Cognitive and interactive aspects of task-based performance in Dutch as a second language
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Chapter 6

Summary of the findings, discussion, and implications

6.1 Introduction

The studies in this book investigated the oral task-based performance of L2-learners of Dutch. This chapter summarizes the findings of the empirical studies presented in chapters 3, 4, and 5 and relates them to the theoretical framework presented in chapter 1 and the hypotheses formulated in chapter 2. It starts by giving a summary of the theoretical background of the studies, in section 6.2. Next, section 6.3 gives an overview of the empirical investigations and summarizes the results. Section 6.4 discusses the outcomes in the light of Robinson's Cognition Hypothesis (2005). It focuses on cognitive aspects of task complexity (simple versus complex) and interactive factors of task condition (monologic versus dialogic). In the process it elaborates on measures of task-based performance and highlights the benefits of including a native speaker baseline. Section 6.5 presents the theoretical implications for task-based research into L2-pedagogy and highlights new aspects of the factors under investigation, ± few elements and ± monologic, with respect to Robinson's Triadic Componential Framework (Robinson 2005). Section 6.6 makes suggestions for the practice of language teaching and testing. Finally, section 6.7 closes with a summary of the conclusions of this book.

6.2 Theoretical basis

Chapter 1 explained in detail the theoretical framework of the studies presented here. Starting from a general description of the cognitive perspective on task-based L2-performance it focused on the theory under investigation: the Cognition Hypothesis by Robinson (2001a, b, 2003b, 2005). This theory includes a taxonomy of factors that may influence attentional allocation during task-based L2-performance. The so called Triadic Componential Framework distinguishes cognitive factors of task complexity from interactive factors of task condition and from learner factors of task difficulty. The
following sections will give a summary of the theoretical claims under investigation that address the cognitive and interactive variables named in the Triadic Componential Framework.

### 6.2.1 The claims of the Cognition Hypothesis

The main goal of this book is to investigate effects of cognitive task complexity on the task-based performance of L2-learners. Following the Cognition Hypothesis there is a distinction between resource-dispersing and resource-directing factors of cognitive task complexity. Robinson (2005) argues that an increase on resource-dispersing variables (e.g., planning time, prior knowledge) diverts attentional allocation over various linguistic and non-linguistic task aspects. As a result, the linguistic output of L2-performers suffers due to the extra cognitive load of a complex task that focuses the attention on other task features than language.

In contrast, the Cognition Hypothesis predicts that an increase on resource-directing cognitive variables, like few elements or reasoning demands, attracts attention and allocates it towards language. Increased cognitive task complexity by means of resource-directing factors initiates data-driven processes that focus the attention to task relevant linguistic aspects (Robinson 2003a).

In terms of measures of linguistic complexity, accuracy, and fluency (in short global CAF-measures) Robinson predicts the following effects on L2-task performance. As L2-learners try to meet the extra-linguistic cognitive demands of a complex task they will use more complex linguistic structures and a more varied lexis. Accordingly, the linguistic complexity increases in cognitively complex tasks. Crucially, L2-learners can meet these demands without losing control over attentional allocation because they can rely on several pools of cognitive resources (Wickens 1992, 2007). As a result of the focused attention, their speech performance is more accurate but less fluent. In short, cognitively complex tasks may push actual L2-performance such that linguistic complexity and accuracy increase in parallel at the cost of fluency.

More recently, Robinson and colleagues have argued that effects of focused attention to form as a result of an increased cognitive task complexity should become visible in particular on those forms and structures that are specifically relevant for successful task performance (Cadierno and Robinson 2009, Robinson et al. 2009, Robinson and Gilabert 2007). As they assume that global CAF-constructs may not be sensitive enough to the task manipulations proposed in Robinson's framework they suggest complementing them by task specific measures.

A further goal of this work is to examine effects of interaction on task-based L2-performance. In the Triadic Componential Framework Robinson (2005) presents different interactive factors of task condition. So called participation variables, like one-way / two-way flow of information, have predictive value for the amount and nature of interaction that is expected during task performance.

A radical form of manipulating the flow of information compares monologic to dialogic tasks. In a
monologue, L2-learners act on their own such that the flow of information by default is one-way. After all, interaction is not possible in a monologic task. In contrast, a dialogue creates a platform for two-way interactions with frequent turn-taking due to comprehension checks, clarification requests, and negotiations for meaning and form (Ellis 2000, Long 1990).

Even though the Cognition Hypothesis makes no overt statements about the factor ± monologic, as explained in section 1.4.4 Robinson’s assumptions about focused attention and interaction (for example based on Long’s 1990 Interaction Hypothesis) may predict the following outcome with respect to manipulations of this interactive factor. On the one hand, the linguistic complexity possibly decreases in dialogues because frequent interactional moves prevent speakers from constructing elaborate linguistic structures. On the other hand, as mutual understanding is crucial, an interactive task presumably focuses attention towards language such that it promotes accuracy at the cost of fluency.

The third goal of the present studies is to explore the combined effects of cognitive task complexity and interaction. Robinson (2001a, b, 2005) claims that cognitively complex interactive tasks generate more interaction than cognitively simple interactive tasks because complex tasks presumably need more clarification work, which reduces linguistic complexity. In contrast, both the joint attention to language in a dialogic setting and the higher cognitive task complexity may push accuracy at the cost of fluency in cognitively complex interactive tasks.

### 6.2.2 Alternative accounts on cognitive task complexity and interaction

As discussed in section 1.3.4 the Limited Attentional Capacity Model predicts a different outcome upon cognitively complex tasks (Skehan 1996, Skehan and Foster 2001). Based on VanPatten (1990) Skehan and Foster argue that attentional resources are limited in capacity such that any increase in cognitive task complexity puts the different dimensions of L2-performance into competition with each other for the available resources. As L2-learners then prioritize either meaning or form, cognitively complex tasks generate trade-off effects. These may emerge in particular between linguistic complexity and accuracy.

Section 1.6.2 brought forward an alternative perspective with respect to task-based performance in interactive tasks. Tavakoli and Foster (2008) suggest that monologues may be cognitively more complex than dialogues. They argue that in dialogic tasks the speaking turn of the interlocutor creates online planning time for the hearer. Also psycholinguistic research suggests that dialogic tasks put up a lower cognitive load than monologues because processes of alignment and priming ease language production in interaction (Costa et al. 2008, Meyer and Schvaneveldt 1971, Pickering and Garrod 2004). Alignment may have a twofold effect. As interactants mirror each others’ speech, this may have a decreasing effect on linguistic complexity in interactive tasks. In contrast, the lower cognitive load of a dialogic task will enhance fluency. Furthermore, in order to keep a constant flow of interaction interlocutors tend to ‘help out’ as soon as the partner falls silent, which again results in a higher overall fluency of dialogic tasks.
In sum, these alternative accounts with respect to the factor ± monologic predict that in dialogues linguistic complexity decreases while accuracy and fluency may be pushed by an interactive task setting.

### 6.2.3 The hypotheses under investigation

In order to test the claims of the *Cognition Hypothesis* and the alternative accounts, this book evaluates task-based L2-performance on cognitively simple versus complex tasks in either a monologic or a dialogic setting. It examines oral speech production by using both global CAF-measures and a task specific measure, that is the use of conjunctions (see chapter 5 for the rationale behind this choice). Furthermore, the present studies investigate the L2-learners’ task performances in light of L1-speaker data.

The hypotheses that guide the empirical investigations in this book with respect to manipulations of resource-directing cognitive factors of task complexity are based on claims of the *Cognition Hypothesis*. The focus lies on manipulations of the factor ± few elements. Following Robinson (2005) *Hypothesis 1* argued that increased cognitive task complexity results in a higher accuracy, a higher linguistic complexity but a lower fluency of L2 oral task performance.

As the *Cognition Hypothesis* makes no clear statements about the factor ± monologic the present studies follow the predictions of e.g., Foster and Tavakoli (2009) and Costa et al. (2008) concerning effects of interaction. While cognitive ease may push speech performance with respect to accuracy and fluency, alignment and interactional moves may result in less complex linguistic structures and forms. **Accordingly, Hypothesis 2** expected interactive tasks to raise the accuracy and fluency of L2 oral task performance while linguistic complexity may decrease.

Following Robinson’s (2005) predictions *Hypothesis 3* stated that increased cognitive task complexity enhances interaction and therefore further decreases the linguistic complexity of cognitively complex interactive task performance when compared to task-based performance on cognitively simple interactive tasks. As both factors may push accuracy, cognitively complex interactive tasks were predicted to further increase the accuracy of L2 oral task performance. With respect to fluency, effects of cognitive and interactive factors may compete with each other. As the factor ± monologic is expected to show larger effects that mitigate against the presumably smaller effects of the cognitive factor ± few elements, fluency is expected to increase in dialogues due to the cognitive ease and the tendency of speakers to keep the flow of speech constant.

