Cognitive and interactive aspects of task-based performance in Dutch as a second language
Michel, M.C.

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Chapter 1

Task-based performance in a second language: cognitive and interactive aspects

1.1 Introduction

The task-based approach to second language acquisition (SLA) promotes learning a language by means of tasks. In box 1.1 on page 2 you find an example of a typical task that second language learners may be confronted with in a task-based textbook. When performing this task a whole set of linguistic and cognitive skills is needed – like in real-life communication. First, task performers need to understand the written information that is given in order to know what they need to do. Second, to reach the extra-linguistic goal of the task they have to further process this information. In concreto, in order to convince their friend they need to balance reasons for or against possible task outcomes. During the two minutes preparation time, they will think about a possible solution but on top they are likely to focus their attention towards linguistic aspects of performance. For example, they think about what phrases and words they may use in order to express their opinion. Third, the actual task performance asks for a demanding oral activity in their second language (L2): They have to discuss their choice with an interactant during a phone call. For L2-learners talking on the phone is especially challenging because they can only rely on aural input that is not accompanied by visual cues, like facial expressions of the interlocutor. Last but not least, this task requires L2-learners to process the target language not only in production but also in perception. After all, they read the instruction, they formulate their own messages, and they listen to their speaking partner.

In sum, this example presents a challenging real-life communicative task that requires language use during a holistic activity – which is the aim of the task-based approach.
Box 1.1: Traveling to Antwerp task

<table>
<thead>
<tr>
<th>STUDYING IN THE NETHERLANDS</th>
<th>STUDYING IN BELGIUM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Petra</strong></td>
<td><strong>Sofie</strong></td>
</tr>
<tr>
<td>age: 25 years</td>
<td>age: 23 years</td>
</tr>
<tr>
<td>from: Poland</td>
<td>from: France</td>
</tr>
<tr>
<td>study: pedagogy</td>
<td>study: pharmacy</td>
</tr>
<tr>
<td>reading: regularly</td>
<td>reading: often</td>
</tr>
<tr>
<td>L2-classes since: 8 months</td>
<td>L2-classes since: 12 months</td>
</tr>
<tr>
<td>taking final exam: maybe</td>
<td>taking final exam: yes</td>
</tr>
</tbody>
</table>

| **Dzifa**                   | **Marta**           |
| age: 24 years               | age: 22 years       |
| from: Ghana                 | from: Germany       |
| study: French               | study: history      |
| reading: never              | reading: often      |
| L2-classes since: 5 months  | L2-classes since: 14 months |
| taking final exam: no       | taking final exam: maybe |

Figure 1.1: Which two girls would make the best studying couple?

**Instruction**

Together with a friend you are organizing a study exchange program. Students of Dutch as a second language in the Netherlands and Belgium will be paired into studying couples. Together they will practice the Dutch language by using e-mail, chat and telephone. Next weekend all the participants of the program will get to know each other in Antwerp. There are two more places left but you received applications of the four girls you see in Figure 1.1. Together with your friend you need to decide who will be accepted for the program. In two minutes from now you will call your friend and discuss on the phone which couple is your favorite.

Look at the descriptions of the students. Take a decision about which two (one from the Netherlands and one from Belgium) would probably make a good couple and who is likely to work happily together. Prepare yourself to explain in detail who you would choose. Describe not only the benefits of the best choice but include also why other couples are less likely to be a good match. Note, try to be convincing because you and your friend will have to agree in the end. There is only one more couple joining you to Antwerp.

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1 The depicted people agreed on using their photograph for this research project. The listed names and characteristics are fictitious. Any resemblance to their real identity is purely coincidental.
The task-based approach ‘is an educational framework for the theory and practice of teaching second or foreign languages’ (van den Branden, Bygate, and Norris 2009: X). In order to learn the second language a task-based curriculum asks students to perform on carefully designed tasks. As the performance on these tasks requires target language use, this generates possibilities for interlanguage development and L2-learning.

This raises the question, what is a carefully designed task? The work presented in this book adopts a cognitive perspective on task-based research when addressing this issue. In general, it is interested in how tasks may be manipulated such that they give the most beneficial output with respect to L2-development. From a more research oriented point of view this book is interested in what and how task characteristics influence the cognitive processes underlying L2-task performance.

With respect to these questions Robinson (1995b, 2001a, b, 2003b, 2005) proposed a theory that makes specific claims about how manipulations of task characteristics affect task-based L2-performance. His proposal, that became known as the Cognition Hypothesis, is the theory under investigation in the present work. More specifically, this book focuses on the predictions of the Cognition Hypothesis with respect to effects of cognitive task complexity and effects of interaction on L2-learners’ oral task performance. These factors are investigated both on their own and in combination.

1.2 Outlook coming chapters

Adopting a cognitive perspective on task-based research, this chapter gives the theoretical background of the studies presented in this book. Section 1.3 elaborates on the basis of task-based research as it defines the central unit of investigation, i.e. a ‘task’, and discusses how task-based language performance may foster L2-development. Furthermore, this section explains how the present work may contribute to four different strands of task-based research and elaborates on one alternative cognitive model of task-based L2-production, the Limited Attentional Capacity Model (Skehan 1996, 2001, Skehan and Foster 2005). Section 1.4 discusses in detail the Cognition Hypothesis and presents Robinson’s claims that are investigated in this book. The focus of this section is on predicted effects of increased cognitive task complexity and effects of interaction on task-based L2-performance. In section 1.5 the dependent variables used in the work at hand are discussed, i.e., global and specific measures of task-based L2-performance. Finally, section 1.6 reviews earlier work investigating the Cognition Hypothesis by addressing open issues that ask for more empirical work.

Chapter 2 introduces the empirical work presented in this book. It formulates the general research questions and hypotheses and gives a description of the design and participants of the empirical studies that are presented in chapters 3, 4, and 5. It is important to consider that these empirical chapters are each intended as individual papers. That is, they have been or will be published outside the context of this book. As a result there is some overlap in their content – in particular when reviewing the theoretical
basis of the work. As far as there seem to be differences in, for example, the predictions between the studies, these reflect the evolution of the work presented here. In other words, the findings of study 1 (chapter 3) were the base for study 2 presented in chapter 4. The study presented in chapter 5 in turn is built on the knowledge gained from the two earlier investigations. Consequently, differences mirror the chronological growth of the research in this book.

Chapter 3 elaborates on study 1, a first empirical investigation among 44 Turkish and Moroccan learners of Dutch as an L2. Participants in this study act on cognitively simple and complex tasks either alone (monologic) or in pairs (dialogic). The simple and complex version of an oral argumentative reasoning task include a different number of elements participants have to take into account for successful task completion. In the simple task (+ few elements) participants are asked to help a friend with the choice between two electronic devices. In the complex version (− few elements) there are six different options. The analysis of the L2-learners’ task performances focuses on global measures of linguistic complexity, accuracy, and fluency. The discussion highlights effects of cognitive task complexity and interaction both on their own and in combination.

Chapter 4 gives the details of study 2, the second empirical investigation. It elaborates on the results of chapter 3 but overcame some methodological problems and extends the groups of participants. It examines the task performance of 64 L2-learners of Turkish and Moroccan background on oral argumentative reasoning tasks. In addition, 44 L1-speakers of Dutch serve as a native speaker control group. Again, participants act on cognitively simple and complex tasks in either a monologic or a dialogic setting. This time, the tasks require participants to combine people into pairs. The simple version presents four, the complex version nine possibilities, respectively. The discussion focuses on (combined) effects of cognitive task complexity and interaction and interprets the L2-results established by means of global measures of linguistic complexity, accuracy, and fluency in light of the L1-speaker’s baseline data.

Chapter 5 presents a more elaborate analysis of the data of study 2. As an extension by means of a task specific measure this investigation examines the L2-learners’ and L1-speakers’ task performances with respect to the use of conjunctions. The data analysis evaluates the frequency and occurrence of conjunctions in the L2- and L1-speaking performances on cognitively simple versus complex argumentative reasoning tasks. The discussion focuses on the use of global versus specific measures of task performance.

Chapter 6 discusses the general findings, implications, and conclusion of this research. After presenting the claims under investigation it summarizes the outcomes of the empirical work presented in chapters 3, 4, and 5. Results are discussed in light of the Cognition Hypothesis and the hypotheses formulated in chapter 2. Furthermore, this chapter addresses the concept of cognitive task complexity, relates the data to the role of interaction, discusses the use of global versus specific measures of task performance, and elaborates on the differences between native and non-native task performance. In
the end directions for future research and practical implications for L2-pedagogy based on the findings presented in this book are given.

1.3 The task-based approach

In the last decades many scholars have devoted themselves to research into task-based second language teaching (TBLT). This book addresses task-based language research (TBLR) and the explanations here will be limited to those aspects of the task-based approach that are relevant for the present work.² The guiding idea of the task-based approach is that tasks are the central unit of any pedagogical intervention. From a theoretical point of view many researchers have defined what exactly they mean by a ‘task’ (a.o., Bygate, Skehan, and Swain 2001, Candlin 1987, Crookes 1986, Long 1985, Nunan 1989, Prahbu 1987). The next section reviews those definitions that emphasize the cognitive aspects of a task and therefore are important for the studies in this book.

1.3.1 Task: definition and characteristics

For Prahbu a task is ‘[a]n activity which required learners to arrive at an outcome from given information through some process of thought and which allowed teachers to control and regulate that process’ (Prahbu 1987: 24). This definition highlights the cognitive processing (‘process of thought’) of information during task performance. Also Ellis characterizes tasks as ‘external means by which we can influence the mental computations that learners make’ (Ellis 2000: 198). However, he defines tasks as a ‘workplan’ consisting of ‘(1) some input (i.e., information that learners are required to process and use); and (2) some instructions relating to what outcome the learners are supposed to achieve’ (Ellis 2000: 195). Ellis’ second point stresses the importance of the outcome of the task.

Also Skehan (1998) highlights the primacy of an extra-linguistic goal that needs to be reached by means of language use. He explains that the activity induced by a task should have a communicative problem to solve and that task performance will be evaluated with respect to this goal. Similarly, van den Branden emphasizes the communicative goal: ‘A task is an activity in which a person engages in order to attain an objective, and which necessitates the use of language’ (van den Branden 2006: 4).

Ellis adds that tasks are ‘activities that call for primarily form-focused language use’ (Ellis 2003: 3). And also Long and Robinson (1998) argue that although tasks may be primarily meaning oriented, they should have some concern for form as a potential for L2-development.

