The influence of complexity in monologic versus dialogic tasks in Dutch L2*

Marije C. Michel, Folkert Kuiken, and Ineke Vedder

Abstract

This study puts the Cognition Hypothesis (Robinson 2005) to the test with respect to its predictions of the effects of changes in task complexity (± few elements) and task condition (± monologic) on L2 performance. 44 learners of Dutch performed both a simple and a complex oral task in either a monologic or a dialogic condition. The performance of the L2 learners was analysed with regard to linguistic complexity, accuracy, and fluency. As predicted by the Cognition Hypothesis, the complex task generated more accurate though less fluent speech. Linguistic complexity, however, was only marginally affected. Dialogic tasks triggered more accurate and fluent output though it was structurally less complex. The interaction of task complexity and task condition showed effects on measures of accuracy only: in the monologic but not in the dialogic condition task complexity did promote accuracy. As a consequence, our results only partially support the Cognition Hypothesis.

1. The Cognition Hypothesis and the Triadic Componential Framework

In the last decade Task-Based Language Teaching (TBLT) has become an important field in Second Language Acquisition (SLA) research. In this approach a central role is assigned to tasks in L2 learning. Tasks have been studied from different perspectives, among which a cognitive, information-theoretic approach is advocated by e.g., Skehan and Foster (2001) and Robinson (2001a, 2005, this volume). This view investigates how (cognitive) task factors influence the performance of L2 learners.

Robinson (2005) assumes that some particular factors of task demands direct the learner's attention towards language form. Attention is crucial in L2 learning because "SLA is largely driven by what learners pay attention to" (Schmidt 2001: 3). Robinson proposes a Triadic Componential Framework, also known as the Cognition Hypothesis, that assigns a crucial role to factors of task complexity and factors of task condition, which can be manipulated systematically in task design with beneficial effects on L2 performance. According to the Cognition Hypothesis, increases in task complexity along the so-called resource-directing dimensions lead to both more accurate and more complex L2 performance. Interactive tasks are also thought to direct the learner's attention to language and thus promote more accurate speech. Robinson rejects the idea of trade-off effects in the linguistic output due to limitations of attentional capacity, as proposed by e.g., Skehan and Foster (2001). For a discussion of the predictions of the Limited Attentional Capacity model in contrast to the Cognition Hypothesis see Kuiken and Vedder (this volume).

The aim of the present study is to investigate whether there is empirical evidence for Robinson's claims. The study, which is based on the Cognition Hypothesis as presented in Robinson (2005), focuses on the effects of increased task complexity in a monologic versus a dialogic task condition. In the following sections (1.1 – 1.4) we will briefly present the basic assumptions of the Cognition Hypothesis that are relevant for the study (see Robinson, this volume, for a discussion of the Cognition Hypothesis and the Triadic Componential Framework).

1.1. Task complexity: Cognitive factors

One of the key constructs of the Cognition Hypothesis is cognitive task complexity, which refers to the amount of cognitive processing that is needed to perform a task. According to Schmidt's Noticing Hypothesis (1990, 2001) cognitive task demands are strongly related to what is noticed and noticing is "…the first step in language building" (Schmidt 2001: 31). Within the dimension of cognitive task complexity the Triadic Componential Framework makes a distinction between resource-directing and resource-dispersing factors. Robinson's claim is that when tasks are cognitively more demanding along resource-directing factors (± here and now, ± reasoning demands, ± few elements) L2 learning is promoted, since these tasks trigger linguistically more complex structures and a more varied lexis. For example, having to take into account numerous elements induces lexically more diverse and structurally more complex output because more elements have to be distinguished and compared. This view is based on Givon (1985), who states that structural and functional complexity are associated with each other. In addition, "…uptake and incorporation of forms is more likely to be evident on more complex tasks, since these more effectively direct learner attention to the targeted input…" (Robinson 2001b: 304) and as such SLA is promoted.

To sum up, the Cognition Hypothesis predicts that cognitively complex tasks trigger both greater accuracy and greater linguistic complexity. In contrast, fluency suffers from increased task complexity, since complex tasks are thought to require more explicit and conscious language processing, affecting procedural dimensions like fluency (Robinson 2005).

1.2. Task condition: Interactive factors

Interactive tasks, where students act in pairs, give the opportunity for negotiation for meaning, clarification requests, and comprehension checks. As "…negotiation brings learners' attention to L2 versions of their interlanguage utterances" (Pica, 1994: 514), earlier work relates this heightened (shared) attention to language form to more noticing and uptake (cf. Doughty 2001; Gass 2005; Pica 1994). Robinson also attributes a central role to interactive factors in his Triadic Componential Framework as "interaction is an important context and opportunity for activating processes thought to contribute to SLA" (Robinson 2007: 14).

Robinson (2005, this volume) distinguishes two types of interactive factors: participation factors, making interactional demands (one-way/two-way flow of information, open/closed solution, and convergent/divergent solution) and participant factors, which pose interactant demands (e.g., same/different gender). Being inherent to the task itself, interactional demands are relevant for task design. Moreover, they influence L2 performance irrespective of the individual learner characteristics a participant brings to the task. These interactional demands are nonetheless closely related to and consequently restricted by the target task in real-life situations. For example, talking to a friend on the phone (dialogic) in order to make a date to go to the movies is a two-way flow task, which asks for an open and hopefully convergent solution.

