The Relationship between Working Memory Capacity and Inferential Reading Comprehension

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Abstract

Most researchers agree that working memory capacity plays a critical role in reading comprehension. This study differentiates itself with the previous research studies in a more limited investigation by testing students' inferential reading comprehension in L2 context to compare with their working memory capacity. The hypothesis of this study is that working memory capacity and inferential reading comprehension ability are positively correlated statistically. The participants were 10 ESL learners in Level 6 of Program of Intensive English in Northern Arizona University. Two instruments were designed to test the intended constructs: Reading Span Test (RST) to measure working memory capacity in reading and Inferential Reading Comprehension Test (IRCT) to assess inferential reading comprehension ability. The findings show that the two constructs have a weak negative correlation (r value=-0.24) which contradict the hypothesis stated earlier. This means that someone's working memory capacity cannot be easily related with their ability to infer meanings from texts.

Keywords: working memory, inferential reading, reading comprehension, reading span test

The Relationship between Working Memory Capacity and Inferential Reading Comprehension

Background

Most researchers agree that working memory capacity plays a critical role in reading comprehension (Alptekin & Ercetin, 2010; Daneman & Carpenter, 1980; Harrington & Sawyer, 1992; Linck, Osthus, Koeth, & Bunting, 2013; Rai, Loschky, Harris, Peck, & Cook, 2011). Working memory correlates with reading comprehension because the readers need to store the syntactic, semantic, and pragmatic information from the preceding text and to cohere them with the following text (Daneman & Carpenter, 1980). However, most of the studies that have done in this topic only focus on the global reading comprehension rather than investigating particular reading constructs. This study differentiates itself with the previous research studies in a more limited investigation by testing students' inferential reading comprehension in L2 context to compare with their working memory capacity. In this study, inferential comprehension refers to the reader's ability to infer meanings and to draw conclusions from the text. Grabe and Stoller (2011) state that assessing inferences is one of the working memory processes. Juffs and Harrington (2011) also suggest that working memory is a part of cognition rather than just a part of memory. In addition, studies show that readers with higher working memory capacity will be more likely to draw pragmatic inferences faster than them who have lower working memory capacity (Calvo, 2001; Rai et al., 2011). Therefore, the purpose of this study is to investigate whether there is a positive relationship between working memory capacity and inferential reading comprehension.

Research Question

Is working memory capacity positively related to inferential reading comprehension in L2 reading?

Methods

Participants

The participants were 10 students from level 6 of the Program of Intensive English (PIE) in Northern Arizona University.

Materials and Procedures

There were two tests that were given to the students: an inferential reading comprehension test and a Reading Span Test (RST). The reading comprehension test was administered in the classroom while the RST was given individually for each participant outside the classroom. The reading comprehension test was distributed in one class schedule of their TOEFL classes.

A reading comprehension test focusing on inferences were designed to measure the students' ability to understand implied meanings from the texts. The answers of the reading comprehension questions were not explicitly stated in the passages. These questions required extraction of the deeper meanings by understanding beyond the texts (Alptekin & Ercetin, 2010). There were 14 inferences questions that were designed for the tests which consisted of short answer questions. Three passages were adapted from the website http://englishforeveryone.org/ with slight changes to make the answers implicit. These passages were selected by taking into account the participants' reading TOEFL score. Because their average reading TOEFL score is 17, the lexile range is 1060L – 1210L. The passages provided have an average lexile range of 1066L which is in the range of their average TOEFL score. Non-academic and non-complex

passages were chosen to focus on their inferential ability so that they would not get distracted because of difficult content or lexical items. They were given 30 minutes to answer all of the questions.