²For more extensive discussions I refer to the following texts: Overview articles on the theoretical rationale behind the task-based approach are provided by Ellis (2000) and Skehan (2003). More elaborately, Samuda and Bygate (2008) and Eckerth and Siekmann (2008) present the theory and research into TBLT together with empirical studies. The focus of these volumes lies on implications for the classroom. van den Branden et al. (2009) reprinted twenty seminal papers in the field of TBLT in order to summarize the most prominent ideas and themes.
In sum, even though they stress different aspects, most researchers seem to agree on the following points:

(a) A task is an activity that promotes holistic language use.

(b) The main aim of a task performance is to achieve the communicative (extra-linguistic) goal.

(c) In order to reach this goal, the use of language is required.

(d) The imposed language use is linguistically challenging such that the L2-learner is pushed to pay attention to language form.

(e) The cognitive processes that are involved in meeting the (extra-)linguistic task demands promote interlanguage development.

Samuda and Bygate give a conclusive summary when they define a task as ‘a holistic activity, which engages language use in order to achieve some non-linguistic outcome while meeting a linguistic challenge, with the overall aim of promoting language learning, through process or product of both’ (Samuda and Bygate 2008: 69). The present book will work with this last definition when referring to a task.

1.3.2 Principles underlying the task-based approach

The task-based account promotes language learning by means of tasks. The idea is that in the task-based classroom students make use of the same communicative acts as in the real world outside the classroom. Therefore, task-based activities are said to have (at least) a two-fold advantage over traditional language teaching methods: First, during task performance L2-learners practice those skills (e.g., fluency) and that knowledge (e.g., vocabulary and syntax) they need for actual use of the second language outside the classroom. When learners perform on a task in their L2, next to learning how to convey their message (= meaning), they will also be triggered to use the appropriate words and linguistic structures (= form) for that task. Carefully designed tasks therefore may promote the use of specific linguistic structures and forms that are necessary for successful task performance. Second, performing on communicative tasks in authentic contexts most likely is more motivating for L2-learners than doing traditional exercises.

As explained in the introduction (see p. 1 to 2), the ‘Traveling to Antwerp’ example task largely follows the requirements (a) to (e) above. It asks for a communicative activity that is guided by achieving an extra-linguistic goal, i.e., convincing the friend about ones choice. In order to reach this goal it presents a challenging linguistic task. L2-learners may formulate in a clear way a convincing line of argumentation. As speakers express and accordingly lexically mark their choices, this task therefore possibly will promote the use of linguistic structures that are related to argumentation (e.g., ‘I think
1.3 The task-based approach

that...’ or ‘because’ and ‘so’). A typical performance sequence on this task between two speaking partners A and B may have the following form:

A: Maybe it is nice to combine Dzifa and Sofie because uh Sofie is from eh France.
B: yes
A: And uh Dzifa, she studies French. So Dzifa could learn a lot from it, uh I guess.
B: But they will speak French with each other. And that is not, not really the idea of uh ...
A: No, because the idea is that they will learn Dutch.
B: I thought of Sofie and Marta, because they uh yes both are European.

Performance on the ‘Traveling to Antwerp’ example may ask for a communicative activity that encourages the use of linguistic means that mark the balancing of reasons. The example shows some repeated instances of the conjunction ‘because’ and lexical items like ‘guess’, ‘thought’, and ‘maybe’. A picture description task with the same input material most likely would not induce these forms and could be satisfactorily completed by using ‘and’, ‘and’, ‘and’. Successful performance on the actual example, however, may foster the use of causal conjunctions like ‘because’. In contrast to a more traditional language exercise, e.g., a fill in the gaps sheet with blanks on every conjunction, this task gives L2-learners the chance to use these forms during the natural context of an argumentative activity. As task-based performance accordingly may generate opportunities for uptake and intake of linguistic forms that are required for successful task performance it has been related to interlanguage development.

Different seminal hypotheses in second language acquisition (SLA) corroborate the task-based approach as a pedagogical intervention for learning a second language. Krashen’s Input Hypothesis states that language acquisition occurs if and only if L2-learners are confronted with ‘comprehensible input’. Comprehensible input is information, that is slightly too difficult, i.e., input that is one step beyond the current level of the processing ability of L2-learners. Krashen (1985) termed this ‘i+1’. The input is understood – and eventually learnt – because the unknown aspects of the input are embedded in a rich linguistic and non-linguistic context that is comprehensible.

The Output Hypothesis puts forward that input processing alone is not enough for L2-development because comprehension can be successful without fully understanding the linguistic input. Swain and Lapkin therefore argue that only through the production of output L2-learners will focus their attention on formal aspects of language, which generates possibilities for learning (Swain 1985, 1998, Swain and Lapkin 2001). Pushed output forces L2-learners to compare their own production to the target forms. This cognitive comparison will make them aware of differences between their own actual interlanguage

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3English translation of two Dutch native speakers performing the ‘Travelling to Antwerp’-task. See Appendix B.5 for the complete original in Dutch.
and the target performance of native speakers that will be classified as a gap in the interlanguage system. ‘Noticing the gap’ raises the awareness about which gaps still need to be ‘filled’ through L2-learning (Gass, Mackey, and Pica 1998).

Also Schmidt (1990, 2001) states in his *Noticing Hypothesis* that L2-learners need to pay attention to details of the L2 as only focused attention may affect L2-learning. Noticing raises the awareness about the own interlanguage system. As learner’s will notice what forms, words, and structures exactly they need to learn in order to perform successfully in their L2, Long (1985) sees noticing as a necessary condition for uptake and intake of new information. Not least importantly, heightened interlanguage awareness presumably has a positive effect on the learner’s motivation and creates opportunities for language learning.

Finally, Long’s (1985, 1989) *Interaction Hypothesis* explains that in particular interactive tasks are important for SLA. For successful interaction it is crucial to understand and to be understood. L2-learners are confronted with input they need to analyze and comprehend as a hearer while in addition, they have to make meaningful use of their L2-knowledge as a speaker. That is, they are pushed to perceive input and to produce output.

When a speaker fails at being comprehensible, he will receive negative feedback from the speaking partner (Pica 1994). As the hearer may ask for clarification or the speaker checks for comprehension, interlocutors start to negotiate about the meaning of an utterance. Especially, if errors affecting the linguistic code obscure meaning, the hearer presumably pushes the speaker to reformulate his initial communicative attempts. It is likely that this induces so-called ‘language related episodes’ (LREs). ‘[W]hen learners negotiate meaning by means of requests for clarification or confirmation checks, they can obtain interactionally modified input that both helps them to comprehend the input and focuses their attention on new or partially learned linguistic forms, thus enabling their acquisition’ (Ellis and He 1999: 286).

Importantly, as the speaker receives this feedback at ‘the most propitious moment […] when the meaning is problematic and when the learner is thought to be most receptive’ (Skehan 2003: 3), this process may also induce a restructuring of the underlying system. Accordingly, during LREs the attention is briefly pointed towards form without losing the primary focus on meaning (Long 1989, Long and Robinson 1998). This establishes what Long calls ‘Focus on Form’ (FonF): the attention of both interlocutors is drawn to the linguistic code. FonF is a prerequisite for language learning as only tasks that generate (some kind of) awareness to language form will contribute to L2-development (Long 1983, 1985, 1989).

During meaning-oriented interaction ‘[i]t is the realization of divergence between L2 forms and target language (TL) forms that becomes the catalyst for learning’ (Gass et al. 1998: 301). FonF and LREs during interaction thus enhance noticing, uptake and intake of new information (Pica 1994, Schmidt 1990). In short, interaction has the potential to trigger cognitive processes that generate L2-learning.
opportunities and possibly promote L2-development.

As a whole, these accounts explain how a task-based approach may promote SLA. After all, performing a task (especially in interaction) is a holistic activity that requires input and output processing in the rich context of an authentic task (Krashen 1985, Swain and Lapkin 1995). As L2-learners are primarily driven by reaching the communicative goal (for example, convincing their speaking partner about the best studying couple in the ‘Traveling to Antwerp’-task) they make meaningful use of their target language knowledge. Consequently, task-based L2-performance generates many opportunities for noticing and FonF (Long 1989, Schmidt 1990). As the linguistic challenge of the task draws the learner’s attention towards formal aspects, which are needed for successful task completion (e.g., the use of causal conjunctions in argumentation), task-based performance can push meaning and form in parallel (Robinson 2003b). As a result, it may (implicitly) enhance uptake and memory for correct language forms.

It follows that performance on carefully designed L2-tasks can contribute to SLA. The question how exactly task-based activities affect L2-performance and may promote language learning is the subject of task-based research, which will be discussed in the next section.

1.3.3 Task-based research

Research into task-based language pedagogy is interested in exploring a wide range of issues. Skehan (2003) identified four different strands of task-based research.

The first strand of research is in line with Long (1989). It advocates a psycholinguistic point of view and emphasizes the role of interaction. Following the Interaction Hypothesis this approach argues that tasks should be designed such that they induce the most interaction possible. This type of task-based research explores how tasks can be designed such that they trigger fruitful interaction.

The second strand adopts a sociocultural view on interaction and focuses on the co-construction of meaning. According to Lantolf (2000) the collaborative L2-performance creates an output that is beneficial for both speaking partners. As both provide the relevant structures they know, the joint knowledge potentially stretches interlanguage and pushes L2-development (Swain and Lapkin 2001). This perspective accordingly explores the type of interaction that evolves upon different kind of tasks.

Thirdly, the structure-focused account advocates designing tasks that make learners use a specific linguistic structure, which is practiced and eventually learnt by performing on that task (Loschky and Bley-Vroman 1993). For example, a task where you tell about your nicest holiday experience asks for past tense while a task with the title ‘What will you do the coming holidays?’ requires the use of future tense. Both of them will ask for specific lexical items for time reference. Research within this strand tries

\[4\] Also for L1-development interaction is essential for linguistic growth: The Vygotskian theory claims that only through interaction with adults or peers children are pushed to higher levels of performance such that higher order cognitive functions, including linguistic skills, are developed (Watson-Gegeo and Nielsen 2003).
to identify characteristics and effects of structure-focused tasks.

The cognitive strand of task-based research aims at understanding the cognitive and attentional processes during L2-task performance. It investigates how manipulations of different task characteristics may affect attentional allocation because only focused attention has the potential to promote L2-development (Schmidt 1990). Especially the cognitive load a task puts forward, i.e., cognitive task complexity, has received a lot of attention as it is crucial in guiding the focus of attention during task-based performance (Robinson 1995b, 2001b, 2005, Skehan 1996, Skehan and Foster 2001).

