehme meine - that's to put on - uh - aus -
ausnehmen - oh Jesus - uh - uh - okay - Hobbes - sagt ihm seine Mutter - yeah sagt nicht - uh - to get a
surprise uh - wenn sie - uh - his - seine - Haare - sehen - ist sie - wenn sie seine - ist - sie - sehr - sie
ärger sich - wenn sie seine Haare sehen ist sie - sie ist sehr . sie ärgert sich - ich ärgere - ärger - sich
ärger - sie ärgern - sie ärgert sich - sie ärgert sie - sie ärgert sich -ärger sie sich -ärger sie sich - ich
ärger ich - sie ärgert - oh yeah ... - uh uh - uh - als - es - un - höflich - ist - okay uh - baldness -
Glaskopf or bare - [karst] no - ... - sie sich uh - to demand just ... - demand - to demand - ich - sie fragt -
sie fragt ob - sie fragt - sie fragt - warum - sie fragt - sie fragen - sie fragt ihn - she demands to demand -
sie f - sie - uh - fragt - sie sagt - sie - no sie fragt - uh sie fragt - uh who hunts his own hair - she asks him
why he cut his own hair - sie fragt - ihm - that's all wrong - warum - er - seine - Haare - geschnit-
geschnitten - hat - uh - Calvin sagt daß - oh oh fault - es nicht meine - schade - meine - Schade - es - eaaß
es nicht seine - sein - oh man what is blame - es ist nicht meine uh - (hums a tune) - uh - Calvin - sagt -
rubbish rubbish - uh - seine Mutter - seine Mutter - uh remains - uh - stays - uh is still - ist noch - ist noch -
wütend - ist noch ganz wütend - ganz wütend - und - wenn sie - treffen - Calvin ist kalter - un- un- Calvin ist unhoflich? - uh - wenn sie -
treffen - Calvin ist unhoflich - zu - Hobbes - yeah - or apologises - he apologises - dass er - meine -
dass er - dass er - dass er - dass er - dass er - dass er - dass er - dass er - dass er -
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Freunden - sind gute Freunden - Freunden - no uh - uh - ja ja ja ja ja na na na na (end of tape)
3. Subject 34

1. L1-Composition (Norwegian)

...

Hobbes vraagt hem hoe hij zijn haar schneiden wil, en Calvin dacht het haar goed is goed als hij het haar aan zijn dat uitsteekt.

Schneidet hij, schneidet het in een Mohawk stijl, en hij is heel enthousiastisch. Als Calvin zich in de spiegel aanspikt schikt hij zijn haartip toch, het is jammer, en hij wil niet dat zijn moeder het ziet niet. Hij heeft zijn haart aan

Haar zijn moeder geloofde hem niet.

Hobbs ze maakt haar op zijn hoofd met een paar kleurpens. Calvin is heel blij

en bedankt Hobbs. Alles is alles gut.
3. Associated Think-Aloud Protocol

Task 1: English Story

Please note the following instructions:

1. Write a coherent story, i.e., avoid just describing the pictures one-by-one
2. Do not interpret what happens, i.e., do not give comments like "Actually, Calvin cuts his hair himself", or "actually, Hobbes is just a toy-tiger"
3. Do not use direct speech, i.e. dialogues:
   do NOT write: Calvin says: "I can't comb my hair."
   Hobbes answers: "I could cut it for you."

   DO write (if you want): Calvin says that he can't comb his hair.
   Hobbes offers to cut it for him.

You have 10 minutes to complete the task. This means that you will have to be concise, and cannot spend too much time mentioning details from every single picture.
Task 2: Translate your story into German

Please note the following instructions:

1. Put your name and ID number on top of each page
2. Translate your previously written story into German

   NB:
   - translate as closely as possible; sometimes you cannot translate literally, i.e. you cannot put things exactly the same way in German as they are in English, but often enough, something quite similar is possible,
   e.g.: *I have breakfast* — *Ich frühstücke* (not: *Ich habe Frühstück*)
   *He is a student* — *Er ist Student* (not: *Er ist ein Student*)

   ■ translate your English version completely, and try to be as thorough as possible
   ■ do not make any changes; watch out for the tense (present/past/...) that you used
   ■ translate every bit of text and do not leave gaps or alternatives in your final version
   ■ if you cannot come up with a satisfactory translation equivalent, try to get as close as you can

   please write on the lines provided; if you have to make corrections, put brackets around the version you do not want, but do not cross out anything; mark the final version, e.g. with an arrow

   do not use a dictionary

   remember to “think aloud”

   You have exactly 30 minutes to complete the task, so do not waste your time on items that you just cannot think of at all, but come back to them later. It might be a good idea to try and finish in 25 minutes and have 5 minutes to read through it again.

Task 3: Translate your story into Dutch (French/Spanish)

   NB: Follow the above instructions

Task 4: Translate your story into Swedish

   NB: Follow the above instructions