The Cognition Hypothesis does not make clear predictions with regard to the effects of interactivity on particular aspects of L2 performance. The relation between interactivity, heightened attention and noticing, as hypothesized by Schmidt (1990, 2001), Doughty (2001), Gass (2005), and Pica (1994), however, suggests that interactivity favours accuracy, while fluency is expected to decrease. Linguistic complexity will be lower, because the clarification requests and repetitions of the interlocutor's speech will induce shorter and structurally simpler sentences as well as lexically less varied output.

1.3. Cognitively complex interactive tasks

Robinson states that interactivity and task complexity will generate a combined effect on the linguistic complexity of L2 performance. "…Cognitively complex interactive tasks will lead to greater quantities of interaction and modified repetitions" (Robinson 2005: 11) as the cognitive load posed by the complex task requires even more clarification requests and comprehension checks. As a consequence, the Cognition Hypothesis claims that complex interactive tasks affect linguistic complexity of L2 performance negatively because they trigger structurally and lexically less complex speech. The beneficial influence of increased task complexity on accuracy, however, is not thought to be affected differently in dialogic tasks. Similarly to monologic tasks fluency is expected to decrease.

Table 1 summarises the predictions of the Cognition Hypothesis (Robinson 2001b) with regard to the influence of task complexity and interactivity, both separately as well as with regard to their combined effect. Note that the Cognition Hypothesis does not predict any differences between simple monologic and simple dialogic tasks. However, that does contradict our own expectations. As outlined in section 1.2, we predicted higher accuracy, but lower fluency and complexity in dialogic tasks.

Table 1 about here

1.4. Previous research on task complexity and task condition within the Cognition Hypothesis

Positive effects of increased task complexity as proposed by Robinson have been found in several studies in which the factor ± here and now was manipulated (Robinson 1995; Rahimpour 1997; Iwashihta, MacNamarra, and Elder 2001; Gilabert 2007).

In a series of experiments concerning L2 writing Kuiken, Mos, and Vedder (2005) and Kuiken and Vedder (2007, this volume) operationalised the factor ± few elements. Their data partially confirmed the Cognition

Hypothesis, as increased task complexity resulted in more accurate writing. With respect to complexity they report a trend for higher lexical variation in the more complex task while no significant effect was found on syntactic complexity.

In an oral interactive task Robinson (2001a) manipulated the factor ± few elements. The complex task prompted significantly more lexically varied speech than the simple task but neither structural complexity nor accuracy revealed any significant effects. Fluency decreased in the complex version. An effect of task complexity on interactivity was that participants needed significantly more comprehension checks and displayed a trend for more clarification requests in the complex task.

Nuevo (2006) found contradictory evidence for the Cognition Hypothesis with respect to the influence of interactivity. Her study analysed the amount of learning opportunities induced by the task in interactive simple versus complex tasks manipulated on the factor ± reasoning demands. Results reveal that the simple task led to more interaction and clarification requests while increased task complexity did not affect accuracy in a post test.

To sum up, the empirical research up to now has not given a conclusive picture with respect to the claims of the Cognition Hypothesis. Especially the predicted effects of ± monologic task conditions in combination with increased task complexity have not yet been tested systematically.

2. Research questions, method, and design

In the present study we put the Cognition Hypothesis (Robinson 1995, 2005, this volume) to the test. Our aim is to collect data on oral tasks that manipulate two factors of the Triadic Componential Framework: cognitive task complexity, with respect to the factor ± few elements and task condition, concerning the factor ± monologic. Our research questions are:

(1) What are the effects of increased cognitive task complexity, manipulated along the factor ± few elements on the oral performance of second language learners?

(2) What are the effects of changes in task condition with respect to the factor ± monologic on the oral performance of second language learners?

(3) Are there any interaction effects of cognitive task complexity and ± monologic task condition on the oral performance of second language learners?

To analyse the L2 performance of the participants measures of accuracy, complexity, and fluency were used. Our hypotheses H1 and H3 with respect to research questions (1) and (3) are based on the Cognition Hypothesis. The second hypothesis (H2), concerning research question 2, is based on our predictions pointed out in section 1.2. Our hypotheses are as follows:

(H1) Increased cognitive task complexity along the resource-directing factor ± few elements will have a beneficial effect on the performance of L2 learners in that their speech will be more accurate and linguistically more complex. Fluency will suffer from increased task complexity.

(H2) Changes in task condition along the factor ± monologic will affect the performance of L2 learners in so far that in dialogic tasks, the oral output will be syntactically and lexically less complex than in monologic tasks. Accuracy will be promoted in the interactive task condition but fluency will suffer.

(H3) Combined effects of increased cognitive task complexity (± few elements) and changes in task condition (± monologic) will influence the performance of L2 learners in so far that in dialogic tasks linguistic complexity will suffer even more from increased task complexity than in monologic tasks. However, similarly to complex monologic tasks, complex dialogic tasks will push learners to greater accuracy while fluency will decrease.