Within the cognitive strand there exist contrasting hypotheses concerning factors of cognitive task complexity. Robinson’s (2005) theory, that has become known as the Cognition Hypothesis, is based on the idea of multiple attentional resources. As the research presented in this book takes Robinson’s claims as object of investigation section 1.4 will give a detailed description of the Cognition Hypothesis. The following section 1.3.4 will discuss an alternative cognitive account on task-based L2-performance that advocates the idea of limited attentional capacity (Skehan 1996, Skehan and Foster 2001).

1.3.4 The Limited Attentional Capacity Model

The Limited Attentional Capacity Model, as its name states, claims that attentional capacity is limited (Skehan 1996, 1998, 2003, Skehan and Foster 1997, 1999, 2001, 2005). Assuming capacity limits means that there is some maximum in the amount of information one can keep active or pay attention to. Also the number or size of attentionally controlled processes that can take place in parallel is limited (Schmidt 2001).5 Accordingly, when performing a task the available resources have to be shared between all the processes a task asks for, e.g., input selection, goal oriented information processing and response actions (Baddeley 2003). If various task demands exceed the total of available resources, the different processes come into competition and the control function of attention will decide where to allocate attention to. For example, it will prioritize important over unimportant task aspects.

The central point of Skehan and Foster’s account is that also during task-based L2-performance the ‘attentional limitations for the L2-learner and -user are such that different areas of performance [linguistic complexity, accuracy, and fluency] compete for one another for the resources that are available’ (Skehan and Foster 2001: 205). In other words, the different ongoing processes during task performance are in competition with each other for attentional resources. As only those aspects that receive enough attention will reach optimal performance, processes which receive no or limited attention will fail or become erroneous such that overall performance declines. Skehan and Foster argue that during L2-tasks learners first and foremost want to reach the communicative goal such that they will prioritize meaning over form (VanPatten 1990).

According to the limited attentional capacity perspective L2-tasks thus should not be too heavy in terms of cognitive complexity. After all, when performing cognitively too complex tasks most attention may be ‘swallowed’ by the communicative aim and only the residual is left for formal aspects. As a result the different dimensions of L2-task performance come into competition with each other, which is likely to generate trade-off effects between the dimensions of performance. Skehan and Foster (2001) present a model that illustrates these trade-offs during L2-language production (see Figure 1.2).

In a cognitively complex task, first, fluency and form compete with each other, i.e., speakers prioritize fluency at the cost of form or vice versa. At the next level the formal notions – linguistic complexity and accuracy – compete for the attentional capacity that remains after ‘subtracting’ the fluency dimension. Crucially, in this model limitations in cognitive capacity may be most prominent as trade-off effects between linguistic complexity and accuracy.

The authors argue that when performing a cognitively complex task, L2-learners will focus their attention (either consciously or not) to one of the three dimensions linguistic complexity, accuracy, or fluency. That is, if they focus on linguistic complexity this will reduce the accuracy of task performance. For example, when L2-learners explore more complex structures and unknown vocabulary, they will produce more errors. Skehan and Foster termed this the ‘accuracy last’ approach. If in contrast L2-learners choose to have control over their interlanguage, they adopt a ‘safety first’ approach: They avoid uncontrolled explorations of the target language because they focus on accuracy. The speech performance is linguistically less complex but more accurate because L2-learners rely on simpler and known language forms (Skehan and Foster 2001).

Traditionally, L2-task performance is evaluated by measures of linguistic complexity, accuracy, and fluency. Section 1.5 will discuss these constructs in more detail. For now it will suffice to acknowledge the three dimensions Complexity, Accuracy, and Fluency, and remember them as so-called CAF-measures.
The **Limited Attentional Capacity Model** predicts that cognitively simpler tasks are more likely to let L2-learners focus on both linguistically complex and accurate performance in parallel, because then L2-learners do not perceive limitations of their attentional capacity. Cognitively complex tasks will inevitably yield an L2-performance of lower linguistic quality than cognitively simple tasks because attention is a resource of limited capacity. As complex tasks put L2-learners under pressure, trade-off effects between the dimensions of performance occur which manifest themselves most obviously between linguistic complexity and accuracy (Skehan 1996, Skehan and Foster 2001).

In contrast to the **Limited Attentional Capacity Model** the **Cognition Hypothesis** by Robinson (2005) claims that L2-learners can rely on multiple attentional pools during task performance such that complex tasks may not induce trade-off effects. As the **Cognition Hypothesis** is the theoretical framework under investigation in the present book, the next section will give a detailed description of Robinson's ideas.

### 1.4 The Cognition Hypothesis

Since the early 1990's Robinson has been developing a theory of task sequencing and L2-development that has become known as the **Cognition Hypothesis** (Robinson 1995a, b, 2001a, b, 2003a, b, 2005, 2007a, b, Robinson, Cadierno, and Shirai 2009, Robinson and Gilabert 2007). This section elaborates on Robinson's view on attention and cognitive task complexity to give the rationale behind the **Cognition Hypothesis**. Finally, it presents Robinson's (2005) taxonomy of factors that influence task performance because the studies in this book investigate some of his claims related to this so-called 'Triadic Compositional Framework'.

#### 1.4.1 Attentional allocation during task-based performance

According to the **Cognition Hypothesis** attention is crucial for processing linguistic information as it 'is the process that encodes language input, keeps it active in working and short-term memory and retrieves it from long-term memory' (Robinson 2003a: 631).

Robinson's perspective is based on Cowan's (1988, 1993) idea of hierarchical subset relations between memory and attention: Short-term memory is the activated part of long-term memory, while working memory in turn is the activated part of short-term memory, i.e., that part of memory that is in the current focus of attention (see Figure 1.3). Robinson extends Cowans' idea by highlighting two attentional processes that are important for SLA: detection and noticing.

Detection refers to a mostly unaware automatic recognition process in short-term memory while noticing takes place in the focus of attention. If a specific bit of information receives focal attention it is processed in working memory. As only information that is in the focus of attention can be activated for further processing, noticing, in contrast to detection, does presuppose some kind of awareness.
Input that is automatically recognized (i.e., detected) but not noticed stays in the peripheral scope of attention. That is, it stays in short-term memory and is not processed by working memory.

To give an example, when talking to someone on the phone who stands on a windy spot one may detect the acoustic signals of both the voice and the wind. Focused attention will help to filter the voice signals for further processing (e.g., try to understand the words) while it will aim at not attending to the noise of the wind.

Robinson distinguishes furthermore ‘data driven’ from ‘conceptually driven’ processes of learning. These processes link the noticed information to the knowledge store in long-term memory. Robinson calls bottom-up, automatic processes that are activated by the data itself data driven. In contrast, conceptually driven processes are participant initiated, top-down, and attentionally controlled.

For example, the task to describe a picture with six cars of different colors requires more various color names than describing a picture with two blue cars. Here, data driven processes of the task itself ask for the use of specific lexical color items. Performance on the same picture description task, however, can be guided by top-down processes. If the task instruction on the one hand asks to describe the picture to a police officer as if it was a street scene of an accident, then the performer probably will try to give an accurate and detailed description. As a result, speech performance will slow down while more attention is given to accuracy and lexical precision. If on the other hand the instruction gives the
speaker maximally 60 seconds to describe all the cars, the performer most likely will speak faster, will use easily activated vocabulary items and structures, and probably will allow some errors.

Generally, humans are aware of the information that is in the focus of attention (Robinson 1995a). Even so, as shown by the example in the picture description task with the cars, not all information that is noticed is a result of conceptually driven top-down processes. Some detection (followed by noticing) may be triggered by bottom-up data driven processes.

It follows that a task itself and its characteristics have the potential to affect attentional allocation during task performance. Different aspects of task performance may receive attention guided by on the one hand top-down processes, e.g., induced by a task instruction or by the aim of the task performer to reach a high level of performance. On the other hand data driven processes triggered by task inherent characteristics may draw the attention on the use of, e.g., specific linguistic structures and lexical forms.

Both ways, detection in the focus of attention can be followed by noticing. As noticing can be seen as a result of focused attention, attentional allocation during task-based L2-performance is crucial for SLA. After all, only information that is in the focus of attention and is processed by working memory, is noticed and only what is noticed may be learnt (cf. the Noticing Hypothesis in section 1.3.2). Consequently, attentional allocation during L2-task performance to a great extent determines what can be learnt from a task (Robinson 1995a, 2003a, Schmidt 1990). Task aspects that receive more attention have more chances to be noticed (Robinson 2003a). However, what aspect of a task receives most attention is determined by how successful it is at attracting attention (Navon and Gopher 1979). The amount of attention a task may ask for is termed cognitive task complexity (Robinson 2003a).

A central claim of the Cognition Hypothesis is that especially cognitively complex tasks are successful in attracting attentional allocation during task-based L2-performance (Robinson 1995a). Robinson refers to first language acquisition research to support this claim. According to Givón (1995) children develop from a ‘pragmatic’ mode to a ‘syntactic’ mode of communication. They start in the pragmatic mode, where they talk within the here-and-now and refer to the immediate environment. Only at later stages of their cognitive development children may use the syntactic mode. Once they have learnt to communicate with complex syntactic and lexical structures more efficiently, they may also talk about the there-and-then.

Unlike children, L2-learners do have the cognitive ability to operate in the syntactic mode. Due to their incomplete L2-knowledge, however, they tend to rely on the pragmatic mode. This speech may be characterized by simple morphosyntactic structures and a less varied lexis. Even so, if a task is communicatively or conceptually complex it can prompt and elicit the syntactic mode of production. L2-learners performing in the syntactic mode show ‘higher’ levels of linguistic production (e.g., their speech is characterized by a greater use of morphology, greater syntactic subordination, and a higher noun to verb ratio as well as a more varied lexicon, Robinson and Gilabert 2007).

In other words, when performing a task in the second language top-down processes guide the
attention to the accomplishment of the communicative goals (VanPatten 1990, 1996). Presumably L2-learners choose the safe way by using the language they know. However, sometimes, simple linguistic features do not suffice to meet the communicative goals of a task. Some task factors may put up conceptual or communicative demands that require structures and lexical items that are quite complex. As complex linguistic means then are needed in order to fulfill the task correctly, data driven processes push the L2-learner to use more complex language than a simple task would do.

For example, tasks that ask learners to tell a story in the there-and-then require them to use verbs in the past tense and to use vocabulary items for time reference. It is obvious that performing such a task creates more opportunities to notice and eventually learn the past tense than when the story can be told in the here-and-now.