In line with more recent claims of Robinson and colleagues (e.g., Robinson and Gilabert 2007) *Hypothesis 4* predicted that increased cognitive task complexity would lead to an increase in the frequency

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1See section 2.3 on page 40 for the research questions concerning these hypotheses.
6.3 Empirically investigating effects of cognitive task complexity and interaction

and occurrence of conjunctions in L2 oral task performance.\footnote{As the investigations with respect to the task specific measure focused on effects of cognitive task complexity, no specifically task relevant structure based on the factor ± monologic was identified or tested in the present book. Therefore, \textit{Hypothesis 4} does not make any predictions about the effects of interaction on the use of conjunctions. Similarly, \textit{Hypothesis 4} did not include predictions about combined effects on the task specific measure.} 

As the empirical studies include a native speaker baseline, the task-based L1-performance was the subject of investigation too. \textit{Hypothesis 5} predicted that the highly automatic oral task performance of L1-speakers would not be affected by an increase in cognitive task complexity. In contrast to the cognitive factors of task complexity, natives also were expected to display effects of changes in the interactive task setting though the influence may be smaller than in non-natives. So, \textit{Hypothesis 5} predicted that interaction shows similar but smaller effects on L1-speakers than on L2-learners. \textit{Hypothesis 5} expected no combined effects of cognitive task complexity by interaction for natives because cognitive task complexity was predicted to have no influence on L1-speakers.

6.3 Empirically investigating effects of cognitive task complexity and interaction

As introduced by chapter 2 chapters 3, 4, and 5 reported on the empirical studies into task-based L2-performance that form the experimental basis of the present book. Referring to the \textit{Cognition Hypothesis} these studies focused on Robinson’s (2005) claims about effects of cognitive task complexity and interaction both on their own as well as in combination with each other.

By means of a $2 \times 2$ design the experimental investigations manipulated cognitive task complexity as a within-participant factor and interaction as a between-participants factor. Based on the Triadic Componential Framework (Robinson 2005) they operationalized cognitive task complexity by means of the resource-directing factor ± few elements and interaction by means of the factor ± monologic. The simple tasks addressed only a few elements to be taken into account while the complex tasks concerned many elements. Half of the participants performed both tasks on their own (monologue), the other half acted in pairs (dialogue). Accordingly, all participants performed on a cognitively simple and a cognitively complex task – either both in a monologic or both in a dialogic setting.

6.3.1 Experimental studies

The first study investigated L2-learners’ task performance by means of global measures of linguistic complexity, accuracy, and fluency (see chapter 3). The second study focused on task-based L2-performance using global CAF-measures in comparison with an L1-speaker baseline (see chapter 4). The third investigation elaborated study 2 by means of an analysis focusing on a task specific measure, the use of conjunctions (see chapter 5). The following paragraphs first explain each empirical study
in more detail and then summarize the results with respect to effects of cognitive task complexity and interaction on their own as well as in combination.

Chapter 3 reported on study 1 where 44 L2-learners of Dutch acted as participants. Their task was to choose between two (simple) or six (complex) electronic devices (mobile phone or mp3-player). The devices differed from each other in seven features (e.g., price, capacity, color). Half of the L2-learners acted on their own, the other half performed in pairs. All of them performed the simple and the complex task (in a counterbalanced order). The oral data were transcribed, and coded for global measures of linguistic complexity, accuracy, and fluency. There were five measures of linguistic complexity, four accuracy measures, and three fluency counts. Three separate statistical analyses per construct (linguistic complexity, accuracy, and fluency) tested by means of a multivariate analysis of variance (MANOVA) for effects of cognitive task complexity (within-participant) and interaction (between-participants) in the L2-speaker data.

Chapter 4 reported on study 2. It used a similar experimental design to study 1 but improved the reliability of its measures, analyses, and interpretations based on the findings of this first investigation. Apart from overcoming methodological problems and statistical limitations of study 1 it elaborated the participant groups. In the second study 64 L2-learners of Dutch acted on simple and complex tasks. Half of them performed both tasks in a monologic setting, the other half acted on both tasks in a dialogic setting. In order to induce more speech than in study 1, the tasks addressed a more challenging human topic (Ellis 2000). Participants were asked to identify the best pair out of four (simple) or nine (complex) couples. They could base their choice on six characteristics that the couples differed on (e.g., age, hobby, favorite music style). In order to have a better base to interpret the results attained by L2-learners, 44 L1-speakers of Dutch acted as a baseline on the same tasks under the same conditions as the L2-learners. All data were examined by means of global CAF-measures. In both populations three different MANOVAs on each global CAF-construct separately tested for effects of cognitive task complexity and interaction. The analyses included three measures of linguistic complexity, three measures of accuracy, and four measures of fluency.

Chapter 5 presented a more elaborate analysis of the L2- and L1-data of study 2 in order to meet Robinson’s suggestion to use task specific measures (e.g., Robinson and Gilabert 2007). The analysis focused on the use of conjunctions as markers of argumentation. As successful task performance depended on a convincing line of argumentation in order to defend one’s choice (the best couple), it was hypothesized that the cognitively more complex tasks including more elements asked for more arguments. Therefore, they were predicted to promote the use of linguistic means that mark argumentation, for example conjunctions. Separate MANOVAs for the learner and native speaker populations investigated effects of cognitive task complexity on the frequency and occurrence of conjunctions. Furthermore, Wilcoxon Signed Ranks tests examined the data for effects of the factor ± few elements on the frequency and occurrence of five specifically task relevant conjunctions.
6.3 Empirically investigating effects of cognitive task complexity and interaction

6.3.2 Effects of cognitive task complexity

This section summarizes the findings with respect to effects of cognitive task complexity that was manipulated in the studies at hand by means of the factor ± few elements. Table 6.1 will give a graphical summary of these findings (see p. 123).

The analyses by means of global measures (chapters 3 and 4) discriminate structural from lexical measures of linguistic complexity. Neither of the studies yielded an effect of increased cognitive task complexity on structural measures. In contrast, in both studies lexical complexity was raised in complex tasks. In study 1, the complex tasks generated a higher percentage of lexical words than the simple tasks while Guiraud’s Index was not significantly affected. In study 2, Guiraud’s Index showed a significant increase from cognitively simple to complex tasks.

The investigations used different measures of accuracy. In study 1 the total number of errors per AS-unit was significantly lowered by an increase of cognitive task complexity. There were no effects on any of the other three error measures. Study 2 found that none of the three accuracy measures (number of lexical, semantic, or determiner errors) was influenced by cognitive task complexity.

Fluency showed a significant effect in study 1 such that participants were slower (on the unpruned speechrate) in cognitively complex than simple tasks. None of the other measures of speed, pausing, and repair were affected. Study 2 displayed no effects of cognitive task complexity on any fluency measure.

With respect to the task specific measure (chapter 5) there were hardly any significant results. Neither the frequency nor the occurrence of conjunctions was affected by cognitive task complexity. The only significant effect was found with respect to one specifically task relevant conjunction. The occurrence of ‘omdat’/’because’ was significantly lowered from cognitively simple to complex tasks.

Looking at native speaker performance by means of global measures of task performance in study 2, only Guiraud’s Index was significantly higher in cognitively complex L1-tasks (similar to the L2-data). There were no effects of cognitive task complexity on structural complexity, accuracy, fluency, or the use of conjunctions. Again, the only significant effect was found concerning one specifically task relevant conjunction: the frequency of ‘daarom’/’therefore’ was significantly lowered by an increase in cognitive task complexity.

To sum up, in study 1 cognitively complex tasks did yield higher scores with respect to lexical complexity and accuracy, while fluency displayed lower scores. These effects however were significant on three out of twelve sub-measures only. Accordingly, study 1 gives partial support for Hypothesis 1 that predicted a parallel increase of linguistic complexity and accuracy at the cost of fluency due to an increase of cognitive task complexity.

In study 2, one out of ten sub-measures (Guiraud’s Index) shows an effect in the predicted direction. As there was no parallel increase on any other complexity or accuracy measure, nor a decrease on the
construct of fluency, the results of study 2 do not support *Hypothesis 1*.

In the analysis established by the task specific measure, i.e., the use of conjunctions, there were no supporting effects at all. The only significant influence of cognitive task complexity contradicts *Hypothesis 4* (a decrease of the occurrence of one out of five specifically task relevant conjunctions).

Concerning native speaker performance, the analysis by means of global CAF-measures shows only one effect of increased cognitive task complexity in study 2 (on lexical complexity). All other CAF-measures were not influenced. As a whole, these data support *Hypothesis 5* that predicted no effects of cognitive task complexity in the native speaker population.

6.3.3 Effects of interaction

In this section the results are summarized with respect to the factor ± monologic, i.e., interaction, that was manipulated as a between-participants factor in the studies presented here. See again Table 6.1 (p. 123) for a graphical overview.

In the investigations by means of global CAF-measures structural complexity decreased from monologic to dialogic task performances. Study 1 did not find any effects on lexical complexity, in study 2 dialogues displayed a higher lexical complexity than monologues. Interaction significantly affected L1-speakers’ structural and lexical complexity. Post-hoc pair-wise comparisons revealed that the size and direction of effects in natives and non-natives were different. L1-speakers show a larger decrease on both structural measures and unlike L2-learners also Guiraud's Index decreases in interactive L1-performances.