2.1. Method

2.1.1. Participants

The participants of the study were 44 L2 learners of Dutch, 29 Moroccan and 15 Turkish, who had had their first contact with Dutch after puberty (mean age: 27.7 years, SD 6.4). Moroccans and Turks form the two largest groups of immigrants in the Netherlands; 9% of the population of Amsterdam is constituted by Moroccans and 5% by Turks. The 27 females and 17 males were selected from four different language institutes in Amsterdam where they attended classes for students with a higher educational background. As they were about to take or just had taken the State Examination for Dutch as a second language, the participants were classified to be at an intermediate level of proficiency, i.e. level B1/B2 of the Common European Framework of Reference for Languages (cf. Witte and Mulder 2006).

A cloze task where every eleventh word was eliminated revealed a mean score of 21 out of 50 (SD 9.3).

2.1.2. Procedure and Tasks

In a 2 x 2 design with ± few elements as a within-subject factor and ± monologic as a between-subject factor 22 participants performed in a monologic and 22 in a dialogic condition. They all did a simple (+ few elements) and a complex (– few elements) task. Table 2 presents a schematic overview of the task factors manipulated in the study at hand.

Table 2 about here

Participants received a full-colour leaflet with two electronic devices (MP3 players or mobile phones) in the simple task and with six devices in the complex version. The gadgets differed from each other in seven relevant features (e.g., price, colour, capacity). Two versions of the same leaflet were created concerning either MP3 players or mobile phones. In the two versions, the features of the mobile phones or MP3 players were either identical or replaced by analogous information. The order of presentation of the different versions was counterbalanced over participants.

In the monologic setting, participants were told to leave a message on the answering machine of a friend who had asked for advice about the MP3 player or mobile phone he or she should buy. In the dialogic setting, participants discussed with each other on the phone about the type of MP3 player or telephone they would buy.

2.2. Production measures: Accuracy, complexity and fluency

Speech samples were transcribed using CLAN (MacWhinney 2000). The output was coded for measures of production in terms of accuracy, linguistic complexity and fluency. The Assessment-of-Speech unit (AS unit) by Foster, Tonkyn, and Wigglesworth (2000) was chosen as the basic syntactic unit of analysis.

With respect to accuracy, we employed one general performance measure, i.e. the total number of errors per AS unit, and two specific measures, i.e. the number of lexical errors as well as the total number of omissions (of articles, verbs, and subjects), both in relation to the number of AS units. Furthermore, two measures with respect to self-repairs were included: the ratio of self-repairs in relation to the number of errors as well as the percentage of self-repairs related to the total number of words. These repair measures were chosen because repair behaviour is thought to reflect the speaker's self-monitoring and therefore is an indication of learners' attention to form (cf. Gilabert this volume).

Structural complexity was measured by means of the total number of clauses per AS unit and by a subordination index: the ratio of subordinate clauses per total number of clauses. Lexical complexity was measured by Guiraud's Index of Lexical Complexity (Guiraud 1954) and the percentage of lexical words in relation to the total number of words. Guiraud's Index, which is calculated by dividing the number of types by the square root of the number of tokens, is thought to be more appropriate than the type-token ratio (TTR), as it takes sample length into account (Vermeer 2000). The second measure, i.e. the percentage of lexical words, was used following earlier studies (Gilabert 2005; Rahimpour 1997; Robinson 1995).

Two measures of fluency were chosen on the basis of Mehnert (1998) and Yuan and Ellis (2003): Speech Rate A, i.e. the ratio of syllables per minute in unpruned speech (including reformulations, repetitions, and replacements), and Speech Rate B, the ratio of syllables per minute in pruned speech (without reformulations, repetitions, and replacements). Furthermore, the number of filled pauses (e.g., uhm) per hundred words was calculated as a measure of breakdown fluency (cf. Skehan and Foster 2005).

This results in five measures of accuracy, four of complexity, and three of fluency respectively as listed in table 3.

Table 3 about here

----

3. Results

The statistical analysis consisted of a multivariate repeated measures analysis of variance (MANOVA) with task complexity (± complex) as within subject-factor and task condition (± monologic) as a between-subject factor. Three different MANOVAs were conducted on the five measures of accuracy, the four measures of complexity and the three measures of fluency respectively.

Table 4 gives the descriptive statistics of the means and standard deviations on the measures of accuracy, complexity, and fluency.

Table 4 about here

The means of the total scores on the simple versus complex task indicate the direction of possible effects on L2 performance. Table 4 shows that complex tasks generally yielded a higher accuracy, as measured by the number of errors, omissions and the ratio of repairs to errors, while the percentage of repairs went in the opposite direction in simple tasks, i.e. the percentage of repairs is lower. Structural complexity decreased, but lexical complexity increased in complex tasks. Fluency is higher in simple tasks with respect to both speech rates.

Comparison of the monologic and dialogic condition suggests that dialogues yielded more accurate speech with regard to the number of errors, omissions, and the ratio of repairs per errors. The percentage of repairs, however, was higher in monologues. Monologues also produced a higher structural complexity. Lexical complexity increased in dialogues, but only with respect to Guiraud's Index. Dialogic tasks yielded more fluent speech.

In the following sections the results are presented of the three MANOVAs on measures of accuracy, complexity, and fluency in order to detect the statistical power of the observed differences.

3.1. Accuracy

Table 5 lists the statistics on the different measures of accuracy by means of the repeated measures MANOVA.