This rationale explains how cognitively complex tasks, in which the conceptual demands require a more elaborate use of linguistic structures and items, are able to push L2-learners’ performance. Importantly, L2-learners conceptually focus on pursuing the communicative aim of a task while data driven processes induced by task inherent characteristics draw the learner’s attention to formal aspects of the L2 and accordingly may stretch the interlanguage.

1.4.2 Interference theory and the Multiple Attentional Resources Model

As explained in section 1.3.4 performing a cognitively complex task in a second language potentially exceeds the available resources of the L2-learner’s attention such that task performance may suffer. However, other than the Limited Attentional Resources Model (Skehan and Foster 2001), the Cognition Hypothesis does not predict trade-off effects. Instead Robinson (2001a, 2003b, 2005) incorporates the ideas of interference and multiple attentional resources into his theory (Navon 1989, Navon and Gopher 1979, Neumann 1996, Wickens 1991, 2002, 2007).

Interference theory predicts that if the cognitive complexity of a task is higher than the available resources, the cognitive system itself loses the control over selective processing (Navon 1989, Navon and Gopher 1979, Neumann 1996). Performance problems then occur due to involuntary attentional shifts that result from a loss of control over attentional allocation. Irrelevant information is processed although it is not a primary task goal because attention focuses on other aspects of performance than the task performer may want to. A drop of performance is the result. For example, people tend to ‘waste’ attention to more automatic processes, which interfere conscious selective processing. Sometimes automatic L1-processes interfere L2-production because there are not enough attentional resources to suppress the automatic activation of the mother tongue (Poulisse and Bongaerts 1994). 7

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7 Also the Stroop (1935) task is a good example. Even though people are focused on the task (i.e., naming the color of the ink a word is written in) they cannot inhibit the automatic process of semantically processing a word. If the stimulus is a color name, e.g., ‘blue’ written in red ink, task performers tend to answer ‘blue’ rather than ‘red’. The automatic process of reading and semantically recognizing the word ‘blue’ cannot be inhibited. It accordingly interferes the controlled process of reaching the task goal, that is, naming the ink color.
The Cognition Hypothesis acknowledges that upon certain increases of cognitive task complexity attention fails at controlling the parallel processes, which are needed for successful L2-task performance. As a result L2-performance problems occur. Yet, the fundamental claim of Robinson (2005) is that not every increase in cognitive task complexity generates interference. The Cognition Hypothesis argues that L2-learners can rely on different attentional resource pools (Navon 1989, Navon and Gopher 1979, Wickens 1989). As task performance depends on the capacity of each of them and various task demands may draw on different pools of attention increasing the cognitive task complexity does not inevitably harm overall task performance. Crucially, assuming multiple attentional resources does not deny the existence of capacity limits but this view claims that not every increase in cognitive task complexity will automatically reach these limits. As long as a task addresses different resource pools no problems during task performance are expected.

Wickens (1991, 2002, 2007) developed a model that explains in detail what different task demands may address what kind of attentional pools. His Multiple Attentional Resources Model (see Figure 1.4) distinguishes three different dimensions of human information processing: input modalities, processing codes, and processing stages.

First, there are two input modalities: auditory (e.g., spoken word or cue tone) versus visual (e.g., a graphical sign or a blinking lamp). Second, information is processed in different codes, i.e., the spatial code for spatial and analog information or the verbal code for verbal and linguistic material. The third dimension proposes perception, cognition, and responding as different stages during information processing. At every stage different pools of resources are responsible for a different code of information: in perception (speech and print versus graphics and motions), in cognitive processing (linguistic information versus spatial memory processes), and in responding (a verbal reaction like a spoken answer versus a spatially guided manual action like pushing a button).
1.4 The Cognition Hypothesis

The central claim of Wickens’ model is that when a task requires processes at the same dimension parallel processing of information generates performance problems. For example, one cannot give two spoken answers at the same time. However, if task performance addresses different dimensions, parallel processing is possible without competition for attentional capacity, e.g., one can read a word while pushing a button. As information of a different code, modality or at a different stage may draw on different pools of attention no competition will occur. Only if two tasks both address the same pool of resources performance problems become visible.8

Wickens’ (2002) model is based on empirical research in the field of ergonomics on multi-tasking by pilots or drivers in heavy traffic. The results demonstrate that indeed task performance is hardly affected by parallel processing of different input signals (e.g., visual and auditory), whereas parallel processing of similar information (e.g., two tasks of visual perception) does cause interference. For example, a car driver can on the one hand listen to the radio without being distracted from driving because this is auditory, verbal and linguistic input that is not harming the visual input and manual response processes of driving. On the other hand, searching for a radio station affects driving skills because it withdraws resources from the same attentional pools as driving (visual input and manual response action).

Considering task-based performance in a second language Wickens’ model may not be specific enough because it presents only a broad distinction between verbal/linguistic and visual/spatial information processing. Furthermore, other than predicting a drop in performance Wickens does not go into details about the processing of information of the same kind. Still, the idea of multiple resource pools has been appealing for theories on attentional aspects of task-based L2-performance – mere verbal/linguistic information – like Robinson’s Cognition Hypothesis.

1.4.3 Cognitive factors of task complexity

The Cognition Hypothesis argues that some task characteristics may require a more elaborate use of linguistic structures and forms than others. Due to data driven processes induced by their characteristics tasks may attract the L2-learner’s attention and focus it to form. Consequently, the characteristics of a task – especially those that attract attention – are crucial factors for task design. Robinson (2005) termed task characteristics that affect the L2-learner’s attention during task performance ‘cognitive factors of task complexity’.

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8 Wickens furthermore predicts that ‘to the extent that any two tasks share common levels along more dimensions (0, 1, 2, or 3), interference will be greater’ (Wickens 2007: 187). Moreover, as revealed by empirical investigations of the model the resources for the first two stages (perception and cognition) are the same and functionally different from those for responding (Wickens 2002). In other words, more interference is expected between perception and cognition but not between either of them and response actions.
Resource-directing versus resource-dispersing cognitive factors

Robinson (2003a) states that tasks with more complex demands by means of a resource-directing factor focus the L2-learner's attention towards the linguistic form because the cognitively complex conceptual and performative demands require complex linguistic means. Figure 1.5 names three resource-directing factors: ± here-and-now, ± few elements, and ± no reasoning demands. For example, a resource-directing task with many elements rather than a few elements is expected to ask for a more specific lexis and to induce more complex syntactic structures because all the different elements need to be named and distinguished. Similarly, a task that takes place in the there-and-then rather than in the here-and-now will lead to more complex use of vocabulary (e.g., references to time) and structures (e.g., past tense). Alike, complex reasoning tasks will generate more complex language because the line of argumentation may be lexically marked (e.g., by the verbs ‘claim’, ‘propose’, ‘argue’), and syntactically expressed by means of complex sentence structures of argumentation (e.g., ‘if…then’ clauses). Simple tasks, that do not involve reasoning, can stick to simpler structures (e.g., clauses coordinated by ‘and then…’).  

Accordingly, resource-directing cognitively complex tasks may result in an L2-output that shows a higher structural and lexical complexity induced by the higher cognitive demands. Due to the increased attention for language also the formal dimension of accuracy will be pushed. So, the increased cognitive complexity may encourage L2-learners to perform in a syntactic mode of processing (Givón 1995). Consequently, resource-directing cognitively complex tasks can promote meaning and form of L2-performance in parallel, that is, linguistic complexity and accuracy may increase both. As L2-learners can rely on different attentional resource pools no competition for attentional resources may be expected (Robinson 2001a, Wickens 2002, 2007). Only fluency possibly suffers from increased cognitive task demands, i.e., complex tasks may induce slower speech with more hesitations, pauses and self-repairs, because fluency is of a more performative nature and therefore may suffer of the high processing effort (Levelt 1989, Riggenbach 2000).

At this point, it may be worth noticing that Robinson (2001a, 2003b, 2005) relates his theory to Wickens' idea of multiple attentional resource pools but does not overtly state how exactly task performers in a second language may address different attentional pools. However, as put forward in section 1.4.2, Wickens distinguishes between verbal/linguistic information and visual/spatial information, while task-based L2-performance is based on processing information of the linguistic/verbal kind at all stages of processing: perception, cognitive processing, and responding. Wickens' Multiple Attentional Resources Model therefore presumably would predict interference between the different task demands in a complex task that is manipulated e.g., on the factor ± reasoning or ± few elements, unless one may increase

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9N.B. In this model task complexity factors are presented as a dichotomy (as shown by the + and – symbols). Robinson (2007b), however, explains that most of the factors may be seen on a continuum from simple to highly complex tasks.
1.4 The Cognition Hypothesis

Figure 1.5: Resource-directing versus resource-dispersing dimensions of cognitive task complexity (adapted from Robinson 2003a)

...cognitive task complexity by changing from visual to verbal cues.¹⁰

With respect to the resource-directing factors named in Figure 1.5 the *Cognition Hypothesis* predicts no interference due to focused attention to the linguistic code. In contrast, Robinson (2005) identifies other task characteristics that do increase the cognitive complexity of a task but fail at focusing the L2-learner’s attention towards language. He states that these resource-dispersing cognitive factors divert attention away from the formal aspects of task-based L2-performance and spread it over processes that are not relevant for the linguistic performance of L2-learners. Cognitively complex tasks manipulated by means of resource-dispersing factors focus the L2-learner’s attention towards non-linguistic aspects of a task and higher task demands may cause a drop in performance because of interference and attentional shifts.

Considering the resource-dispersing variables given in Figure 1.5 a higher cognitive demand by means of the factors ± planning time, ± prior knowledge, and ± single task will affect learner speech negatively. For example, research gathered in Ellis (2005) has shown that increasing cognitive task complexity by means of the factor ± planning time leads to trade-off effects of linguistic complexity and accuracy. In a task with planning time learners can conceptualize their propositional message prior to the actual speaking act. In a no-planning-time condition, learners will need attentional capacity for the conceptualization of the message while they are formulating it (Levelt 1989). As attention is needed for online planning of the propositional content the learner’s attention is drawn away from the formal aspects of the linguistic message (VanPatten 1990). Consequently, cognitively complex tasks on the factor ± planning time are considered to disperse the attentional resources.

The *Cognition Hypothesis* distinguishes so-called ‘resource-directing’ from ‘resource-dispersing’

¹⁰For example, a picture naming task where the input is visual should leave more attention for linguistic task performance, than an aural-oral word translation task, where the involved cognitive processes are all linguistic in nature. Wickens’ model would predict more interference and accordingly more problems in the spoken performance on the translation task than in the picture naming task.
cognitive factors of task complexity. Figure 1.5 depicts this distinction (see also Table 1.1 on page 23).