Both studies consistently showed a large decrease in the number of errors in dialogic tasks when compared to monologic performances. This higher accuracy manifested itself on all different error types in both studies in the L2-learners. Unexpectedly, even in the native population dialogic task performances showed a significant gain in accuracy with respect to lexical and determiner errors but not concerning morphosyntactic errors.

Interaction revealed a consistent effect in both studies with respect to fluency. Dialogues yielded faster speech, fewer pauses, and also fewer repairs (in study 2 only) than monologues. Mirroring L2-learners, native speakers’ fluency increased from monologues to dialogues – with respect to unpruned speechrate A and in pausing behavior.

The task specific measure (i.e., the use of conjunctions) was chosen based on its ‘specificity’ for the task with respect to cognitive task complexity. Therefore, the measure was not expected to react to a difference between monologic and dialogic settings. However, the analysis in chapter 5 included interaction as a between-participants factor such that these results are summarized here. As expected, none of the comparisons of monologic versus dialogic speech performances yielded a significant effect on the frequency or occurrence of conjunctions. In contrast to non-natives, native speaker's frequency
6.3 Empirically investigating effects of cognitive task complexity and interaction

of conjunctions was significantly affected by interaction. It was higher in monologues than dialogues.

To sum up, most of the data confirm Hypothesis 2 that predicted a decrease of linguistic complexity but an increase of accuracy and fluency in interactive tasks. In study 1 both measures of structural complexity decreased and all error counts and fluency measures increased, while the measures of lexical complexity and repair were not affected. In study 2 lexical complexity showed an unexpected increase from monologues to dialogues. Data on other global CAF-measures confirm Hypothesis 2. As no effects on the use of conjunctions with respect to the factor interaction were expected the null-results for the L2-learners with respect to the task specific measure confirm the hypothesis.

According to expectations, an interactive task condition did influence native speech production with respect to global CAF-measures. Even though not all sub-measures were affected the L1-data largely mirror L2-performance. Also the behavior with respect to the task specific measure is comparable in the two populations. There are two differences between L1-speakers and L2-learners. First, lexical complexity is affected in opposite directions in the two groups and second, the frequency of conjunctions does show an effect for L1-speakers but not for L2-learners. Still, in general the data are in line with Hypothesis 5 that predicted similar effects of interaction in natives and non-natives.

6.3.4 Combined effects of cognitive task complexity and interaction

The findings with respect to combined effects of cognitive task complexity and interaction, addressing Hypothesis 3 are given in this section. The graphical summary presents again Table 6.1 (p. 123).

The present investigations hardly revealed any combined effects of cognitive task complexity by interaction – neither by means of global CAF-measures (chapters 3 and 4) nor when using the task specific measure (chapter 5). In study 1, there was only one significant combined effect of cognitive task complexity by interaction in the L2-learners’ task performance. Cognitively complex tasks in the monologic condition yielded significantly fewer errors and omissions while in the dialogic condition increased cognitive task complexity did not affect the accuracy measures.

The only combined effect of cognitive task complexity by interaction that turned out to be significant in study 2 concerns the fluency of native speakers. As revealed by planned post-hoc comparisons, L1-speakers’ speechrates were higher on both measures in simple compared to complex dialogues. In the monologic condition no such effect of cognitive task complexity could be detected.

As a whole, these data contradict Hypothesis 3 that expected combined effects of cognitive task complexity and interaction such that complex interactive tasks would further decrease linguistic complexity, while accuracy and fluency were expected to be pushed by both factors. In study 1, the results contradict the predictions because the pushing effects of increased cognitive task complexity found in the monologic task condition disappeared in the dialogic condition. Study 2 did not generate any sup-

Note that for the specifically task relevant conjunctions no such analysis was performed as interaction was not a main goal of the study described in chapter 5.
porting effects by means of global measures. Similarly, the analysis using the task specific measure did not confirm the hypothesis.

In contrast to L2-learners, L1-speakers showed a combined effect of cognitive task complexity by interaction on fluency. This contradicts Hypothesis 5 that expected the two populations to show similar effects.

6.3.5 Summary of results

In sum, only four out of eleven predicted effects of cognitive task complexity on L2-speakers’ performance manifested themselves in the present studies. As this is based on partial support in study 1 – in the sense that effects were visible on a minority of the different sub-measures – the conclusion is that the empirical data presented in this book challenge Hypothesis 1: An increase of cognitive task complexity by means of the factor ± few elements did not result in a parallel increase of linguistic complexity and accuracy at the cost of fluency. Similarly, its related Hypothesis 4 that expected effects of cognitive task complexity to become even more visible on task specific measures is rejected by the data at hand.

In contrast, the experimental investigations concerning effects of interaction support Hypothesis 2. An interactive task condition influenced all tested aspects of task-based L2-performance in the predicted direction with the exception of lexical complexity and repair behavior. Manipulating the factor ± monologic resulted in a lower structural complexity, but higher accuracy and fluency in dialogic than in monologic L2-performances. Unexpectedly, lexical complexity was increased by an interactive setting in study 2 (but not in study 1), while repair behavior was not influenced in either study.

The data give no support for Hypothesis 3 that expected combined effects of cognitive task complexity by interaction. Cognitively complex interactive tasks did not further push the accuracy or fluency of L2-performance, nor did they further lower linguistic complexity. Only two results confirm the hypothesis, that is, as predicted there was no combined effect on the frequency nor the occurrence of conjunctions. Cognitive task complexity did not substantially affect native speaker task performance while effects of interaction in the L1-data mostly mirror L2-learners’ performance. Both findings confirm Hypothesis 5. Table 6.1 summarizes these results.
Table 6.1: Summary of results of the present studies

<table>
<thead>
<tr>
<th>L2-LEARNERS</th>
<th>TASK COMPLEXITY</th>
<th>INTERACTION</th>
<th>TASK COMPLEXITY × INTERACTION</th>
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<td>fluency</td>
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<td>↓ √</td>
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<td>lex. complexity</td>
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<td>INTERACTION</td>
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Note. L2 = second language; L1 = first language; √ = confirmed prediction; (√) = partially confirmed prediction; Global CAF = global measure of linguistic complexity, accuracy, and fluency; str. complexity = structural complexity; lex. complexity = lexical complexity; task specific = use of conjunctions; spec. task relevant = specifically task relevant conjunctions; n.a. = not applicable; a The predictions did not make a difference between structural and lexical measures of linguistic complexity, however, the results sometimes revealed a different pattern. Therefore, they are listed separately in this table.; b A hypothesis is considered to be confirmed if there are more measures (partially) affected in the predicted direction than measures that are not affected or affected in the opposite direction.
6.4 Discussion

This section puts the results of the empirical chapters 3, 4, and 5 in relation to the theoretical framework of the cognitive approach to task-based research presented in chapter 1 and discusses their consequences for the hypotheses formulated in chapter 2.

6.4.1 Cognitive task complexity

The main goal of the present work was to investigate effects of cognitive task complexity on L2-learners’ oral task performance. In the process, the studies evaluated the Cognition Hypothesis (Robinson 2005) that predicted a parallel increase of linguistic complexity and accuracy at the cost of fluency in cognitively complex tasks.

As summarized in Table 6.1, the results of the empirical investigations in this book that manipulated the factor ± few elements do not support Robinson’s claims. The only reliable change from simple to complex tasks appeared on the measure of lexical complexity: It was higher in cognitively complex tasks than in cognitively simple tasks. This finding is supported by both studies that employed global CAF-measures (chapters 3 and 4) and on its own is in line with the Cognition Hypothesis. However, in order to confirm Robinson’s claims also accuracy should be enhanced in cognitively complex tasks (Skehan 2009). Although study 1 revealed a higher accuracy in complex tasks, this finding may be debatable because only one out of four sub-measures was affected significantly. In addition, study 2 does not show any effects on any accuracy measure. The present studies accordingly reject Hypothesis 1.

Following the suggestion of Robinson and colleagues, chapter 5 examined the data for the frequency and occurrence of conjunctions as a task specific measure (Cadierno and Robinson 2009, Robinson et al. 2009, Robinson and Gilabert 2007). Hypothesis 4 claimed that cognitively complex tasks would promote the use of conjunctions in the cognitively complex tasks. As the results revealed no effect of cognitive task complexity on this measure also Hypothesis 4 is rejected.

As a whole, these investigations fail at finding confirmatory results for the Cognition Hypothesis and question Robinson’s predictions. However, before jumping to conclusions, this section highlights four possible explanations for the results at hand. They can be summarized as (1) a quantitative effect of the factor ± few elements, (2) a confound of the resource-directing factors ± few elements and ± reasoning demands, and doubts about (3) cognitive task complexity or (4) limited attentional capacity.