Table 5 about here

With respect to accuracy there are significant main effects of task complexity ($F(38,5) = 5.78$, $p < 0.001$) and of task condition ($F(38,5) = 7.62$, $p < 0.001$), while the combined effect did not reach significance (task complexity x task condition: $F(38,5) = 2.28$, $p = 0.07$). Participants were significantly more accurate on complex tasks. Similarly dialogues yielded more accurate speech.

Concerning the separate measures, a significant effect of increased task complexity is reflected only in the total number of errors per AS unit ($F(42,1) = 6.63$, $p < 0.01$), while neither lexical errors or omissions, nor the repair behaviour yielded significant results.

The main effect of task condition can be detected in a robust effect on error countings. The interactive task generated significantly more accurate speech with regard to the total number of errors ($F(42,1) = 41.72$, $p < 0.001$), lexical errors ($F(42,1) = 20.86$, $p < 0.001$), and omissions ($F(42,1) = 14.95$, $p < 0.001$) per AS unit. Again, repair behaviour was not significantly affected.

An interaction effect of task complexity and task condition was found with respect to three measures of accuracy. Increased task complexity did produce more accurate speech in the monologic task condition only concerning the total number of errors ($F(42,1) = 7.63$, $p < 0.01$), lexical errors ($F(42,1) = 5.26$, $p < 0.05$), and omissions per AS unit ($F(42,1) = 3.99$, $p = 0.05$). Once again, the repair behaviour of the participants was not significantly affected.

3.2. Complexity

In the general analysis, linguistic complexity was not affected significantly by increased task complexity. Task condition however, did generate a significant main effect ($F(39,4) = 10.12$, $p < 0.001$). No combined effects of task complexity and task condition were found. In table 6, the results of the repeated measures MANOVA on the different measures of complexity are listed.

Table 6 about here

Of the different measures of linguistic complexity, the percentage of lexical words was significantly affected by task complexity ($F(42,1) = 4.47$, $p < 0.05$), in so far that the complex task generated more diverse speech. Other comparisons on measures of linguistic complexity did not reach significance.

Task condition did yield significant differences on both measures of structural complexity while lexical complexity was not affected. In dialogues, participants produced syntactically simpler structures than in monologues (number of clauses per AS unit: $F(42,1) = 29.37$, $p < 0.001$; subordination index: $F(42,1) = 8.87$, $p < 0.01$). None of the combined effects of task complexity and task condition was significant.

3.3. Fluency

With respect to fluency, both increased task complexity ($F(40,3) = 3.55$, $p < 0.05$) and the dialogic task condition ($F(40,3) = 5.38$, $p < 0.01$) displayed a significant main effect: complex tasks produced less fluent speech, while dialogic tasks generated a higher fluency. There was no combined effect of task complexity and task condition. In table 7, the statistics on the different measures of fluency established by means of the repeated measures MANOVA are listed.

Table 7 about here

Task complexity did affect the participants' fluency with respect to the measure of unpruned speech only (Speech Rate A: $F(42,1) = 7.46$, $p < 0.01$). On this measure complex tasks led to less fluent speech.

Task condition did significantly affect the participants' behaviour on all three measures. In dialogic tasks participants were more fluent both on unpruned speech ($F(42,1) = 10.71$, $p < 0.01$) and on pruned speech ($F(42,1) = 13.65$, $p < 0.001$), and they produced significantly fewer filled pauses ($F(42,1) = 13.17$, $p < 0.001$).

There was no significant interaction effect of task complexity and task condition on any of the complexity measures.

3.4. Summary of results

Task complexity did yield significant effects for accuracy and fluency in the overall analysis. Regarding the different performance measures, the oral output of the participants was influenced significantly on only one accuracy measure: with respect to the total number of errors per AS unit the complex task generated more accurate speech. Similarly, one measure of linguistic complexity, i.e., the percentage of lexical words, showed beneficial effects of increased task complexity, while structural complexity was not affected. Complex tasks generated less fluent speech, but only one of the three fluency measures (unpruned speech rate) displayed a significant influence.

Task condition did have significant effects on measures of accuracy, complexity, and fluency. In the dialogic condition participants made fewer errors and omitted fewer words than in the monologic condition. In addition, the dialogic condition triggered simpler sentences, as established significantly by both structural measures. Participants were significantly more fluent in the dialogic tasks on both speech rates and produced fewer filled pauses.

No robust combined effect of task complexity and task condition was found, but the effects on accuracy were significant for the error and omission countings: complex tasks in the monologic condition yielded fewer errors and omissions while in the dialogic condition increased task complexity did not affect accuracy.

4. Discussion

The aim of the present study was to investigate the predictions of the Cognition Hypothesis (Robinson 2005) concerning the effects of the manipulation of task complexity (± few elements) and task condition (± monologic). In addition we were interested in the question whether task complexity and task condition yielded any combined effects.

4.1. Hypothesis 1: Effects of task complexity

Task complexity significantly affected overall accuracy: we found a beneficial effect of increased task complexity on accuracy. However, the effect was reflected in only one accuracy measure. The general direction of the differences in our data, however, suggests that increased task complexity has a positive effect on accuracy measures. Our data are in line with the results of e.g., Gilabert (2007), Kuiken, Mos, and Vedder (2005), and Robinson (1995), who found strong effects of increased task complexity on accuracy. Unlike Gilabert (2007), we did not find any effects on repair behaviour. Nevertheless, we conclude that the positive effect on accuracy (at least on error countings) seems to be a stable effect of increases in task complexity along the resource-directing factors.