Not providing prior knowledge or giving participants dual rather than single tasks is expected to equally disperse task performer’s attention. The resulting loss of control over attentional allocation creates an inefficient and effortful processing of information. In the end, linguistic complexity, accuracy, and fluency probably all suffer from increased cognitive task complexity on a resource-dispersing factor.

To sum up, the **Cognition Hypothesis** predicts speech on cognitively complex tasks manipulated by means of a resource-directing factor to be more complex and accurate but less fluent, that is, resource-directing factors have the potential to stretch interlanguage use and create opportunities for L2-development (Schmidt 1990). On the contrary, cognitively complex tasks manipulated on a resource-dispersing factor presumably will generate interference and possibly create a drop in performance with respect to all three dimensions of task-based L2-performance.

With respect to these claims, the research in this book is interested in the differential effects of cognitively simple versus complex tasks manipulated by means of the resource-directing factor ± few elements. In addition it focuses on what Robinson (2005) calls ‘interactive factors of task condition’ because they have predictive value for task outcome too. The next section will elaborate on task-based interaction.

### 1.4.4 Interactive factors of task condition

Guided by Long’s (1985) *Interaction Hypothesis* (cf. section 1.3.2) investigating L2-interaction has been a productive strand in the task-based approach. According to Ellis (2000) this research asked questions like: What task characteristics provide the most interaction? What kind of task generates what kind of interaction? What task manipulations may push L2-development as they promote the key interactional feature, i.e., negotiation of meaning? A body of research focused on interactional modifications during task-based L2-production (e.g., Gass and Varonis 1994, Kuiken and Vedder 2002, Mackey 1999, Nassaji 2007, Nuevo 2006, Pica 1994, Révész 2007, Shehadeh 2004, Swain and Lapkin 2000).

Just as for cognitive factors of task complexity, the **Cognition Hypothesis** formulates predictions with respect to how different interactive factors of task condition may affect task-based L2-performance (see again Table 1.1 on page 23). Robinson (2005) distinguishes two types of interactive factors: (a) participation and (b) participant variables. The latter can be seen as grouping variables based on gender, familiarity, and power relations that may be or be not shared between participants.\(^\text{11}\)

The first category, participation variables, are specified in terms of information-flow (e.g., one–way / two–way) and task outcomes (open / closed; convergent / divergent). Interactive factors determine the

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\(^{11}\)In the empirical studies presented in this book, the participant factors, e.g., whether people of the same or different gender talk to each other, were controlled over and within conditions. Therefore, no further elaboration of these factors will be discussed here.
amount and nature of interaction that a certain task condition will promote. For example, closed and
divergent task outcomes are related to more interaction than tasks with an open or convergent outcome
(Ellis 2000). Differential effects based on the participation variable one–way versus two–way flow of
information forms a major topic of the studies in this book.

The distinction one–way / two–way refers to how task relevant information is distributed over partici-
pants and to what extent successful task performance involves the exchange of that information (Long
1990). A classical way to manipulate this factor is the use of split information tasks. For example, an
interactive task, where one participant has to describe a picture to an interlocutor, will generate an in-
teractional setting where one holds the role of speaker (the information giver) and the other one the role
of hearer (the information receiver). As speaking in these kind of tasks is relatively one-sided, they are
characterized as tasks with a one–way flow of information.

In an interactive split information task, where two interlocutors exchange information and where both
participants hold half of the task-relevant information, the interaction will be more balanced because
both participants hold both the roles of hearer and speaker. As interlocutors need to give and receive
parts of the information, both of them are active participants of a two–way interaction. These kind of
tasks are said to ‘produce more negotiation work and more useful negotiation work than one–way tasks’
(Long 1990: 41). In short, two-way tasks may focus the L2-learners’ attention to form.

The studies presented in this book adopted a radical form of manipulating the flow of information by
investigating the factor ± monologic.

Monologue versus dialogue

In a dialogic task condition L2-learners will interact – with all the beneficial aspects discussed in section
1.3.2. During interactive tasks L2-learners have many opportunities to test their hypotheses about the
target language. If a speaker fails to be comprehensive the interlocutor gives feedback. Negative
feedback causes interlocutors to review their hypotheses and linguistic processes. Furthermore, it is
likely that such tasks induce negotiations about meaning and form, clarification requests, modified input
and output, and other LREs. All these processes focus the attention of both interactants towards form
(FonF) and thus push L2-accuracy (Long 1985, 1989, Pica 1994).

In contrast, L2-learners act on their own in a monologic task condition where the flow of information
by default is one–way. Accordingly, L2-learners have to rely on their own knowledge and resources. They
do not receive other feedback and no interactional modifications will focus their attention to form
or meaning. The only way to generate modified output is by monitoring the own speech. However,
self-repair is an effortful process that needs time and attentional capacity especially in the L2 (Kormos
1999, 2000a, b).

Even though the Cognition Hypothesis makes no spelled out predictions about the factor ± mono-
logic, the explanations given above and the claims with respect to effects of the interactive variable one–way / two–way flow of information may allow the following summary: Contrary to monologic tasks, dialogic tasks possibly have a beneficial effect on the accuracy of L2-performance. Mutual understanding is crucial so that the attention of both the L2-learners is focused on form. The turn-taking behavior, in contrast, may prevent L2-learners from producing elaborate linguistic structures as frequent interactional moves and interruptions presumably inhibit speakers to produce complex sentences (Robinson 2001a, 2005). Dialogic tasks therefore are expected to yield a lower linguistic complexity than monologues. In analogy to effects of a higher cognitive task complexity, the focused attention to accuracy may reduce the speed of production so that L2-learners may produce less fluent speech upon dialogic than monologic tasks.

Besides the discussed cognitive factors of task complexity and interactive factors of task condition, Robinson (2005) distinguishes a third category of task characteristics, i.e., ‘learner factors of task difficulty’.

### 1.4.5 Learner factors of task difficulty

According to Robinson (2005) task difficulty is the perceived amount of cognitive effort needed to perform a task (see Table 1.1 on page 23). Robinson distinguishes (a) affective variables (e.g., anxiety and motivation) from (b) ability variables (e.g., working memory capacity and aptitude). In combination with the interactive factors of task condition under which a task is performed and the task inherent cognitive factors of complexity, learner factors determine how difficult a task was perceived to be by a learner. As such, the difficulty of a task of a stable cognitive complexity may vary depending on the task performer and the task conditions. Task difficulty is defined by the triple learner–setting–task and emerges during task performance.

Robinson argues that it is important to take into account task difficulty factors when trying to interpret task performances of L2-learners. Learner factors possibly interact with factors of task complexity or task condition (Robinson 2001b, 2003b, Robinson and Gilabert 2007). However, the large variety of affective and ability factors that a group of L2-learners brings to the task is less important in task design because researchers cannot manipulate it. After all, task difficulty depends on learner internal factors and therefore, factors of task difficulty may be less important for task-based research interested in how task factors influence task performance. After all, they are not inherent characteristics of a task itself and they do not define the inherent cognitive complexity of a task.

The empirical studies presented in this book measure some learner factors in order to be able to explain possible differences in task performance post-hoc. Even so, as cognitive factors of task complexity and interactive factors of task condition are in the focus of investigation, this short explanation

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12 Other researchers (e.g., Skehan and Foster 1999) use the words ‘cognitive difficulty’ to refer to the cognitive demands of a task, i.e., what Robinson calls cognitive task complexity.
1.4 The Cognition Hypothesis

Table 1.1: The Triadic Componential Framework (adapted from Robinson 2005)

<table>
<thead>
<tr>
<th>TASK COMPLEXITY</th>
<th>TASK CONDITION</th>
<th>TASK DIFFICULTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>cognitive factors</td>
<td>interactive factors</td>
<td>learner factors</td>
</tr>
<tr>
<td>(a) resource-directing variables</td>
<td>(a) participation variables</td>
<td>(a) affective variables</td>
</tr>
<tr>
<td>± here-and-now</td>
<td>one-way/two-way</td>
<td>anxiety</td>
</tr>
<tr>
<td>± few elements</td>
<td>open/closed</td>
<td>motivation</td>
</tr>
<tr>
<td>± no reasoning demands</td>
<td>convergent/divergent</td>
<td>confidence</td>
</tr>
<tr>
<td>(b) resource-dispersing variables</td>
<td>(b) participant variables</td>
<td>(b) ability variables</td>
</tr>
<tr>
<td>± planning time</td>
<td>same/different gender</td>
<td>working memory</td>
</tr>
<tr>
<td>± prior knowledge</td>
<td>power/solidarity</td>
<td>aptitude</td>
</tr>
<tr>
<td>± single task</td>
<td>familiar/unfamiliar</td>
<td>intelligence</td>
</tr>
</tbody>
</table>

Sequencing criteria: Methodological criteria: Dependent factors:
Prospective decisions: On-line decisions: Take into account for
for syllabus design: about pairs and groups: post-hoc interpretations

of task difficulty factors may suffice here.

1.4.6 The Triadic Componential Framework

The claims of the Cognition Hypothesis presented in section 1.4.3, 1.4.4, and 1.4.5 are summarized in a classification system of factors of task design that Robinson (2005) termed the ‘Triadic Componential Framework’. This framework is given in Table 1.1 which shows the Triadic Componential Framework based on Robinson (2005).\(^{13}\) It provides a taxonomy of 18 different task design factors.

Although, the taxonomic structure never changed, Robinson expanded the Triadic Componential Framework over the past years according to findings of empirical research (Robinson 2007b). Even so, the research at hand adopts the framework from 2005 because the newer version may be considered to be less feasible (Kuiken and Vedder 2007b).

As points of critique Kuiken and Vedder named the following issues: First, the 2007 version of the Triadic Componential Framework consists of 36 variables (in contrast to the 18 in Figure 1.1), which leads Kuiken and Vedder to ‘wonder how all these variables can be operationalised and differentiated and how for instance the supposedly different kinds of reasoning should be tested in an experimental setting’ (Kuiken and Vedder 2007b: 265–266). As an example they mention problems with the factor ± few elements because a larger number of elements implies almost automatically an increase in the number of reasoning demands. The factor ± reasoning demands, however, is seen as a separate

\(^{13}\)In addition to the original, this table includes Robinson’s post-hoc considerations with respect to the dependent factors of task difficulty.
factor in the Triadic Componential Framework. Accordingly, ‘it is nearly impossible to make a clear-cut
distinction between them’ (Kuiken and Vedder 2007b: 265). Moreover, ‘it is far from clear how [all] these variables have to be operationalised, which of them are predominant, how they interact and how fine-grained they should be’ (Kuiken and Vedder 2007b: 265–266). For example, the framework does not explain in detail based on which criteria the number of elements in a task should differ in order to determine substantial differences in cognitive task complexity.