The factor ± few elements generates more speech

The studies presented in this book aimed at singling out the factor ± few elements. Therefore, it manipulated the number of elements in a straightforward way. A simple task included a few elements (two elements in study 1; four combinations in study 2) and by adding some more elements a complex ver-
tion of the same task concerned many elements (six elements in study 1; nine combinations in study 2).

Robinson (2005) states that an increase on the factor ± few elements does change the attentional allocation during task-based L2-performance. He bases his predictions on the cognitive perspective on memory and attention during L2-task performance (see chapter 1). This claim finds support in cognitive psychology as Halford et al. (2007) argue that our cognitive capacity is limited to a maximum of four elements or combinations. Accordingly, the simple tasks in the present book addressed a number of elements that were within the assumed limitations whereas the complex tasks included an amount that should be beyond these capacity limits.

The data suggest however, that increasing the number of elements did not have the expected effect on cognitive processes. Hardly any significant effects of the factor ± few elements were found. Possibly, ‘just adding more elements’ did not place ‘greater functional or conceptual communicative demands’ (Robinson and Gilabert 2007: 162) on the learner. If the complex task does not put up a greater cognitive load, L2-learners will not show traces of trying to meet the increased demands. That is, no parallel increase of linguistic complexity and accuracy, or a difference in the use of conjunctions, becomes visible in the data.

When dealing with many elements in the complex tasks at hand an effective strategy could be to consider one element after the other. Such a linear approach to more elements most likely would not affect the cognitive load of a task. Only if all elements are taken into account at the same time may this produce a higher cognitive load. Meeting the increase in the number of elements by addressing one element after another possibly would manifest itself in longer speech productions. In other words, if talking about nine rather than four options to combine people into pairs, one may just speak more in order to talk about every possible combination. The longer speech samples then would be characterized by similar, recurring linguistic structures and forms rather than showing different linguistic means than when talking about a few elements.

This explanation finds support in the data. A consistent finding of the empirical work at hand is that the complex tasks generated more speech than the simple tasks. Looking at raw scores of, for example, the number of subordinate clauses therefore suggests that cognitively complex tasks promote subordination and therefore complexify linguistic production. However, quantifying linguistic complexity, accuracy, and fluency or a task specific form by means of measures that correct for sample length, the differences between the simple and complex task conditions disappear.

This explanation may also account for the fact that in both studies that employed global CAF-measures, lexical complexity was significantly raised from simple to complex tasks. As discussed in chapter 4, the increased number of words in the input of the complex task fits to the manifested increase on Guiraud’s Index from simple to complex task performances. It seems that complex tasks did

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4N.B. The seminal paper by Miller (1956) assumes a limitation of seven elements or chunks.
generate speech with a higher lexical complexity, but, to repeat the earlier explanation, participants in
the complex tasks addressing many elements did not produce linguistically ‘different’ output. Apparently
they just spoke ‘more’.

In line with this assumption, also the data gained by the task specific measure may be explained.
As discussed in chapter 5, the analysis by means of the specific measure did not revise any findings
of the analysis examining global CAF-measures. Apparently, the tasks addressing more elements did
not result in participants using substantially more or a different set of conjunctions. As the raw scores
indicate higher numbers (see Tables 5.3 and 5.4), it may be that the longer speech samples of the
complex tasks addressing more elements increased the absolute numbers of conjunctions. Correcting
them for sample length, however, generates no significant differences any more (see Tables 5.5 and
5.6). It is more likely that the L2-learners relied on recurring linguistic forms, that is they used the same
conjunctions more often.

Repeating the conclusions of chapters 4 and 5, the studies as a whole therefore suggest that par-
ticipants produced in the complex versions of the tasks at hand more speech, i.e., ‘more of the same’
language, rather than a linguistically ‘different’ output. Put differently, it seems that the factor ± few
elements results in a mere quantitative change of L2-speech production.

A confound of the factor ± reasoning demands

Interestingly, earlier work investigating the factor ± few elements did find corroborating results for the
Cognition Hypothesis. For example, the work of Gilabert (2007a) and Gilabert et al. (2009) did yield
supporting results by manipulating the number of elements in an instruction giving task. Paradoxically,
in the same studies this effect was not found in a decision making task. As an explanation chapter 4
hypothesized that in the decision making task there was a ‘confound’ by means of the factor ± reasoning
demands.

After all, the Triadic Componential Framework includes reasoning as a resource-directing variable
(Robinson 2005). Robinson and Gilabert (2007) distinguish even three different types of reasoning
demands (causal, spatial, intentional) that focus attention towards different specific linguistic means.
Robinson (2007b) found that complex intentional reasoning tasks triggered L2-learners to make greater
use of e.g., cognitive state terms, which was the task specific measure in this study.

The decision making tasks in Gilabert (2007a) and Gilabert et al. (2009) as well as the present
investigations included reasoning tasks that were manipulated by means of the factor ± few elements. It
may be, that in these studies all tasks were quite complex in terms of the factor ± reasoning demands.
Possibly, if participants act on highly complex reasoning tasks, an additional change of the number
of elements does not affect attentional allocation any more. In other words, possibly the factor ± few
elements did not differentiate between two tasks that were both complex on the dimension of reasoning.
6.4 Discussion

Importantly, the Cognition Hypothesis argues that the factor ± reasoning differentiates between tasks that do and tasks that do not ask for reasoning (e.g., argumentative tasks versus description tasks). Earlier work by Révész (in press), who found corroborating results for Robinson’s claims, systematically combined increases of the reasoning demands and the number of elements. Révész changed the number of elements in her tasks such that it explicitly and deliberately included a parallel increase of the reasoning demands. In Kuiken et al. (2005) and Kuiken and Vedder (2007b) participants were asked to base a decision on either three (simple) or six (complex) criteria. All of these criteria had to be taken into account in parallel when performing the task. The authors argue that this manipulation of the number of elements almost automatically generated a higher amount of reasoning. Their data are partially in line with Robinson’s claims (see discussion chapters 4 and 5).

As a whole, this suggests that the earlier support for the Cognition Hypothesis possibly stems from the factor ± reasoning demands, that was a result of the increase on the factor ± few elements, rather than from the latter factor on its own. Put differently, it may be that in earlier work the factor ± few elements in combination with the cognitive factor ± reasoning demands influenced cognitive task complexity such that it affected task-based L2-performance.

The aim of the present studies, however, was to investigate the single factor ± few elements. Even though all the tasks were argumentative, that is the simple and the complex tasks were all ± reasoning tasks, great effort was made to increase the number of elements without a ‘confound’ of the amount of reasoning demands. However, it may be that this very fact eliminated effects of increased cognitive task complexity by means of the factor ± few elements. After all, the data of the present studies challenge the Cognition Hypothesis (Robinson 2005) that predicts the resource-directing cognitive factors of task complexity to affect the cognitive processes of L2-learners during task-based performance. More specifically, they question the use of the factor ± few elements as a cognitive factor of task complexity.

Cognitive task complexity?

This discussion raises another pending question: How exactly do we manipulate cognitive task complexity? Put differently, how do we know that a task manipulation, e.g., by means of the factor ± few elements, indeed induces a higher cognitive load than its simple counterpart?

The operationalization of cognitive task complexity in this book is based on the Triadic Componential Framework (see section 1.4.6 and Robinson 2005). Robinson explains how changes on different task design factors of this taxonomy influence the cognitive complexity of L2-tasks and how this in turn influences task-based L2-performance. As such the framework functions as a research agenda for empirical investigations. But how do we know its assumptions are correct?

As discussed in chapter 4 the scores on the affective variables questionnaire of the second study suggest that participants did not perceive a substantial difference in task difficulty between the task
addressing a few and the one addressing many elements (see section 4.4). It may be, that the manipulation of the number of elements did not establish the intended higher cognitive task complexity. Again, this supports the idea that the factor ± few elements, as it was manipulated in this book, may not have the potential to directly affect cognitive processes and attentional allocation during task-based L2-performance.

Moreover, the studies in chapter 4 and 5 of this book included a native speaker baseline. As explained in section 1.6.4, native speakers can rely on mostly automatic processes of language production. Therefore, Hypothesis 5 expected L1-speakers to show hardly any effects of cognitive task complexity. This assumption concerned global CAF as well as task specific measures of performance. Results of the present studies confirmed Hypothesis 5 as they revealed that indeed, the L1-speakers showed only one effect of the factor ± few elements on global CAF-measures. Like L2-learners, their lexical complexity was higher in cognitively complex than simple tasks. Also regarding the task specific measure L1-speakers mirrored L2-learners’ behavior. There was one effect on one specifically task relevant conjunction in the unexpected direction, that is, it was higher in simple than complex tasks.

As predicted, L1-speakers were hardly affected by this task manipulation, which we may explain by the automaticity of their speech processing. But also the L2-learners show hardly any influence of the number of elements in their task performances. The similarities between the two populations therefore point towards the earlier assumption that also for L2-learners the factor ± few elements as manipulated in this book possibly did not directly affect the cognitive load of a task. As it does affect task performance – it generates a quantitative change of task-based production – it may be seen as a factor of general task design that pushes the amount of speech in task-based performance (of L2-learners and L1-speakers) rather than as a resource-directing factor of cognitive task complexity.