Linguistic complexity did not reveal any significant effects of task complexity apart from the effect on one measure of lexical complexity. Again, earlier work of Kuiken, Mos, and Vedder (2005) is replicated, where a minor effect on lexical complexity was found too.

As expected, increased task complexity did significantly affect fluency in the overall analysis in so far that speech became less fluent in complex tasks. Again, the effect was significantly reflected only for one measure, i.e. the unpruned Speech Rate A. In contrast, Speech Rate B (pruned speech) and the number of filled pauses are not significantly affected. Perhaps our measures of repair behaviour in accuracy, which were not affected by task complexity either, and these two fluency measures are related to the same construct "repair" rather than to accuracy or fluency. Ellis and Yuan (2005) for example did use the number of reformulations as a measure of fluency and not of accuracy.

In this study, the predictions of the Cognition Hypothesis about the effect of increased task complexity along the resource-directing variables summarised in our first hypothesis (H1) have partially been confirmed. Increased task complexity did promote accuracy and a small effect on lexical complexity was found. Fluency suffered from increased complexity. However, on the basis of the direction of the observed differences on measures of accuracy and complexity, it could be argued that our data reject the existence of trade-off effects between these measures (Skehan and Foster 2001). Increased task complexity seems to direct the learner's attention to language form and thus has a beneficial effect on task performance in L2.

4.2. Hypothesis 2: Effects of task condition

Task condition significantly affected all three performance measures. Our participants made significantly fewer errors in the dialogic task condition than in the monologic version. This result is in line with the suggestions of earlier work on interactive tasks that interactivity promotes attention to language form. Contrary to Schmidt's Noticing Hypothesis (Schmidt 2001) we did not find any effects on monitoring that were reflected in the repair behaviour of our participants. It may be that interactivity on the one hand pushes attention to language form, resulting in more accurate speech, but on the other hand the quick turn-taking in the dialogic tasks did not allow for extensive self-monitoring.

With respect to structural complexity, the findings are in line with the Cognition Hypothesis: in the dialogic task structural complexity decreased significantly. This confirms that interactivity indeed affects structural complexity negatively and suggests that the shorter and syntactically simpler sentences produced in the dialogic tasks were caused by clarification requests and confirmations.

Contrary to our expectations, lexical complexity did not suffer from interactivity. Since dialogues consist of many modified repetitions of (the interlocutor's) speech, they are likely to result in lexically less varied output. In our analysis, however, we looked only at the oral output of each single participant, without relating it to the speech sample of the interlocutor. Consequently, any repetitions of the partner's utterances have not been included in our analysis. This is possibly a reason why the present data set does not yield any significant effects on lexical complexity.

Surprisingly, our participants were significantly more fluent in the dialogic task than in the monologic task on all three measures of fluency. This finding might be explained by the quick turn-taking behaviour in the phone tasks. As soon as a participant paused in the dialogic condition, the interlocutor tried to help and immediately started speaking. In the monologues, participants acted alone without any help of an interlocutor.

Our second hypothesis (H2) has been partially confirmed: interactivity positively influences accuracy but negatively affects structural complexity.

Effects on lexical complexity could not be shown, possibly due to the nature of the analysis. The observed beneficial effects on fluency might be explained by the quick turn-taking behaviour in the interactive condition.

4.3. Hypothesis 3: Combined effects of task complexity and task condition

There was no significant overall effect of task complexity and task condition in interaction. However, accuracy as a whole displayed a trend, and on separate error measures significant results were found with respect to the total number of errors, the number of lexical errors, and the number of omissions. In the complex tasks in the monologic condition there was more accurate speech. However, in the dialogic condition, this beneficial effect of increased task complexity disappeared. Linguistic complexity and fluency did not display any significant effects.

As predicted by the Cognition Hypothesis, no significant combined effect on fluency was found. Nevertheless, these data corroborate the positive effect of dialogic task conditions on fluency. The observed positive effect of interactivity, however, seems not to be influenced by increases in task complexity.

Our results do not confirm the predictions of the Cognition Hypothesis with respect to measures of accuracy and linguistic complexity. No combined effects were found on measures of linguistic complexity. Structural complexity did not suffer more from increased task complexity in dialogic tasks compared to monologic tasks. No combined effects were found with respect to lexical complexity either. In our data we could not find evidence for more clarification requests and comprehension checks in complex interactive tasks in comparison to simple interactive tasks. However, as we focused in our analysis on structural and lexical measures of complexity but, unlike Nuevo (2006), we did not consider clarification requests and confirmation checks, we cannot draw the conclusion that this kind of negotiation did not take place. Since the increase of this kind of conversational turns is one of the basic arguments for the claims of the Cognition Hypothesis with regard to the effects on linguistic complexity, future research should also take this kind of utterances into consideration, together with linguistic complexity measures.

The only significant interaction effect of task complexity and task condition that was found contradicts the predictions of the Cognition Hypothesis. In our study, accuracy was positively affected by increased task complexity in a monologic condition but in the complex dialogic tasks this effect disappeared.