Similarly, Ellis criticizes that the framework does not ‘specify how to weight the different factors hypothesized to contribute to complexity’ (Ellis 2009: 492). In sum, although it may seem to be more precise, the newer version of the Triadic Componential Framework opens many new questions too.

For the present research that is interested in how task design features influence L2-task performance the Triadic Componential Framework from 2005 was used. It provides a useful agenda because it relates predictions to specific task characteristics.14 So far, this section discussed Robinson’s predictions with respect to cognitive factors of task complexity and interactive factors of task condition. The next section summarizes Robinson’s claims and introduces his predictions with respect to a combination of the two types of factors, that is task performance in cognitively complex interactive tasks.

1.4.7 Summarizing the theoretical claims of the Cognition Hypothesis

Table 1.2 gives a schematic overview of the effects of increased cognitive task complexity and changes in interactive task condition on their own and in combination predicted by the Cognition Hypothesis.

The *Cognition Hypothesis* predicts that of the factors distinguished in the Triadic Componential Framework cognitive factors of task complexity are able to substantially manipulate attentional allocation during task-based L2-performance (Robinson 1995a, 2001a, 2005, 2010, Robinson et al. 2009, Robinson and Gilabert 2007). Among the cognitive factors only the resource-directing ones, e.g., the factor ± few elements, have the potential to focus the learner’s attention to language while conceptual demands ask for complex linguistic means. As L2-learners may draw on multiple pools of attentional resources, task performance is pushed towards greater linguistic complexity and accuracy in parallel at the cost of fluency. Increasing the cognitive demands on resource-dispersing factors, e.g., the factor ± planning time, results instead in the learner’s attention being diverted – away from the language code. Due to lost control and interference L2-task performance suffers.

Following Robinson’s (2001b, 2005) view on interactive factors of task condition (e.g., one–way versus two–way flow of information) and based on Long’s (1989) *Interaction Hypothesis*, the factor ± monologic is expected to push accuracy but reduce linguistic complexity and fluency of L2-performance.

14N.B. Also the *Limited Attentional Capacity Model* distinguishes different task characteristics that affect L2-task performance (cf. Skehan and Foster 2001 and section 1.3.4). Also Skehan and Foster’s (2001) model gives a distinction between factors of ‘code complexity’ (e.g., vocabulary load), ‘cognitive complexity’ (e.g., clarity and sufficiency of information), and ‘communicative stress’ (e.g., time pressure). In many ways their classification addresses comparable factors as Robinson’s Triadic Componential Framework. See Kuiken and Vedder (2007b, 2008) who give in-depth comparisons of the two models and highlight overlaps as well as contrasts.
1.4 The Cognition Hypothesis

Table 1.2: Predicted effects of task complexity and interaction based on the Cognition Hypothesis

<table>
<thead>
<tr>
<th>MEASURE</th>
<th>TASK COMPLEXITY</th>
<th>INTERACTION</th>
<th>TASK COMPLEXITY × INTERACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-LEARNERS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ling. complexity</td>
<td>↑</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>accuracy</td>
<td>↑</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>fluency</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
</tbody>
</table>

Note. ↑ = increase; ↓ = decrease

The frequent turn-taking and interactional moves in interaction will prevent speakers from building complex linguistic structures while the joint attention to language and the need for mutual understanding will push both interlocutors to produce more accurate speech at the cost of fluency.

Combining cognitive task complexity and interaction

Finally, Robinson (2001a, b, 2003b, 2005) predicts a combined effect of increased cognitive task complexity and interaction. He states that cognitively complex interactive tasks yield more interaction than simpler versions of the same task would do. The rationale is that cognitively complex tasks may need more clarification between interactants than simple tasks. As a result, more negotiation work emerges, which promotes the amount of interaction.

Consequently, a dialogic task setting may increase the accuracy of cognitively complex task performance because the higher cognitive task complexity and the interactive task condition both focus the L2-learner’s attention to form. In contrast, linguistic complexity may decrease in cognitively complex interactive tasks because frequent interruptions, clarification work, and comprehension checks decomplexify the syntactic structures that are generated in interaction. The fluency of L2-production may decline because of the higher procedural load induced by the focused attention.

Robinson (2001b) argues that the effect of an interactive setting possibly mitigates against effects of a higher cognitive task complexity such that the linguistic complexity of cognitively complex interactive L2-performance is reduced. In contrast, both, interaction and cognitive task complexity, push accuracy at the cost of fluency.

After this in-depth description of the theoretical framework under investigation, i.e., the Cognition Hypothesis by Robinson (2001b, 2003b, 2005), with a focus on how task characteristics may affect task performance, the next section will discuss the dependent variables in task-based research into L2-performance, i.e., the constructs of linguistic complexity, accuracy, and fluency.
1.5 Measures of task-based performance

The studies presented in this book use both so-called ‘global measures’ of linguistic complexity (C), accuracy (A), and fluency (F) – in short CAF, and a task specific measure. The choice for global CAF-measures was based foremost on the aim of the present work to relate itself to a tradition of task-based cognitive research into L2-production across tasks and populations, as well as over source and target languages (e.g., Ferrari 2009, Gilabert 2005, Kuiken and Vedder 2007b, Nuevo 2006, Révész 2007, Robinson 2001b, Skehan and Foster 2007). In addition, the results of the different studies within the present investigations (that is chapters 3 and 4) need to be compared over tasks and populations. Therefore, task-based performance is evaluated by means of global CAF-measures.

More recently, Robinson proposed to complement global by what he calls ‘task-specific’ measures (Cadierno and Robinson 2009, Robinson et al. 2009, Robinson and Gilabert 2007). As the focus of the studies presented here lies on investigating Robinson’s claims, chapter 5 evaluates the task-based performance by means of a task specific measure (the use of conjunctions).

In order to interpret the data of the empirical investigations this section will give a short introduction to each measure. Furthermore, it discusses the use of global versus specific measures of task performance. This review includes some controversies about the definitions of each constructs because the empirical chapters address this issue only briefly. The actual measures used in the present book are presented in the individual chapters as well as in section 2.6 that explains the design of this work.

1.5.1 Basic units of speech

Several suggestions have been brought forward for basic units of L2-performance, e.g., T-units, C-units, idea-units, utterances, clauses, S-nodes or the number of words (see Crookes 1990, Wolfe-Quintero, Inagaki, and Kim 1998 for an elaborate discussion of the benefits and drawbacks of these units). Basic units are needed in order to calculate measures that are corrected for sample length. Many CAF-measures are based on frequency counts, e.g., of errors, for accuracy. Drawing conclusions from raw scores though, risks to generate confounded interpretations. L2-learners differ in how much they may (have to) say in reaction to a given input. This results in task performances of different lengths in terms of utterances, clauses, and words.

For example, a complex task addressing many elements presumably yields more utterances than a simple version with only a few elements. After all, in the complex task the mere description of all the items probably will need more words than in the simple task. This increases the chance of making an error. It is higher in the complex than in the simple version. Any comparison of raw error frequencies in the simple and complex tasks then would be biased for sample length, such that the results turn ‘meaningless in comparison with other populations or across different tasks’ (Wolfe-Quintero et al. 1998: 10). Therefore it is necessary to correct measures for the length of task performance.
Foster, Tonkyn, and Wigglesworth (2000) developed the Analysis of Speech unit (AS-unit) and define it as ‘a single speaker’s utterance consisting of an independent clausal or sub-clausal unit, together with any subordinate clause(s) associated with either’ (Foster et al. 2000: 365). The authors present the AS-unit as an alternative to the popular T-unit that works well for written language but may not give a reliable tool for spoken language. After all, in spoken language, pausing and intonational patterns suggest that speakers may produce utterances that are longer than a single clause. Furthermore, speech is characterized by elliptical or minor utterances, which would not be considered as independent T-units.

For example, coordinated phrases may belong to the same unit if the conjunction combines clauses like in ‘Peter likes chips and Sophie chocolate.’ However, if pauses and intonation suggest a clear break, the ‘and’ may serve as a conversational marker: ‘Peter likes chips (falling tone and pause of 0.5 seconds) and Sophie chocolate.’ The AS-unit acknowledges this difference.

Although it first and foremost is a syntactic unit it takes into account intonational and pausing information where syntactic information does not suffice. Foster et al. (2000) also give instructions how to deal with false starts, repetitions, self-corrections, topicalizations as well as interruptions and joint utterances resulting from scaffolding. They furthermore suggest three levels of application, that may be used depending on the aim of the analysis (fine-grained full analysis or investigation of complete utterances only). As a whole, the AS-unit is a workable tool, which gives credit to the specificities of oral task-based L2-performance.

### 1.5.2 Linguistic complexity

‘[Linguistic] complexity is certainly the most problematic construct of the CAF triad because of its polysemous nature’ (Pallotti 2009: 592). A first problem is that in task-based research into effects of task manipulations the independent input variable of ‘cognitive task complexity’ is easily confused with the ‘linguistic complexity’, which is the dependent variable that measures task output. The second problem lies in the complex composition of the construct itself. Ellis defines linguistic complexity as the ‘extent to which the language produced in performing a task is elaborate and varied’ Ellis (2003: 340).

Linguistic complexity comprises of at least two sub-constructs: structural complexity and lexical complexity. Both of them may be further divided into ‘subsubconstructs’ themselves. For example, Norris and Ortega (2009a) propose three sub-types of structural complexity: (i) complexity via subordination; (ii) general complexity indicated by length measures; and (iii) subclausal complexity based on clause length (see there and Norris and Ortega 2003, Ortega 2003, Wolfe-Quintero et al. 1998 for detailed discussions about measures of structural complexity).

Also lexical complexity may be devided into two different sub-types. Daller, van Hout, and Treffers-
Daller (2003) differentiate (i) text-internal measures, which are calculated with the information of the linguistic sample itself (e.g., the type-token ratio) from (ii) text-external measures, which use an external database, e.g. general word frequency, as point of reference (for example, the lexical profiles proposed by Laufer and Nation 1995). For a more elaborate review of measures of lexical complexity and separate definitions for lexical diversity, density, richness, and vocabulary range consult among others Bulté (2007), Daller et al. (2003), Laufer and Nation (1995), Malvern and Richards (2002), Skehan (2009), Vermeer (2000), and Wolfe-Quintero et al. (1998).