**Limited attentional capacity?**

A last possible explanation may come from the alternative account on task-based performance. As the studies do not confirm the Cognition Hypothesis, it may be that the Limited Attentional Capacity Model gives a better fit to the results (Skehan 1996, Skehan and Foster 2001). This model assumes trade-off effects, in particular between linguistic complexity and accuracy upon cognitively complex tasks.

However, the present investigations do not point towards trade-off effects. For example, even though the effects may not be significant on all measures the descriptives of study 1 revealed a parallel increase of linguistic complexity and accuracy from cognitively simple to complex tasks (see Table 3.4). As discussed in chapter 4, also the scores in study 2 do not support Skehan’s model. That is, there was neither an increase nor a decrease on any accuracy measure while lexical complexity was higher in the cognitively complex task performances. Consequently, the present studies do not support Skehan and Foster either who predict trade-off effects.
Concluding remarks

As a whole, the studies at hand indicate that the factor ± few elements on its own (without affecting reasoning demands) may not have the potential to directly influence cognitive processes during task-based performance. In contrast to the predictions of the Cognition Hypothesis (Robinson 2005), no effects on attentional allocation due to a higher number of elements could be traced. There were no consistent results in cognitively simple versus complex L2-tasks other than an increased lexical complexity. Similarly, no confirmatory effects on a task specific measure were found in the data. It follows that the data do not confirm Hypothesis 1 and Hypothesis 4. In light of the confirmed Hypothesis 5 that expected no effects of cognitive task complexity on L1-speaker data, the factor ± few elements may no longer be characterized as a cognitive factor of task complexity.

Apparently, the factor ± few elements can influence the amount of speech produced upon a certain task input: A task concerning + few elements generates a small amount of speech. A task that addresses many elements (– few elements) induces more speech, asks for a wider lexicon and possibly creates more instances and thus learning opportunities for similar recurring linguistic structures. Section 6.5 will elaborate on the theoretical implications of this point.

6.4.2 Interaction

The second goal of the present book was to investigate effects of interaction on L2-learners’ oral task performance. Hypothesis 2 predicted interactive tasks to raise the accuracy and fluency of L2 oral task performance while linguistic complexity may decrease.

These predictions were in line with Robinson’s (2005) assumptions about interactive factors of task condition in his Triadic Componential Framework. Accordingly, the factor ± monologic may be seen as a radical form of the factor one-way/two-way flow of information. Robinson (2001b) states that dialogues may reduce the linguistic complexity of task performance because of frequent interactional moves and interruptions. As interaction creates a need for mutual understanding and focuses both speakers’ attention to language, dialogic tasks may push accuracy at the cost of fluency.

Alternative perspectives propose that dialogues enhance L2-speech performance because they put up a lower cognitive load than monologues based on more planning time and processes of alignment and priming (Costa et al. 2008, Pickering and Garrod 2004, Tavakoli and Foster 2008). However, linguistic complexity may decrease because of the copying and mirroring of words and clauses through alignment and priming. As a whole, these accounts expect dialogues to show a lower linguistic complexity but a higher accuracy and fluency than monologues.

The summary of results (Table 6.1, p. 123) shows consistent effects of the factor ± monologic. The studies confirm Hypothesis 2 concerning effects of interaction. Also Hypothesis 5 that expected similar results in the native population was confirmed. In more detail the data may support a combination of
the predictions by Robinson and the alternative accounts with respect to the factor ± monologic.

**The factor ± monologic: interactive and cognitive aspects**

As dialogues resulted in a lower structural complexity than monologues, the data suggest that Robinson’s predictions concerning linguistic complexity were correct. Apparently, turn-taking behavior cuts off the production of complex syntactical structures and forms. However, whether this indeed is the reason for the lower structural complexity cannot be answered by the data at hand because only global measures were used to investigate effects of interaction and the analysis did not include countings of, e.g., comprehension checks and clarification requests. Even so, the fact that the average number of AS-units in general was higher in dialogues than monologues lends further support to this assumption. In addition, L1-speakers show a similar behavior as the L2-learners. As addressed in chapter 4, this fact points to the conclusion that a low structural complexity in dialogues possibly is a natural byproduct of interactive speech. In other words, to produce structurally less complex language in dialogues than monologues is what native speakers do. Therefore this may be seen as target language use.

Robinson’s perspective and for example Long’s (1985, 1989) *Interaction Hypothesis* may also explain the higher accuracy in dialogues. The need for mutual understanding may focus both speakers’ attention to form. This joint attention to language predicts a reduction of the amount of errors in interactive settings – which is what we find in the data.

However, in contrast to Robinson’s predictions, also lexical complexity and fluency increased from monologic to dialogic tasks in L2-learners. It may be that the alternative accounts on interaction possibly present a better fit to these results (e.g., Costa et al. 2008, Foster and Tavakoli 2009, Pickering and Garrod 2004, Tavakoli and Foster 2008). As discussed in chapter 4, assuming processes of alignment and priming can account for the increase of lexical complexity in the dialogic task condition (Costa et al. 2008). It may be that due to copying and mirroring of words L2-interactants could profit from each other’s lexical input in dialogues. In the monologic condition, participants had to rely on their own lexical knowledge while in the dialogic condition speakers presumably incorporated words of the interlocutor they may not have come up with on their own. Possibly, this kind of priming resulted in an elaborate lexicon. Again, this explanation gains support from the native speaker data. As assumed by Pickering and Garrod (2004) the lexical complexity in L1-speakers decreases in interactive tasks compared to monologues. The authors explain that as the L1-lexicon is very large by itself it may be that through routinization and recycling alignment of vocabulary items in L1-dialogues decreases rather than increases lexical complexity (see chapter 4 for a more detailed discussion of this point).

Robinson’s perspective can account for the fewer errors in L2-dialogues by assuming joint focused attention to language. This view may be supported by seminal hypotheses on SLA that predict interaction to promote attention to form (e.g., the *Interaction Hypothesis* Long 1985, the *Output Hypothesis*
6.4 Discussion

Swain and Lapkin 2001 and the Noticing Hypothesis Schmidt 1990, see section 1.3.2). However, also native speakers showed a gain in accuracy (especially with respect to lexical choices). Therefore, the explanation by Costa et al. (2008), Pickering and Garrod (2004) and Tavakoli and Foster (2008) possibly finds more support. This view predicts a lower cognitive load in dialogues due to online planning time during the speaking partner's turn. This possibly accounts for the gain in accuracy. Also the fact that dialogues generated more fluent speech than monologues (in both populations) is in line with the assumption of a lower cognitive complexity in dialogues.

In sum, both accounts serve partially as an explanation for effects of the factor ± monologic in the data presented here. It seems that apart from being an interactive factor of task condition, the factor ± monologic has a cognitive dimension that possibly affects task complexity at the resource-dispersing dimension.

Concluding remarks

Taken together, the studies in this book give a new perspective on the factor ± monologic. As defined in Robinson's Triadic Componential Framework (Robinson 2005) it may serve as an interactive variable of task condition. However, the present studies highlight the cognitive aspects of this factor, which could be corroborated by the comparison of the L2-learner data with a native speaker population. In sum, the data presented here suggest that the factor ± monologic has a cognitive dimension that may be related to the resource-dispersing factor of cognitive task complexity ± planning time. Again, the theoretical implications of this discussion will be addressed in section 6.5.

6.4.3 Cognitive task complexity and interaction in combination

The third goal of the present book was to explore the combined effects of cognitive task complexity and interaction on L2 oral task performance. Hypothesis 3 followed Robinson's claims by expecting cognitively complex tasks to even further decrease linguistic complexity but even further increase the accuracy of oral L2-task performance. As effects of interaction were expected to mitigate against the effects of cognitive task complexity, fluency was predicted to be high. Hypothesis 5 expected no joint effects of cognitive task complexity and interaction in native speakers because no main effect of the cognitive factor was expected.

Like in L1-speakers, L2-learners showed hardly any combined effects of cognitive task complexity and interaction. Study 1 revealed that the promoting effect of cognitive task complexity on accuracy, that was found in monologic tasks, disappeared in the dialogic setting. Study 2 found no joint effects with the exception of native speaker fluency. As summarized in Table 6.1 the studies therefore do not support Robinson's theory. In light of the discussion of the factor ± few elements this is not surprising. How could almost no effects (of the cognitive factor of task complexity) create combined effects with the
factor interaction?

Based on the discussion about the cognitive aspects of the factor interaction it may be, though, that factors of cognitive task complexity can generate positive synergies with interaction. If dialogues indeed are cognitively simpler than monologues, an increase of cognitive task complexity by means of a resource-directing factor in an interactive setting possibly can benefit from the freed attentional capacity in the dialogue. In other words, if interaction eases the cognitive load during task performances and consequently makes more attentional resources available, it may be that more attention can be focused on task relevant linguistic forms by increasing the cognitive task complexity by means of a resource-directing factor. Future research may reveal whether such synergies exist. It seems, however, that the resource-directing dimension then should be manipulated on other factors than the number of elements as the work in this book does not support Robinson’s claims of combined effects of cognitive task complexity and interaction.

