Task complexity, modality, and working memory in L2 task performance

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Abstract

Despite the prolific research on the effects of task complexity on performance, the applicability of the research findings on other task modes is limited due to its focus on oral language. Modality has recently started to gain interest for its potential for L2 development, and learner variables such as working memory is expected to mediate between task effects and performance. This study investigates the roles of task complexity and modality in task performance. It further examines how working memory is associated with task performance and mediates the effects of task variables on performance. Thirty-nine participants performed four argumentative tasks, which differed in task complexity and modality. Working memory was measured via reading span and operation span tests, and task performance was evaluated in terms of complexity, accuracy, and fluency. The results revealed that task complexity produced increased syntactic complexity but only by the phrasal-level measure. Task complexity led to decreased accuracy, but fluency was not affected by task complexity. Task complexity effects were similar across modalities. As for modality on performance, speaking was more accurate, but less fluent than writing. Interestingly, speaking produced higher syntactic complexity than writing. No significant relationship existed between working memory and any performance measures.

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1. Introduction

One of the key principles of task-based language teaching (TBLT) is that second language (L2) acquisition processes are facilitated when learners engage in real-world communicative tasks and produce language output. Learner output has received much research investigation as both a product and a process of learning (Leow, 2015). As tasks engages learners into various acquisition processes (i.e., noticing the gap, hypothesis testing, automatization), task performance has been considered to reflect language learning processes (e.g., Shehadeh, 2005). This has motivated researchers to focus on language output or task performance with research agenda of identifying conditions in which learning processes are maximally facilitated (Gilabert, Manchón, & Vasilyte, 2016).

Task complexity, the manipulation of the cognitive demand of a task, has been probably the most widely researched task feature to influence task performance. A gradual increase in task complexity is expected to direct learner attention to language form, promoting language development (Robinson, 2001), and this assumption has been widely tested. Despite the prolific research on task complexity, however, findings are still inconsistent partly due to different methodologies and measurement adopted in the studies, and the generalizability of the findings to different modes is limited due to the fact that
research to date has focused on oral task performance (for a review, see Jackson & Suethanapornkul, 2013). Therefore, the effects of task complexity on performance should be tested in other task production modes.

Related to this, another under-researched area concerns the role of modality in task performance. While the scope of modality is comprehensive to include various channels of communication (i.e., computer-mediated communication, face-to-face, sign languages) and different stages of language processing (i.e., input, output), the scope of discussion in this study will be limited to the contrast between speaking and writing in output production. Research on tasks has focused on oral language development to date, but there has been growing interest in the potential of writing for L2 development, and modality thus has started to gain attention as a task feature (Byrnes, 2014; Gilabert et al., 2016; Ortega, 2012). According to Gilabert et al. (2016), although modality can be seen as merely distinct learning environments, researching the contrast between speaking and writing tasks bears importance in that they share the same mental space, feeding and influencing each other's development. Also, real-life tasks draw on both skills and even the blended form of them, so speaking and writing should not be separated. Furthermore, task mode is a pertinent pedagogic choice that teachers and practitioners should make for task design and implementation. Continuing this line of argument, this study views modality as a task variable that can explain and further language development in light of existing theories and research findings.

In understanding the effects of task complexity and modality on task performance, this study also seeks to understand the potential role of working memory as a mediating learner variable (Baddeley, 2003). As working memory controls various levels of language production processes, determining the amount of input, processing, and output demands that one can handle (for a review, see Juffs & Harrington, 2011), it is expected to have some influence on task performance as well. It is also expected that working memory mediates the relationship between task features and task performance. Yet, research on this has been scarce and findings on its role is thus far limited. To address research gaps, this study examines the effects of task complexity and modality in task performance as well as the mediating role of working memory in their relationships.

2. Literature review

2.1. Task complexity and modality

Task complexity refers to “the result of attentional, memory, and other information processing demands imposed by the structure of the task on the language learner” (Robinson, 2001, p. 29). It has been accepted as an important criterion for task design and task sequencing, as it influences learners’ attention allocation, task performance, and language development. Regarding the role of task complexity in L2 learners’ task performance, various cognitive models have been proposed. Robinson (2001) cognition hypothesis is one of the influential models, which postulates that task complexity manipulated via resource-directing dimensions (i.e., increasing conceptual demands of the tasks) directs learner attention to language form, which increases complexity and accuracy, but decreases fluency. A competing model is (Skahan, 1996, 1998) trade-off hypothesis, which, based on the idea of limited attentional capacity (Van Patten, 1996), argues that although task features can direct learner attention to a certain aspect of performance (i.e., complexity, accuracy, and fluency), any increase in one aspect of performance occurs at the expense of others. Thus, in this view, syntactic complexity and accuracy cannot be raised together as a function of task complexity as Robinson’s hypothesis predicts.

A number of studies have set out to examine the effects of task complexity on L2 performance under different task conditions, with mixed findings. Jackson and Suethanapornkul (2013) meta-analysis on task complexity in oral task performance found small positive effects for accuracy and small negative effects for fluency with increasing task complexity. There was no significant task complexity effects on linguistic complexity. Albeit the usefulness of the findings from the meta-analysis in informing learner attention in task performance, caution needs to be taken to interpret the findings. As Wang and Skehan (2014) pointed out, the relationship between complexity and accuracy should be examined at a within-individual level, rather than between-individual level, because findings of between-subject correlations may also appear to demonstrate simultaneous increases in syntactic complexity and accuracy that in fact arise as a function of different participants’ separate increases in syntactic complexity or accuracy.

In addition, research findings seem to vary depending on how constructs of linguistic performance are operationalized. Measures of syntactic complexity is perhaps the most controversial construct, and existing studies have demonstrated that different results can be drawn depending on how sophisticated the measurements are (cf., Kormos, 2014). For example, length-based measures of syntactic complexity (e.g., the mean length of T-unit), which represents a global or generic metric of linguistic complexity, may not be sensitive enough to reflect the development of syntactic complexity where the sentence length decreases after reaching a certain level of proficiency (for a discussion, see, Norris & Ortega, 2009). There have been calls for adopting both general and developmentally specific measures such as phrasal elaboration and structural variety to reflect “the construct reality of multidimensionality” (Norris & Ortega, 2009, p. 574).

In addition to task complexity, modality can also direct learner attention, hence, producing different performance outcomes. Although speaking and writing productions seem to share basic psycholinguistic mechanisms (Kellogg, 1996; Kormos, 2012; Levelt, 1989; Zimmermann, 2000), modality differentiates spontaneous language processing demands. According to Grabowski (2007), the presence of an audience in speaking and the ensuing communicative needs call for continuous on-line progress to be made by the speaker, while one’s writing pace is generally self-determined. Writers can allocate their attention according to their intentions and needs, making it possible to place attention solely on one stage of the writing process such as linguistic retrieval or planning. Moreover, speaking protocol is generally volatile and ephemeral so all spoken information
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