1.5.3 Accuracy

According to Housen and Kuiken (2009) accuracy is ‘the ability to produce error-free speech’ (Housen and Kuiken 2009: 1). Of the three CAF-measures, accuracy may be the least controversial. After all, it is based on the concept of the degree to which non-target like forms are used, i.e., error frequencies. People may criticize this very fact because accuracy measures are based on the comparison of learner output with a target norm (often the written standard of native speakers). Errors therefore ignore that some grammatical norm violations may be communicatively adequate in spoken language. Furthermore, accuracy measures evaluate learner performance in a momentum of time such that they cannot say much about interlanguage development (Norris and Ortega 2003, Pallotti 2009, Wolfe-Quintero et al. 1998).

Error frequencies generally are related to the sample length in units or words. Some task-based research uses ‘error-free’ clauses or units. However, in populations of intermediate proficiency (e.g., the studies at hand), there may be hardly any units without errors. In addition, these general accuracy measures do not distinguish between an utterance with one error and a hardly understandable utterance consisting of ‘errors only’ (Wolfe-Quintero et al. 1998). On top, they risk overlooking errors that are indicators for developmental steps.

Kuiken and Vedder (2008) chose to differentiate their errors based on gravity, from type 1 errors of e.g., spelling, to type 3 errors that obscured meaning. Weighting errors, however, can be rather subjective as it presumably is based on a researcher’s intuition rather than on objective, external means (Wolfe-Quintero et al. 1998). Other researchers therefore proposed to use error types based on different linguistic categories (e.g., Ortega 1999, Wolfe-Quintero et al. 1998). The problem with taxonomies differentiating e.g., lexical, morphosyntactic, and/or other error types, is that it can be difficult to unambiguously assign an error to a specific type (Lennon 1991). For example, when using a non-native choice of preposition does this violate lexico-semantics or morphosyntax? For more detailed reviews of accuracy measures see Norris and Ortega (2003), Pallotti (2009), Polio (1997), and Wolfe-Quintero et al. (1998).
1.5 Measures of task-based performance

1.5.4 Fluency

Speed and pauses in speech production may serve as the most prominent measures of fluency. It is ‘the extent to which the language produced in performing a task manifests pausing, hesitation, or reformulation’ (Ellis 2003: 342). This definition sees fluency as a skill. It is the speedy retrieval and production of speech that relies on knowledge. As L2-proficiency increases, the processes in the conceptualizer, formulator, and articulator become more and more automatized and may be processed in parallel (de Bot 1992, Levelt 1989). Advanced L2-speakers accordingly are skilled and fast users of their L2-knowledge. With growing automaticity, more cognitive resources may become available for the process of monitoring. Consequently, the amount of self-repairs may be seen as a fluency measure too (Dörnyei and Kormos 1998, Kormos 2000a).

Summing up these three aspects of fluency, the distinction made by Tavakoli and Skehan (2005) has become famous and widely used. The authors distinguish three sub-dimensions of fluency: ‘The first sub-dimension of fluency is silence [. . .]. A second sub-dimension of fluency deals with the speed with which language is produced. [. . .] The third sub-dimension of fluency is what is known as repair fluency’ (Tavakoli and Skehan 2005: 254–255).

Elaborate discussions on these and various other aspects of fluency can be found in the volume edited by Riggenbach (2000) including the conclusive chapter by Freed (2000) who relates objective measures to expert ratings. One may also consider the work by Chambers (1997), de Jong, Steinel, Florijn, Schoonen, and Hulstijn (2007), Kormos and Dénes (2004), Mehnert (1998), and Riggenbach (1991).

1.5.5 Global versus specific measures of task performance

The use of global measures of linguistic complexity, accuracy, and fluency is currently under debate (e.g., Pallotti 2009). In order to complement the broad view on task performance by means of CAF Robinson and colleagues propose to use task specific measures (Cadierno and Robinson 2009, Robinson et al. 2009, Robinson and Gilabert 2007). The rationale is: ‘Such specific measures should be more sensitive to conception, task complexity, and its linguistic demands than general measures’ (Robinson et al. 2009: 550). Especially, if tasks are designed in such a way that the demands can be met by the use of specific linguistic structures, task specific measures presumably complete the picture that global CAF-measures leave open.

For example, the effect of an increase of cognitive task complexity by means of the manipulation on the factor ± here-and-now may serve as a focused elicitation of specific linguistic markers of the past, e.g., past tense and temporal conjunctions. Investigating past tense in such a task may complement the picture gained by global measures. As such, the use of specific measures next to global CAF may give more insights in the actual linguistic performance of an L2-learner. Not least importantly, it is worth
taking them into account because up to now not much earlier work investigated task specific measures and the related claims of the Cognition Hypothesis.

So far, this chapter has reviewed theoretical approaches to the cognitive strand of research into task-based L2-performance in general and in particular addressed the Cognition Hypothesis (Robinson 2005). The following section will review earlier research, that has taken Robinson’s theory as its point of departure for collecting and analyzing experimental L2-data.

1.6 Earlier empirical investigations and open issues

A body of research has focused on the investigation of Robinson’s Cognition Hypothesis. Another line of scientific work took the Limited Attentional Resources Model (Skehan 1996) as its base. Together these studies give a valuable perspective on the cognitive approach to task-based L2-performance. This section reviews this work by restricting itself to those studies that address the Cognition Hypothesis. As the present studies are intended to contribute to task-based research by addressing some of the open issues that have not been fully answered yet, this review focuses on general findings and open questions of earlier work (see chapters 3, 4, and 5 for discussions of individual papers).

1.6.1 Investigating cognitive task complexity

Manipulations on the factor ± here-and-now have generated positive effects of increased cognitive task complexity as proposed by the Cognition Hypothesis (Gilabert 2005, Iwashihta et al. 2001, Rahimpour 1997, Robinson 1995b). Looking at the manipulation of this factor, the interpretations, however, may be problematic. In most studies, participants in the here-and-now condition had to tell a story while looking at a sequence of pictures. The complex counterpart of this task asked participants to tell the story in the past tense after the pictures were removed in order to induce the there-and-then setting. As in the complex version participants told the story by heart it may be that this complex setting put up a higher load on working memory than the simple here-and-now condition. Using this task manipulation therefore probably is confounded by the factor ± dual task because participants on the one hand need to tell the story and on the other hand have to remember the story line (see Révész 2007 for a comparable manipulation by means of the resource-dispersing factor ± dual task).

Other empirical investigations focused on the factor ± few elements. In Gilabert (2007a) and Gilabert et al. (2009) participants acted on a map task. The complex task did not only increase the number of elements but also the way how difficult or easy these items were to distinguish from each other.

Similarly, Robinson (2001b) used, when testing university students, in a simple map task a well known route on the campus while the complex version of this task addressed an unknown and larger area of town. Kuiken et al. (2005) and Kuiken and Vedder (2007b) choose a different manipulation. They asked participants to take into account a different number of criteria when deciding between five options. As one can see, these studies did use different operationalizations of the factor ± few elements. Probably, this is one of the reasons why findings of these studies are mixed and do not give a conclusive picture. Kuiken et al. (2005) and Kuiken and Vedder (2007b) found partial support for the Cognition Hypothesis as cognitively complex tasks triggered a higher accuracy while linguistic complexity was influenced in opposite directions in different populations. In contrast, Robinson (2001b) attested the predicted outcome on lexical complexity but parallel increases on accuracy manifested itself as trend effects only. Finally, the studies presented by Gilabert (2007a) and Gilabert et al. (2009) found an increasing effect on accuracy but did not test for complexity.

As a whole, these studies therefore may not serve as support for Robinson's theory. As Skehan (2009) points out, support for the Cognition Hypothesis should always reveal an augmentation on linguistic complexity and accuracy measures in parallel. Otherwise data speak more for the existence of trade-off effects as proposed by his Limited Attentional Capacity Model (see section 1.3.4 and Skehan 1996, 1998, Skehan and Foster 2001).

A puzzling finding of the work by Gilabert (and colleagues) was that it yielded different results for different task types. That is, a narrative task, that manipulated the factor ± here-and-now, revealed significant support for the Cognition Hypothesis on 8 out of 9 measures. However, the instruction giving and decision making tasks, that manipulated the number of elements, failed at giving substantial support, e.g., the decision making task showed significant effects on 2 out of 9 measures only (see chapter 3 for a more elaborate discussion of this study). Pallotti (2009), however, points out that one should be cautious in interpreting data as support if there are more measures that are not in line with the Cognition Hypothesis than that give support to Robinson's predictions. Taken together, these studies manipulating the number of elements therefore may not allow conclusive interpretations with respect to the Cognition Hypothesis.

These findings with respect to the factor ± few elements show one problem with the Cognition Hypothesis that was addressed in section 1.4.6. Robinson's theory does not give clear instructions how to manipulate the different factors of the Triadic Componential Framework. Possibly, results point into different directions because researchers opted for different operationalizations. In addition, some of the factors may be intertwined and therefore easily get confounded with each other, as explained with the ± dual task / ± here-and-now above. With respect to the factor ± few elements Kuiken and Vedder (2007b) argue that an increase in the number of elements almost always induces an increase in the amount of reasoning demands, which would again result in the factors ± few elements and ± reasoning demands to be confounded. Possibly, this can explain the findings for different task types in Gilabert (2007a) and
Some other controversies with the empirical support for the Cognition Hypothesis are of a more methodological nature. For example, Robinson (2001b) used the token-type ratio as a measure of lexical complexity. This measure, however, may be unreliable because it is sensitive to sample length and complex tasks often yield longer speech samples than simple tasks (see section 1.5 and Bulté 2007, Vermeer 2000).

As the work by Kuiken and colleagues investigates L2-writing tasks it possibly suffers from a methodological blemish concerning time on task (Kuiken et al. 2005, Kuiken and Vedder 2007a, b). In their investigations, participants did receive equal amount of time to work on a written text. Even so there was no instruction on how to use the overall time for the task. Most likely participants differed in the amount of time they spent on planning, writing, or reviewing. This suggests that there possibly is a confound of the resource-dispersing factor ± planning-time, that may yield trade-off effects between linguistic complexity and accuracy (see section 1.4.3 and Ellis 2005).