6.4.4 Global versus specific measures of task performance

In the process of investigating effects of cognitive task complexity and interaction the present work aimed at evaluating the use of global versus specific measures of performance. Robinson and colleagues postulated that global measures possibly fail at detecting slight differences due to task manipulations and therefore called for task specific measures (Cadierno and Robinson 2009, Robinson et al. 2009, Robinson and Gilabert 2007).

The work at hand does not confirm the added value of investigating specific structures and forms as the findings by means of the task specific measure did not change the results obtained by the global CAF-constructs. This finding suggests, on the one hand, that focusing on task-specific measures may be more useful when one is interested in L2-development as they probably give a better insight in how task performers develop over time (Norris and Ortega 2009a, Révész in press).

On the other hand, when interpreting the data a limitation of the present studies must be considered. The analysis in chapter 5 did evaluate only one task specific measure, that is, the use of conjunctions as a marker for argumentation in simple and complex tasks manipulated by means of the factor ± few elements. Even though the present studies intended to strictly manipulate only the number of elements, it is possible that there is a confound of the two factors ± few elements and ± reasoning. That is, both the simple and the complex tasks were argumentative tasks. As conjunctions are seen as lexical markers of argumentation, their use may be in particular sensitive to manipulations of the factor ± few elements in tasks that involve reasoning even if the number of elements was manipulated. Possibly, other task specific measures that can be related to the factor ± few elements may show the predicted

\[^5\]For example, it is worth noticing that in chapter 5, there is an apparent approximation of the L2-performances to the native speakers’ use of the specifically task relevant conjunction ‘als… dan’/‘if… then’ (see Tables 5.7 and 5.8 on page 107). As no statistics were calculated with respect to this point the data at hand cannot give a conclusive answer. Even so, a trend on the frequency of all conjunctions (cf. Table 5.6, p. 106) possibly supports this idea.
6.4 Discussion

6.4.5 The benefits of a native speaker baseline

Taken together, the present studies show how valuable it is to include a native speaker baseline in research into task-based L2-performance. At all times, the L2-performance could be interpreted in light of L1 task specific performances. This presumably has more confirmatory strength than evaluating L2-speech by means of an external standard (which is often based on prescriptive written norms).

For example, the similarities between the two populations with respect to effects of the factor ± few elements led to the assumption that this factor may not directly affect the cognitive load of a task. As the non-native experimental group and the native control group displayed comparable gains in lexical complexity this interpretation was corroborated. Without the control group, such an interpretation possibly would be hard to defend.

Also the interpretation of effects of the factor ± monologic gained from having the native speaker baseline. For example, the disparities between native and non-native speaking performances concerning lexical complexity in L2- and L1-interaction served as an explanation for the effect in L2-learners. To recap, an interactive task setting decreased the lexical complexity of native speakers but increased it in L2-learners’ performances. The comparison of the L2- and L1-data allowed the assumption that dialogues put up a lower cognitive load than monologues (see the discussion in chapter 4).

Similarly, the interpretation of the interactional aspects, i.e., turn-taking, interruptions, clarification requests, were corroborated by the native speaker data. For example, the decrease of structural complexity due to the dialogic task setting was larger in natives than in non-natives, which led to the inter-

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6N.B. The examination by means of the task specific measure did not intend to test for effects of interaction therefore this factor cannot contribute to the discussion for or against the use of specific measures of task performance when evaluating monologues versus dialogues.
pretation that a decrease of structural complexity is a natural byproduct of interactive speech rather than a drop in performance in dialogues.

In sum, the L1-baseline corroborated tentative explanations of the L2-data and as such helped understanding the L2-learner results.

6.5 Theoretical implications

This section discusses the theoretical implications by evaluating cognitive and interactive factors of task design in light of Robinson’s Cognition Hypothesis and formulates directions for future research based on the present studies.

6.5.1 Cognitive and interactive factors of task design

As discussed in section 6.4 the present book generated insights with respect to the main interventions, i.e., cognitive task complexity and interaction. With respect to Robinson’s Triadic Componential Framework and the Cognition Hypothesis the findings point to a change of the predictions related to the factor ± few elements and the factor ± monologic. After all, the data suggest that both factors possibly address other aspects than expressed in the original framework of Robinson (2005). As a summary of the discussion in sections 6.4.1 and 6.4.2, Table 6.2 (on page 135) displays the proposed changes.

First, summarizing section 6.4.1, the present work suggests that the factor ± few elements may be characterized as task design factor that affects the amount of speech while attentional allocation may not be directly influenced by manipulating this factor. Adding more elements to a simple task possibly has the result that the – few elements task creates more speech than the + few elements task. Accordingly, manipulating the number of elements may create the single CAF-effect of yielding a higher lexical complexity. Based on the assumption that producing more speech can be related to more recurring but similar structures and forms, no other effects of an increase in the number of elements may be found upon manipulations of the factor ± few elements – as long as measures correct for sample length.

Second, as a summary of section 6.4.2, the studies in this book propose that the factor ± monologic possibly has two sides. In terms of Robinson (2005) it is related to (a) interactive factors of task condition, e.g., the participation variable one–way / two–way flow of information. Manipulations of this factor accordingly result in frequent interactional moves, which induce a lower structural complexity while the joint attention to language presumably promotes lexical complexity and accuracy. In addition, the factor ± monologic may be related to (b) resource-dispersing factors of task complexity. The present studies suggest that an interactive task setting creates natural pauses for speakers during the turn of the interlocutor which increases the amount of planning time (Tavakoli and Foster 2008). In addition, processes
Table 6.2: Summarizing effects of the factors ± few elements and ± monologic

<table>
<thead>
<tr>
<th>Factors</th>
<th>± FEW ELEMENTS</th>
<th>± MONOLOGIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAF effects</td>
<td>≈ structural complexity</td>
<td>− structural complexity</td>
</tr>
<tr>
<td></td>
<td>+ lexical complexity</td>
<td>+ lexical complexity</td>
</tr>
<tr>
<td></td>
<td>≈ accuracy</td>
<td>+ accuracy</td>
</tr>
<tr>
<td></td>
<td>≈ fluency</td>
<td>+ fluency</td>
</tr>
</tbody>
</table>

Possible explanations:
- more speech
- more lexical items
- similar, recurring linguistic structures
- hardly affecting attention
- more interactional moves
- interruptions & clarifications during interlocutors’ turn
- negotiation of meaning and form
- priming and alignment on all linguistic levels
- joint attention to language
- freed attentional capacity

In terms of task condition TASK CONDITION TASK COMPLEXITY
- interactive factors cognitive factors
- (a) participation (b) resource-dispersing

of priming and alignment may decrease the cognitive load in dialogic tasks (Costa et al. 2008, Pickering and Garrod 2004). In general, dialogues therefore may free attentional capacity such that it pushes L2-performance.7

As a whole, the studies presented here suggest that these two aspects of the factor ± monologic together affect speaking performance. Possibly, routinization and copying, that are associated with alignment, increase lexical complexity of task-based L2-production while the turn-taking behavior reduces structural complexity. Accuracy and fluency are fostered in dialogic performances.

Finally, in light of the discussion in section 1.4.6 it is questionable whether these additions to Robinson’s Triadic Componential Framework make the model more feasible. In contrast, the results may rather give support to the critique by Kuiken and Vedder (2007b) and Ellis (2009). That is, the existing proposals of the framework (e.g., Robinson 2005, 2007b) create a large variety of different manipulations and research designs, so that it may be difficult to find consistent results. The results of the present studies therefore possibly support the call for more precise explanations how exactly researchers could operationalize and weight the different factors named in the Triadic Componential Framework. Even so, future research, which uses the Triadic Componential Framework as a research agenda, can benefit from the considerations concerning the factors ± few elements and ± monologic as it was found in the present studies.

7N.B. In this analysis pragmatic aspects of the factor ± dialogic are not taken into account. As addressed in chapter 1, it may be that the pragmatic conventions needed in a dialogue increase the cognitive load.
6.5.2 Manipulating cognitive task complexity

Consider the explanations for the results of the data with respect to the cognitive factor ± few elements, several suggestions for future research can be formulated. Two of them are named more explicitly concerning (1) the confound of the factor ± few elements and ± reasoning demands and (2) the need for a better definition and investigation of cognitive task complexity.

As discussed, it may be that the earlier research confirming Robinson’s claims with respect to the factor ± few elements suffered from a confound of the associated factor ± reasoning demands. Kuiken and Vedder (2007b) argue that every increase of the number of elements automatically induces a larger amount of reasoning. The studies at hand tried to eliminate this confound. Accordingly, their findings seem to indicate that the mere addition of some elements may not affect reasoning demands per se. Rather, they suggest that the factor ± few elements can be seen as a factor of task design that influences the amount of speech. Future research could systematically investigate which of the two analyses receives more support by empirical data.