To measure the working memory capacity in reading context, the RST adapted from Friedman and Miyake (2004) was used which they also adapted from the original Daneman and Carpenter's (1980) Reading Span Test with an addition of some college-level reading sentences. The Reading Span Test (RST) consisted of 56 unrelated sentences with 12-17 words in length per sentence. Every sentence ended up with different word. Each sentence appeared only once and the sentences were divided into 4 sets. One set consisted of 4 levels (2 sentences in level 2, 3 sentences in level 3, 4 sentences in level 4, and 5 sentences in level 5). The test taker needed to read the sentences aloud while memorizing the last words of the sentences. They were asked to recall all the words at the end of each level. This RST was given by using Powerpoint individually so that the test takers could have their own control on the pace. The participants had a full control to click on the mouse of the computer to the next page. Before the test, the researcher explained to the participants the detailed instructions of the test and gave some sentences to practice first. The participants were informed that they cannot go back to the previous sentences if they already clicked the next page. The total of the score was 56 with one point given for each correct word even if they were not recalled in the correct order of appearance for each level. The sentences were typed in *Calibri* font of size 72 to ensure the visibility.

Results

Tables 1 and 2 present the descriptive statistics of the two tests: Inferential Reading Comprehension Test (IRCT) and Reading Span Test (RST). The participants' IRCT scores has a mean of 70.14. The standard deviation is somewhat high with the value of 16.18. As shown in Table 2, the average score of the test is 38.7 with the standard deviation value of 6.68.

Table 1

Descriptive Statistics of the Inferential Reading Comprehension Test

Statistics	Value
k	14
N	10
Mean	70.14
SD (N<30)	16.18

Table 2

Descriptive Statistics of the Reading Span Test

Statistics	Value
k	56
N	10
Mean	38.70
SD (N<30)	6.68

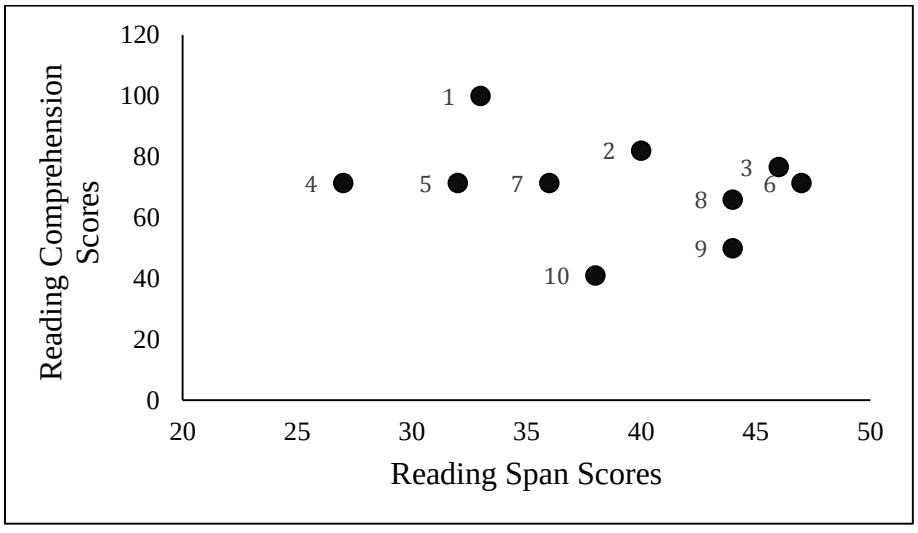

Figure 1. A scatterplot between the scores of the IRCT and the RST.

Figure 1 displays the scatterplot diagram of the students' scores. Each dot represents each student with the dots located in the figure based on their scores in the two tests. The dots are scattered without any pattern which reflect the strength of the correlation. From the statistical calculation using Microsoft Excel, the correlation coefficient (*r* value) from the correlation of the two tests is -0.24. This value means that there is a weak negative correlation between the two variables.

Relevance to PIE and Second Language Learning

The implications of this research for PIE and other ESL contexts are to address additional information regarding the topic of individual differences in second language acquisition and also to identify whether the two variables are comparable or not in the context of reading. Language teachers need to know that different individuals can be strong in one aspect and less strong in the other, therefore, one construct measurement of a language skill should not be accounted as a judgment of students' overall ability. As this research proves, a high score in one reading aspect could not predict the ability in the other reading aspect. In addition, in measuring reading ability, different types of instrument designs need to be distributed to assess different multi-level skills in reading such as storing word information, using syntactic information, establishing main ideas, inferring from context.

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