A last point concerns the input material. As far as the information was presented in the publications discussed so far, one must conclude that the visual and written input material (e.g., pictures and instructions) was rather different over conditions, and sometimes addressed various topics. However, verbal instruction, visual stimuli and task topic to a large extent influence subsequent task performance (e.g., Schoonen 2005). In sum, these issues reveal that more empirical work is needed with respect to investigations of cognitive task complexity.

### 1.6.2 Investigating interaction

Concerning the interactive factor of task condition one–way / two–way flow of information, empirical work within the Cognition Hypothesis is rather limited. Most studies investigating this factor looked at effects of how information was distributed over participants. Accordingly, these studies evaluated the amount and type of interaction in dialogic settings (e.g., Doughty and Pica 1986, Gass and Varonis 1994, Gass et al. 1998, Shehadeh 2004).

Other researchers investigated effects on interaction due to an increase on cognitive task complexity. While data by Nuevo (2006) contradict the claims of the Cognition Hypothesis (there were more learning opportunities in simple than in complex reasoning tasks), Révész (2008) and Gilabert et al. (2009) found supporting effects. In these studies complex tasks generated more interactional moves than simple tasks. Again, effects in the study of Gilabert et al. (2009) were not equally clear over task types (see above and chapter 4, Table 4.1). Robinson (2001b) and Kim (2009) did find supporting data. Participants displayed more interaction in complex than in simple interactive tasks. However, these studies used raw scores for measuring the amount of interaction such that results may be confounded by sample length.
1.6 Earlier empirical investigations and open issues

Up to now, hardly any investigation looked at the difference between task performances manipulated on the factor monologic. In a meta-analysis Skehan and Foster (2007) compare their data on monologic tasks with data on dialogic tasks and find that dialogues push accuracy and complexity but decrease fluency. Even so, this meta-analysis compares L2-performances on various different tasks that manipulated all kinds of other task factors. Consequently, there is a lack of systematic comparisons of monologic versus dialogic performances on the same tasks.

The studies presented in this book try to fill this gap. In the process an intriguing question may be answered. As discussed in section 1.4.4 Robinson’s theory gathers interactive factors under the term ‘task condition’. From a cognitive point of view, however, Tavakoli and Foster (2008) suggest that ‘a monologic task […] makes greater demands on attentional resources than an interactive task’ (Tavakoli and Foster 2008: 461). In other words, it may be that language production in interaction is cognitively simpler than language processing in a monologic situation, since the absence of an interlocutor in a monologue possibly generates an increase in cognitive demands by itself.

Also psycholinguistic research into interaction among native speakers points into this direction. Pickering and Garrod (2004) state that in interaction, interlocutors tend to mirror each others speech on all linguistic levels: syntax, semantics, phonology, and pragmatics. Their Alignment Hypothesis argues that this copying of the other’s speech ‘greatly simplifies production and comprehension in dialogue’ (Pickering and Garrod 2004: 169). The authors explain the simplification of the cognitive processes during speech production via alignment by referring to Levelt’s (1989) model of language production.

First, in a dialogue the speaking partner’s turn creates planning time. While listening to the speaker the hearer can conceptualize his own speech act. As a result, the hearer has more cognitive capacity for formulating during his own speaking turn because less attention for online planning and conceptualization is needed. Furthermore, research of Fiksdal (2000) has shown that interactive tasks push fluency because interlocutors tend to ‘help out’ as soon as the partner falls silent in order to keep a constant flow of interaction. Therefore, interactive tasks show fewer moments of silence than monologic tasks. In contrast, in a monologue all processes of language production – including the effortful conceptualization of a message – need to be performed at the same time. As this is a complex cognitive task that requires attention, speakers may process information in a mostly serial way which is likely to generate hesitations and pauses.17

Second, in addition to this supposed extra planning time in interaction, another simplification in dialogues may occur due to priming. Priming refers to the easier availability of items (e.g., words or syntactic structures) that have been pre-activated through related items or structures (Friederici, Steinhauer, and Frisch 1999, Meyer and Schvaneveldt 1971). For example, the vocabulary item ‘knife’

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17Pickering and Garrod (2004) argue that also the amount of self-repair is higher in dialogues than in monologues. In interaction, speakers by default are in a listener’s position such that their attention is focused on the spoken output of the speaking partner but also of themselves. As they are likely to notice more errors in their own output, the authors consider self-repairs as ‘a natural byproduct of dialogues’.
pre-activates the vocabulary item ‘fork’ because these words are semantically related. Similarly, ‘knife’ pre-activates the word ‘wife’ because they share phonological features. Priming may occur on semantic, syntactic, phonological, and morphological levels.

In a dialogue, vocabulary items and syntactic structures used by a speaker pre-activate these words and forms in the speaking partner. When turns change, the current speaker needs less activation in order to incorporate the actual and related items and structures into his own turn. As priming affects all levels of linguistic production, message generation in a dialogue presumably needs less cognitive resources than in a monologue. After all, in a monologue one has to conceptualize, formulate, and articulate a message from scratch on one’s own and speakers cannot rely on primes of a partner.

A third effect of alignment is termed ‘routinization’, that is, interlocutors establish and agree on specific phrases or words they may use and keep using within a conversation (Pickering and Garrod 2004). Put differently, it is likely that interactants copy each others lexical and syntactic forms and use them again and again during the same dialogue.

Costa, Pickering, and Sorace (2008) applied the Alignment Hypothesis to L2-interaction. They state that L2-learner’s may not be affected by alignment to the same extent at the same linguistic levels as L1-speakers. Also Ejzenberg (2000) points out that priming processes in second language learners may only be possible when their level of proficiency in the L2 is high enough. For example, vocabulary items that are not known in the L2 cannot be primed.18 Even so, also L2-learners may benefit from extra planning time and primed language use during interaction.

In sum, this alternative perspective on the factor ± monologic suggests that dialogues are cognitively less effortful than monologues because interaction frees attentional capacity. Dialogic tasks can give extra planning time during the speaking partner’s turn, and processes of alignment and priming may ease language production. As a result, interactive, dialogic tasks as opposed to non-interactive, monologic tasks, may be seen as cognitively simple tasks.19

Applying this view to the Cognition Hypothesis (Robinson 2005), the factor ± monologic then possibly could be related to the resource-dispersing factor ± planning time rather than to the interactive factor of task condition one-way / two-way flow of information. This alternative perspective would predict that dialogues push accuracy and fluency of L2-speakers (due to cognitive ease on a resource-dispersing variable) while speech performances may be linguistically less complex because of recycling of words and clauses via routinization.

To recap, the Cognition Hypothesis predicts with respect to interactive factors of task condition that accuracy increases while linguistic complexity and fluency decrease in interactive tasks (see section 1.4.4 and Table 1.2). Research evaluating these two perspectives would be welcome. In light of Robin-

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18 Similarly, it may be that primed items of the L1 need to be suppressed and thus priming uses rather than frees attentional capacity.
19 This statement may only hold from a cognitive point of view. Taking a pragmatic perspective on interaction, a dialogue may put up many unknown conversational demands, which can complexify speech production.
son’s (2005) *Cognition Hypothesis* also combined effects of increased cognitive task complexity and interaction may ask for more empirical work.

### 1.6.3 Investigating task specific measures

Only a few studies so far do explore data with respect to the use of task specific measures in relation to the claims of the *Cognition Hypothesis* because Robinson raised this issue only recently (Cadierno and Robinson 2009, Révész 2008, in press, Robinson et al. 2009, Robinson and Gilabert 2007). These investigations consistently report that while the global CAF-measures did not discriminate between the task manipulations, task specific measures did find supporting results for the *Cognition Hypothesis* (see chapter 5). New work in this direction may be able to yield more conclusive results with respect to the use of task specific measures.

### 1.6.4 Investigating native speaker task-based performance

Surprisingly few studies tested L1-speakers in order to have a baseline for the evaluation of L2-learner’s task performance. To the best of my knowledge only Dörnyei and Kormos (1998), Foster (2001), Foster and Tavakoli (2009) included native speakers in their analyses. Especially in light of the *Cognition Hypothesis*, which bases its predictions on cognitive and attentional processes during task-based performance, it is important, however, to interpret L2-production against a native speaker control group.

Levelt (1989) presents the native language production system as a modular construct consisting of a conceptualizer, a formulator, and an articulator. He assumes that formulating and articulating a message in the L1 relies on automatic, incremental, parallel, and mostly unconscious and therefore fast processes whereas the conceptualization and monitoring of a message need attentional control.

Oral production in a second language differs in at least three points from native language production (a.o. de Bot 1992, Costa et al. 2008, Dörnyei and Kormos 1998, Poulisse 1997, Poulisse and Bongaerts 1994). First, L2-speakers’ production is guided by attention at all levels of speech production, that is, also lexical retrieval, morphosyntactic formulation, and articulation are non-automatic and therefore rely on serial processing – especially at lower levels of L2-proficiency. Second, as L2-learners possibly cannot express the originally intended message with their incomplete L2-system they may need to revise their propositional messages in the conceptualizer. Third, L2-learners need attention to prevent automatic L1-activation that may interfere with L2-production (cf. Kroll and Sunderman 2003, MacWhinney 2001, Segalowitz 2003).

Consequently, in contrast to task performance in the L1, task-based L2-performance is a mostly conscious and therefore slow and effortful cognitive activity (Schmidt 2001). Taking into account this difference between native and non-native language production possibly enables us to understand task-based L2-performance in a better way. For example, we may be able to come to more reliable inter-
pretations of measures of linguistic complexity, accuracy, and fluency when evaluating L2-performance against a reference of L1-speakers (e.g., Ellis 2009, Foster and Tavakoli 2009, Pallotti 2009, Skehan 2009). Therefore, it is important to have a native speaker baseline in task-based cognitive research into L2-production.

1.7 Concluding remarks

This chapter has given the theoretical basis of this book with a focus on the Cognition Hypothesis (Robinson 1995b, 2001a, b, 2003b, 2005). In addition, it reviewed global and specific measures of task performance. Furthermore, it reviewed earlier empirical work investigating the Cognition Hypothesis.

The conclusion from this theoretical overview may be that in order to test the claims of the Cognition Hypothesis with respect to cognitively complex interactive tasks there is a need for studies that systematically evaluate effects of cognitive task complexity and interaction, both on their own as well as in combination. In the process, research may examine L2-learner performances by means of global and task specific measures of task performance in light of L1-speaker baseline data. The research in this book aims at providing empirical data that address these open issues. The next chapter introduces the empirical work of this book, which is presented in the chapters 3, 4, and 5.