Importantly, the present work suggests that with respect to factors of cognitive task complexity there is a need for an objective way to empirically determine the cognitive load of a task. Based on the Cognition Hypothesis, there is a body of studies that have established an empirical base. However, Robinson (2003a) defines cognitive task complexity as the amount of cognitive processing that is needed in order to perform successfully on a task. As such it is dependent on task inherent features and characteristics that increase or decrease the mental effort needed, which in turn affects task performance as established by, for example, CAF-measures. Norris and Ortega (2009b) point out the circularity in this definition: How can we objectively determine the inherent cognitive load of a task, the independent variable, if it is defined by successful task performance, the dependent variable? Therefore, future research may aim at having some external means that confirm the theoretically assumed cognitive load even if the foremost goal is to test its effects.

Norris and Ortega (2009a) name several possibilities to do so, e.g., gauge perceived task difficulty or use imaging techniques to register brain activity. Another solution would be to establish beforehand the amount of cognitive processing that is needed for a certain task. Considering other fields of research (computer science, cognitive psychology) possibly gives fruitful suggestions in the search for how to determine the intrinsic cognitive load of a task.8

6.5.3 Manipulating interaction

With respect to manipulations of the factor ± monologic there are at least three major implications of the present work that are worth mentioning. Also some limitations of these studies may serve as directions

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8For example Cognitive Load Theory (Kirschner, Kester, and Corbalan 2010, Sweller 1988) or Computational Complexity Theory (Goldreich 2008, Papadimitriou 1994).
to future research.

First, as this is one of the few investigations that have systematically manipulated the factor ± monologic, there is a need for more work looking at the difference between task-based performance by one person on his or her own in contrast to task-based interactions of pairs or even groups of L2-learners on the same tasks under the same conditions. In the process, more attention could be given to the difference between learner-learner-interactions and native-learner-interactions.

Moreover, it may be a limitation that, when coding dialogues, the studies presented here looked at a single speaker’s individual performances. A future examination may choose to see how the CAF-measures look when the dialogic speech performances are analyzed based on the joint dialogic performance.

Second, the studies presented here adopted a quantitative perspective on data processing. As a result, speech performances were evaluated by means of quantitative measures, e.g., global measures of linguistic complexity, accuracy, and fluency. Even though some global measures (e.g., accuracy) may have a ‘communicative’ aspect, it would make good sense to include judgments on communicative success (like e.g., Ferrari 2009, de Jong et al. 2007, Kuiken et al. 2010, Pallotti 2009). In addition, it would be interesting to have a more qualitative look on interactions to find out whether the variety in type of interaction differed between the simple and complex performances. Especially from a communicative account like the task-based approach, studies should be more interested in whether L2-speakers managed to achieve the communicative goal of a task. This is a limitation of the work at hand.

Third, when focusing on the factor ± monologic, the present book suggests to take into account the cognitive aspects of interaction (see also Tavakoli and Foster 2008). The Triadic Componential Framework Robinson (2005) assumes interactive factors to be factors of task condition. The present studies, however, indicate that this factor seems to affect cognitive task complexity too. It would be interesting to take a more detailed look into interactive task-based performance by addressing its effects on the cognitive load of a task, for example, by investigating the amount of online planning time.

Also when considering effects of alignment and priming, the present work calls for other measures (and possibly different experimental techniques) that would catch the cognitive aspects of interaction. Possibly, the existing tools (e.g., counting LREs) may not be sufficient. With regard to differential effects on non-natives and natives it would be in particular valuable to find out whether, and if so how exactly, alignment and priming ease L2 dialogic speech. Systematic investigation of these issues sounds promising also in light of earlier work addressing alignment (Costa et al. 2008, Pickering and Garrod 2004).

Recently, CAF-constructs have been interpreted in terms of Levelt’s (1989) blueprint of the speaker that focuses on the underlying processes during speech production (Ellis 2009, Skehan 2009). Skehan (2009), for example, relates processes of message generation in the conceptualizer to measures of lexical and structural complexity while accuracy and fluency (of lexical retrieval) are accounted for by
the formulator. This perspective can partially account for the results of the present studies. The (visual) input of the argumentative tasks at hand required the use of some infrequent lexical items. Possibly, the lexical retrieval of these items swallowed most of the attentional capacity of the formulator. As a result, accuracy suffered – especially in the complex version where more lexical items were compulsory for successful communicative task performance. It may be that this effect mitigated against accuracy-raising effects of a higher cognitive task complexity.

Especially in light of a native speaker baseline, this interpretation gains support. In contrast to L2-learners, L1-speakers have no problems meeting the functional demands of the conceptualized message with their native language competence. As they need hardly any attention for lexical retrieval, structural and lexical complexity accordingly show the same tentative directions – which is what we see in native speaker’s performances comparing e.g., monologues and dialogues.

6.5.4 Manipulating cognitive task complexity by interaction

Concerning Robinson’s claims with respect to a combined effect of cognitive task complexity and interaction there is definitely more work to be done. It may be worth researching whether indeed an interactive task setting frees attentional capacity such that increased cognitive task complexity in complex interactive tasks has more attention available that in turn may be focused towards task relevant aspects (as was hypothesized in section 6.4.3). Again, such an investigation would benefit from measures that capture the cognitive nature of interaction.

6.5.5 Measuring task-based L2-performance

Based on the findings but also limitations of the present studies there may be some suggestions for future research concerning measures of task performance. The following paragraphs address each global construct (linguistic complexity, accuracy, and fluency) separately before highlighting some general points regarding measuring L2-performance.

First, concerning linguistic complexity, the comparison of native and non-native speech with respect to structural complexity reveals that a higher score does not always imply a more native-like behavior (see discussion in chapters 4 and 5). This corroborates Pallotti (2009) who postulates that researchers should be careful when interpreting ‘higher’ scores on a CAF-measure as ‘better’.

Second, with regard to accuracy the present studies reveal how the interpretation of the accuracy measures gained from the comparison of the L2- with the L1-data. For example, the data showed that native speakers make mistakes if errors are defined as a violation of a (written) standard form. Therefore, future L2-error coding may preferably use adequate oral task-based L1-performance as a reference point.
Third, with respect to fluency the division into the sub-measures of speed, silence, and breakdown fluency as proposed by Tavakoli and Skehan (2005) seems to address the intuitive dimensions of this construct. Even so, de Jong and Wempe (2009) have introduced an automatic syllable counter into the program PRAAT (Boersma and Weenink 2006). This allows a quick and easy determination of the phonation time ratio, a measure that subsumes the fluency measures of speed and silence.

The present work has shown that sometimes it may be difficult to distinguish between different measures because they are intertwined with each other. For example, breakdown fluency is related to accuracy as repair is triggered by an error. A non-error repair presumably is induced by problems in lexical retrieval, which in turn is related to pausing behavior.

As a whole, study 2 of this book improved the reliability of its measures, analyses, and interpretations as it overcame some methodological and statistical limitations of study 1. The comparison of the two studies therefore reminds us to be cautious, for example, with interpretations based on one out of many measures (see also Pallotti 2009). Similarly, studies may gain in statistical power from calculating statistics on measures that are corrected for sample length, from testing measures for collinearity and redundancy and giving effect sizes (as suggested by Norris and Ortega 2003, 2009a). Luckily, computer applications allow less time-consuming ways such that we can use more reliable performance measures. For example, CLAN (MacWhinney 2000) has the possibility to measure linguistic complexity by means of the lexical measure D (Malvern and Richards 1997) rather than the type-token-ratio.

In sum, the present investigations show a need for new measures that take into account the cognitive aspects of language in use. Even so, adding new measures may not be the solution either. As addressed by Pallotti (2009), ideally researchers should aim at generating a small but reliable set of measures that are used by most studies. After all, ‘what we measure in our individual primary studies will need to be understood in relation to what is being measured in other studies of CAF in other learning contexts’ (Norris and Ortega 2009a: 556).

One step into this direction may be to always include a native speaker baseline when investigating task-based L2-performance. In general, the present studies show how valuable it is to collect native speaker data. As discussed in section 6.4.5 the L1-data many times served as a corroboration of tentative assumptions based on the L2-findings. In addition, comparing L2-performance with L1-performance on the same tasks under the same conditions probably creates a more reliable base for interpretations. In terms of Daller et al. (2003) who distinguish internal and external measures of lexical complexity (cf. section 1.5.2), having native speaker baseline data may produce a ‘text-internal’ (or at least a task specific) reference for any kind of measure. Therefore, native speaker data give important insights for the interpretation of L2-performance measures.