Positive effects on accuracy of task complexity in dialogues were not found by Robinson (2001a) or Nuevo (2006) either. In addition, most earlier work, in which it was found, that increases of task complexity promoted accuracy, was conducted in a monologic condition e.g., in which a picture story had to be told (Gilabert 2007; Iwashihta, MacNamarra, and Elder 2001; Rahimpour 1997; Robinson 1995). On the basis of these studies, we may conclude that there does not seem to be a beneficial effect on accuracy of task complexity in interactive tasks, as predicted by the Cognition Hypothesis, which means that this claim of the Cognition Hypothesis has to be rejected.

The third hypothesis (H3) is not confirmed by the present study and our results do not support the predictions of the Cognition Hypothesis about combined effects of increased cognitive task complexity (± few elements) and changes in task condition (± monologic). The beneficial effect of task complexity on accuracy disappeared in the dialogic condition. Complexity did not display any (stronger) negative effects of increased task complexity in dialogic tasks. Furthermore, fluency was enhanced by interactivity, both in the complex and in the simple task but no combined effect was significant.

5. Conclusion

To our knowledge, this study is the first that systematically investigates the predicted effects of task complexity and task condition put forward by the Cognition Hypothesis. Our results replicate earlier work in so far that positive effects of increased task complexity were found on accuracy, together with a minor positive effect on lexical complexity, whereas fluency decreased. Therefore, our first hypothesis (H1), based on the Cognition Hypothesis is partially confirmed.

Our second hypothesis (H2) has been confirmed with respect to accuracy and structural complexity. Beneficial effects of interactivity could be attested with respect to accuracy. As predicted by the Cognition Hypothesis, linguistic complexity decreases in dialogic tasks, but only on structural measures. The lack of effects on lexical complexity might be due to the way in which the analysis was carried out. The observed positive effects of interactivity on fluency, contrary to our expectations, might be explained by the quick turn-taking behaviour on our tasks.

With respect to the third hypothesis (H3) and the predictions of the Cognition Hypothesis, our study challenges Robinson's claims concerning the combined effects of increased cognitive task complexity and interactivity. The only interaction effect we found contradicts Robinson's predictions: the positive effects of increased task complexity on measures of accuracy found in the monologic condition disappeared in the dialogic condition. Moreover, linguistic complexity did not reveal any evidence for a combined effect.

Future research should explore the combined effects of the factors mentioned in the Cognition Hypothesis in more detail. Moreover, it is important to test native speakers as a baseline in order to find out what the effect of increased task complexity and changes in task condition on oral performance in L1 is.

6. Affiliation and author's e-mail address

University of Amsterdam
m.c.michel@uva.nl

7. Notes

* This study was made possible by the Amsterdam Centre of Language and Communication (ACLC) of the University of Amsterdam (UvA). Our word of thanks goes to Gabriele Pallotti and Rob Schoonen for support on methodological and statistical questions.

8. References

Doughty, Catherine (2001). Cognitive underpinnings of focus on form. In *Cognition and Second Language Instruction*, Peter Robinson (ed.), 206-257. Cambridge, Cambridge University Press.

Ellis, Rod and Fangyuan Yuan (2005). The effects of careful within-task planning on oral and written task performance. In *Planning and Task Performance in a Second Language*, Rod Ellis (ed.), 167-192. Amsterdam/Philadelphia, John Benjamins Publishing Company.

Foster, Pauline, Alan Tonkyn, and Gillian Wigglesworth (2000). Measuring spoken language: A unit for all reasons. *Applied Linguistics* 21 (3): 354-375.

Gass, Susan M. (2005). Input and interaction. In *The Handbook of Second Language Acquisition*, Catherine Doughty and Michael H. Long (eds.), 224-255. Malden, Blackwell Publishing Ltd.

Gilabert, Roger (2005). Task Complexity and L2 Narrative Oral Production. Ph.D. diss., Barcelona, Universitat de Barcelona.

- (2007). The simultaneous manipulation of task complexity along planning time and +/- here-and-now: Effects on L2 oral production. In *Investigating Tasks in Formal Language Learning*, Maria P. García Mayo (ed.), 44-68. Clevedon, Multilingual Matters.

- (this volume).

Givon, Talmy (1985). Function, structure, and language acquisition. In *The Crosslinguistic Study of Language Acquisition*, Dan I. Slobin. Hillsdale, NJ, Erlbaum. 1: 1008-1025.

Guiraud, P. (1954). *Les caractères statistiques du vocabulaire*. Paris, Presses universitaires de France.

Iwashihta, Noriko, Tim MacNamarra, and Catherine Elder (2001). Can we predict task difficulty in an oral proficiency test? Exploring the potential of an information-processing approach to task design. *Language Learning* 51: 401-436.

Kuiken, Folkert, Maria Mos, and Ineke Vedder (2005). Cognitive task complexity and second language writing performance. In *Eurosla Yearbook*, Susan H. Foster-Cohen, Maria P. García Mayo and Jasone Cenoz. Amsterdam, John Benjamins. 5: 195-222.

Kuiken, Folkert and Ineke Vedder (2007). Cognitive task complexity and linguistic performance in French L2 writing. In *Investigating Tasks in Formal Language*

Learning, Maria P. García Mayo (ed.), 117-135. Clevedon, Multilingual Matters.