Finally, a limitation of the studies in this book is that they measure L2-performance at a certain moment in time. Accordingly, it is difficult to say anything about L2-development. An aim of task-based research, however, is to give implications for L2-pedagogy. Especially the theory under investigation,
the *Cognition Hypothesis*, presents itself as a guideline for the sequencing of L2-tasks in order to push L2-development (Robinson and Gilabert 2007). Pallotti (2009) warns against making interpretations about development as long as no longitudinal data are collected. Yet, apart from Ferrari (2009) up to now not much work has been based on investigations over time. As these few studies furthermore focus on the evaluation of CAF-constructs, there is a need for studies that investigate developmental data – in particular evaluating Robinson’s predictions about sequencing effects on interlanguage development (Robinson 2010).

### 6.6 Practical implications

Even though the studies in this book do not share the pedagogical aim of the *Cognition Hypothesis* its results may contribute to L2-pedagogy. This section will highlight some practical implications for the L2-classroom.

#### 6.6.1 Challenging tasks may include many elements

The studies presented here fail at giving confirmatory results to Robinson’s (2001b, 2005) *Cognition Hypothesis*. Accordingly, a task including many elements did not push L2-performance with respect to accuracy and linguistic complexity in parallel at the cost of fluency. Only a gain in lexical complexity could be attested.

Turning this conclusion around, there is an interesting implication for the practice of task-based language teaching. After all, the higher number of elements in complex tasks did not harm L2-performance either. That is, also in the task addressing many elements the measures of structural complexity, accuracy, and fluency were stable while lexical complexity increased. This means that L2-learners can work on tasks concerning many elements without showing trade-off effects on other measures, by means of, for example, using simpler syntactic structures, making more errors, or suffering from fluency problems.

A suggestion for language teaching then is that it is good to have tasks with many different elements. At least, the studies at hand show that while L2-learners use similar structures, make similar errors, and keep their pace of speaking, they are able to elaborate their lexical complexity in a task with many elements. In addition, a task addressing many elements made participants speak more.

Similarly, the tasks in study 2 generated more speech than the set of tasks in study 1. Probably the fact that in study 2 the task topic concerned human beings rather than inanimate electronical devices was the reason for this finding (Ellis 2000). Another explanation may be that the tasks in study 2 were more challenging because participants were asked to argue for a combination of people. Probably, combining-tasks are more interesting than giving advice for one single item.

In sum, the studies at hand therefore suggest to favor tasks in the classroom that challenge L2-
learners, e.g., because they address many different items that need to be paired or combined. In the end, more speech also means that L2-learners have more instances of recurring linguistic forms or structures they use. Accordingly, challenging tasks that induce more speech are predicted to create more chances for L2-learners to practice and eventually learn task relevant language.

### 6.6.2 Learning and testing by monologic and dialogic tasks

With respect to the factor interaction, the studies in this book point towards a pushing effect of interactive tasks. In dialogues, L2-learners used a wider range of lexical items, they made fewer mistakes, and were more fluent, while monologues let task performers produce more structurally complex language.

This suggests that in the L2-classroom mostly dialogues should be used for actual speaking tasks. After all, even if they are still learning, students apparently can perform at higher levels of their L2 when they act in pairs. In contrast, monologic settings probably serve as a platform for creating complex syntactic structures.

Also for the practice of grading L2-learners’ task-based performance this finding is important. Most oral language testing is based on individual assessment sessions. The studies in this book, however, suggest that L2-learners possibly display more of their competences when they act in pairs. Ideally, oral performance testing therefore should include a monologic and a dialogic part. It would give second language learners the chance to show their structural competence during monologues and their knowledge with respect to lexical complexity, accuracy, and fluency in dialogues. In addition, a dialogic setting would give insights into the pragmatic abilities of L2-learners.

### 6.6.3 Sequencing tasks

Combining the findings with respect to the factor ± few elements and the factor ± monologic, the results of the studies at hand may be used for the sequencing of tasks. ‘The fundamental pedagogic claim of the Cognition Hypothesis is that pedagogic tasks should be designed, and then sequenced for learners on the basis of increases in their cognitive complexity’ (Robinson and Gilabert 2007: 162). Robinson (2007a, 2010) claims that the L2-learner will gradually approximate target language use in real life by performing a sequence from cognitively simple to complex tasks that are manipulated on resource-directing and resource-dispersing variables.

Table 6.3 on page 142 presents a possible sequence of tasks that is likely to gradually approach language use outside the classroom. It is based on the results of the present studies that point to some concrete manipulations how to raise cognitive task complexity by means of resource-directing and resource-dispersing factors.

First, one may start with a simple task, including only a few elements such that L2-learners can get familiar to a task. In a monologic setting with plenty of pre-task planning time this possibly makes L2-
Table 6.3: Example of task sequencing (following Robinson 2010)

<table>
<thead>
<tr>
<th>DIMENSIONS OF TASK DESIGN</th>
<th>SIMPLE</th>
<th>COMPLEX</th>
</tr>
</thead>
<tbody>
<tr>
<td>± few elements</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td>± planning time</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td>± no reasoning demands</td>
<td>±</td>
<td>±</td>
</tr>
<tr>
<td>± monologic</td>
<td>±</td>
<td>±</td>
</tr>
</tbody>
</table>

CAF-EFFECT

<table>
<thead>
<tr>
<th>structural complexity</th>
<th>lexical complexity</th>
<th>fluency</th>
<th>accuracy &amp; linguistic complexity, accuracy &amp; fluency</th>
</tr>
</thead>
</table>

Learners produce language that, on the one hand, is characterized by a low lexical complexity, accuracy, and fluency. On the other hand, the unlimited time gives the opportunity to build complex linguistic structures.

The second step would confront L2-learners with an increased number of elements such that the L2-learners produce more speech and use a wider range of lexical items with similar syntactic structures.

In a third round, pre-task planning time is removed, L2-learners will have to produce the earlier rehearsed complex structures under online time pressure, which enhances fluency. This increases task complexity by means of a resource-dispersing factor which may affect the automatization of earlier internalized linguistic means Robinson and Gilabert (2007).

The fourth manipulation raises the reasoning demands of the task (e.g., from describing photographs of people to a task where participants need to give arguments for a pair of people). This increase on a resource-directing factor requires the use of structurally more complex features. The focused attention to language results in a parallel increase of the accuracy.

Finally, task performers act in pairs. The results of the present studies suggest that a dialogic task performance creates online planning time while alignment and priming lead to a more elaborate lexis that is accompanied by greater accuracy and fluency. In the end, L2-learners are able to produce, even upon a complex task that includes many elements, a large amount of speech that is elaborate concerning lexical complexity, accuracy, and fluency due to the interactive setting. Because of the earlier training phases from step 1 to 4 on their own, the speech performance is also structurally complex.

Sequencing tasks according to the proposed order gradually brings L2-learners towards real life task performance. Consequently, frequent task cycles of this kind present an L2-learning strategy that possibly pushes L2-development. The table shows, what task characteristic may promote what dimension of task-based L2-performance. That is: planning time may enhance all CAF-dimensions; a higher number of elements apparently increases lexical complexity; increasing the reasoning demands

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9By requiring task performers to finally present (as a monologue) their findings to the whole class, these claims concerning task sequencing possibly serve as a theoretical justification for the think-pair-share-method of teaching (Lyman 1987).
possibly pushes lexical and structural complexity; monologues promote the use of complex linguistic structures while dialogues push accuracy, lexical complexity, and fluency.

Finally, in the classroom it may not be practicable to consider all these steps because teachers may not have their students perform the same task more than once. Therefore educators could chose to include or leave a manipulation and use different tasks with the same underlying structure, like the dating- and study-tasks used in study 2 (see chapters 4 and 5 and appendix B.4).

6.7 Summary

The data of the present book challenge Robinson’s *Cognition Hypothesis*. The factor ± few elements, as manipulated here, did not result in a parallel increase of linguistic complexity and accuracy at the cost of fluency, nor were there any effects on the task-specific measure. In addition, there were no supporting combined effects of cognitive task complexity by interaction.

In light of the mere raise of lexical complexity, the discussion argues that by only increasing the number of elements a task may not affect attentional allocation during task performance as predicted by the *Cognition Hypothesis*. Rather than a different language use, the manipulation resulted in ‘more of the same’ language, i.e., a quantitative change. The factor ± few elements accordingly may not have the potential to affect the cognitive load of a task and direct attentional resources towards task relevant linguistic means.

In contrast, considering the consistent effects of interaction, this work suggests that the factor ± monologic, apart from being an interactive factor, has a cognitive impact too. Manipulated by means of the interactive factor of task condition, dialogues reduce the structural complexity of task performance presumably because they induce frequent interactional moves and interruptions. Taking a cognitive perspective on interaction, the factor ± monologic may be related to resource-dispersing factors of task complexity, like ± planning time. A lower cognitive task complexity induced by a dialogic task therefore may result in a pushing effect with respect to lexical complexity, accuracy, and fluency.

The use of a task-specific measure did not change the interpretation of the data based on global CAF-constructs. In contrast, the availability of a native speaker baseline helped greatly to interpret the data of the present studies.

In sum, the perspective adopted in this book highlighting cognitive and interactive aspects of task-based production, seemed to be a productive way to evaluate the oral performance of L2-learners.