- (this volume).

MacWhinney, Brian (2000). *The CHILDES project: Tools for analyzing talk*. Mahwah, NJ, Lawrence Erlbaum Associates.

Mehnert, Uta (1998). The effects of different lengths of time for planning on second language performance. *Studies in Second Language Acquisition* 20: 52-83.

Nuevo, Ana-Maria (2006). Task Complexity and Interaction. Ph.D. diss., Georgetown, Georgetown University.

Pica, Teresa (1994). Research on negotiation: What does it reveal about second language learning conditions, processes, and outcomes? *Language Learning* 44: 493-527.

Rahimpour, Massoud (1997). Task Condition, Task Complexity, and Variation in L2 Discourse. Ph.D. diss., University of Queensland, Australia.

Robinson, Peter (1995). Task complexity and second language narrative discourse. *Language Learning* 45: 99-140.

- (2001a). Task complexity, task difficulty and task production: Exploring interactions in a componential framework. *Applied Linguistics* 22 (1): 27-57.

- (2001b). Task complexity, cognitive resources, and syllabus design: a triadic framework for examining task influences on SLA. In *Cognition and Second Language Instruction*, Peter Robinson (ed.), 287-318. Cambridge, Cambridge University Press.

- (2005). Cognitive complexity and task sequencing: Studies in a componential framework for second language task design. *International Review of Applied Linguistics* 43: 1-32.

- (2007). Criteria for classifying and sequencing pedagogic tasks. In *Investigating Tasks in Formal Language Learning*, Maria P. García Mayo (ed.), 7-26. Clevedon, Multilingual Matters.

- (this volume).

Schmidt, Richard (1990). The role of consciousness in second language learning. *Applied Linguistics* 11: 17-46.

- (2001). Attention. In *Cognition and Second Language Learning*, Peter Robinson (ed.), 3-32. Cambridge, Cambridge University Press.

Skehan, Peter and Pauline Foster (2001). Cognition and tasks. In *Cognition and Second Language Instruction*, Peter Robinson (ed.), 183-205. Cambridge, Cambridge University Press.

- (2005). Strategic and on-line planning: The influence of surprise information and task time on second language performance. In *Planning and Task Performance in a Second Language*, Rod Ellis (ed.), 193-218. Amsterdam/Philadelphia, John Benjamins Publishing Company.

Vermeer, Anne (2000). Coming to grips with lexical richness in spontaneous speech data. *Language Testing* 17 (1): 65-83.

Witte, Femmy and Froukje Mulder (eds.) (2006). *Staatsexamen NT2 op de Arbeidsmarkt. Informatiebulletin over het diploma Nederlands als tweede taal in*

bedrijf en beroepsopleidingen [State Examination Dutch as a Second Language (NT2) on the Job Market. Information Bulletin about the Certificate NT2 in Business and Professional Education] 18, Instituut voor Taalonderzoek en Taalonderwijs Anderstaligen. Retrieved April 18, 2007, from the Expertise Centrum NT2 Web site:
http://www.expertisecentrumnt2.nl/staat/downloads/NT2%20nr%2018%20-%2009-2006.pdf.

Yuan, Fangyuan and Rod Ellis (2003). The effects of pre-task planning and on-line planning on fluency, complexity and accuracy in L2 monologic oral production. *Applied Linguistics* 24 (1): 1-27.

Table 1. Predicted effects of interactivity and complexity

Task		measure		
		accuracy	complexity	fluency
monologue	simple	–	–	+
	complex	+	+	–
dialogue	simple	–	–	+
	complex	+	–	–

Table 2. Manipulated factors

		TASK CONDITION *(interactive factors)* between-subjects *monologue*	 *dialogue*
TASK COMPLEXITY *(cognitive factors)* within-subjects	simple	+ few elements + monologue	+ few elements – monologue
	complex	– few elements + monologue	– few elements – monologue

Table 3. Measures of accuracy, complexity, and fluency used in the present study

Accuracy	*Complexity*	*Fluency*
total number of errors per AS unit	total number of clauses per AS unit	Speech Rate A
number of lexical errors per AS unit	subordination index	Speech Rate B
number of omissions per AS unit	percentage of lexical words	number of filled pauses per 100 words
percentage of self-repairs	Guiraud's Index	
ratio of self-repairs to errors		

Table 4. Descriptive statistics of all measures: Means (Standard Deviations)

	TASK COMPLEXITY					
	simple			*complex*		
	TASK CONDITION			*TASK CONDITION*		
measure	*monologue*	*dialogue*	*total simple*	*monologue*	dialogue	total complex
	ACCURACY					
errors/AS	2.03 (0.83)	0.83 (0.35)	1.43 (0.87)	1.50 (0.62)	0.85 (0.38)	1.17 (0.60)
lex. errors/AS	0.49 (0.35)	0.15 (0.14)	0.32 (0.31)	0.31 (0.25)	0.17 (0.11)	0.24 (0.20)
omissions/AS	0.64 (0.42)	0.25 (0.17)	0.45 (0.37)	0.47 (0.35)	0.27 (0.15)	0.37 (0.28)
% repairs	3.62 (2.90)	2.74 (1.89)	3.18 (2.46)	3.76 (3.56)	2.93 (1.36)	3.34 (2.69)
repairs/errors	17.14 (15.24)	31.01 (36.93)	24.08 (28.79)	21.20 (22.21)	24.11 (15.24)	22.65 (18.88)
	COMPLEXITY					
clauses/AS	1.52 (0.25)	1.26 (0.14)	1.39 (0.24)	1.42 (0.17)	1.27 (0.13)	1.34 (0.17)
subord. index	0.14 (0.12)	0.08 (0.05)	0.11 (0.10)	0.11 (0.05)	0.07 (0.06)	0.09 (0.06)
% lexical words	54.51 (6.42)	52.61 (6.59)	53.56 (6.50)	55.12 (7.35)	56.09 (5.96)	55.61 (6.63)
Guiraud	5.88 (0.59)	6.19 (0.90)	6.04 (0.77)	6.12 (0.50)	6.27 (0.95)	6.19 (0.75)
	FLUENCY					
speech Rate A	134.96 (32.02)	170.60 (34.30)	152.78 (37.42)	132.20 (32.40)	158.07 (31.28)	145.14 (34.09)
speech Rate B	103.93 (28.18)	139.78 (30.92)	121.86 (34.40)	104.38 (31.20)	131.51 (28.53)	117.95 (32.57)
filled pauses/ 100 words	24.30 (10.36)	16.38 (6.50)	20.34 (9.44)	25.34 (10.49)	15.82 (7.73)	20.58 (10.30)

AS = Assessment of Speech unit; lex. errors = lexical errors; % = percentage; subord. index = subordination index; Guiraud = Guiraud's Index of lexical diversity by means of types/√ tokens; Speech Rate A = syllables per minute in unpruned speech; Speech Rate B = syllables per minute in pruned speech

Table 5. Results of the repeated measures MANOVA on accuracy

ACCURACY				
Overall effects on accuracy		*df*	*F*	*p*
task complexity		5	5.78	0.001**
task condition		5	7.62	0.001**
task complexity X task condition		5	2.28	0.07
Effects on different measures of accuracy		*df*	*F*	*p*
task complexity	*errors per AS*	1	6.633	0.01**
	lexical errors per AS	1	3.253	0.08
	omissions per AS	1	2.463	0.12
	percentage of repairs	1	0.089	0.77
	ratio of repairs to errors	1	0.083	0.76
task condition	*errors per AS*	1	41.72	0.001**
	lexical errors per AS	1	20.86	0.001**
	omissions per AS	1	14.95	0.001**
	percentage of repairs	1	2.53	0.12
	ratio of repairs to errors	1	2.49	0.12
Interaction effects on different measures of accuracy		*df*	*F*	*p*
task complexity X task condition	*errors per AS*	1	7.627	0.01**
	lexical errors per AS	1	5.264	0.03*
	omissions per AS	1	3.991	0.05*
	percentage of repairs	1	0.001	0.97
	ratio of repairs to errors	1	1.23	0.27

AS = Assessment of Speech unit; * = p < 0.05; ** = p < 0.01

Table 6. Results of the repeated measures MANOVA on linguistic complexity

LINGUISTIC COMPLEXITY				
Overall effects on linguistic complexity		*df*	*F*	*p*
task complexity		4	2.19	0.088
task condition		4	10.12	0.001**
task condition X task complexity		4	1.28	0.26
Effects on different measures of linguistic complexity		*df*	*F*	*p*
task complexity	*clauses per AS*	1	1.53	0.22
	subordination index	1	1.37	0.25
	percentage of lexical words	1	4.47	0.04*
	Guiraud's Index	1	1.61	0.21
task condition	*clauses per AS*	1	29.37	0.001**
	subordination index	1	8.87	0.005*
	percentage of lexical words	1	0.07	0.79
	Guiraud's Index	1	1.46	0.23
Interaction effects on different measures of complexity		*df*	*F*	*p*
task complexity X task condition	*clauses per AS*	1	1.61	0.21
	subordination index	1	0.23	0.64
	percentage of lexical words	1	2.21	0.15
	Guiraud's Index	1	0.41	0.52

AS = Assessment of Speech unit; * = p < 0.05; ** = p < 0.01;

Table 7. Results of the repeated measures MANOVA on the different measures of linguistic complexity

FLUENCY				
Overall effects on fluency		*df*	*F*	*p*
task complexity		3	3.55	0.023*
task condition		3	5.38	0.003**
task complexity X task condition		3	1.80	0.16
Effects on different measures of fluency		*df*	*F*	*p*
task complexity	*speech Rate A*	1	7.46	0.009**
	speech Rate B	1	1.97	0.17
	filled pauses per 100 words	1	0.04	0.85
task condition	*speech Rate A*	1	10.71	0.002**
	speech Rate B	1	13.65	0.001**
	filled pauses per 100 words	1	13.17	0.001**
Interaction effects on different measures of fluency		*df*	*F*	*p*
task complexity X task condition	*speech Rate A*	1	3.05	0.09
	speech Rate B	1	2.45	0.13
	filled pauses per 100 words	1	0.43	0.51

Speech Rate A = number of syllables per minute in unpruned speech;
Speech Rate B = number of syllables per minute in pruned speech;
* = $p < 0.05$; ** = $p < 0.01$;