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EDUCATIONAL ASSESSMENT & EVALUATION | RESEARCH ARTICLE

The relationship between EFL learners' reading comprehension ability and their fluid intelligence, crystallized intelligence, and processing speed

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Abstract: The general purpose of the current study was to clarify the role and estimate the correlation of specific cognitive abilities with Second Language (L2) reading achievement of English Foreign Language (EFL) university students. Since there are not ample available studies about the cognitive correlates of reading comprehension in a second language, we put our attention on the role of cognitive abilities of individuals to investigate second language reading comprehension's nature. To this aim, the relationship between fluid intelligence, crystallized intelligence, and speed of processing with second language reading comprehension as three different kinds of tests was examined to predict participants' reading achievement. The results revealed a significant correlation of fluid intelligence with second language reading comprehension.

Subjects: Behavioral Sciences; Education; Language & Literature

Keywords: C-test; fluid intelligence; crystallized intelligence; speed of processing

1. Introduction

The ability to read in a second language is one of the most essential skills necessary for people in multilingual and international settings. Making a child encounters with difficulties of reading comprehension as early as possible is essential in preventing future academic failure (Horowitz-Kraus &

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PUBLIC INTEREST STATEMENT

In second language setting, the ability to read is recognized as a key predictor for academic achievement and is considered as one of the most important skills that seems to be essential for learners' progress. Previous studies showed that research on second language acquisition of individual differences has typically dealt with affective and sociocultural factors rather than cognitive abilities; therefore, the current research aimed at examining the relationship between fluid intelligence, crystallized intelligence, and speed of processing, as indicators of cognitive abilities, with second language reading comprehension to predict participants' reading achievement. The results showed a significant correlation of fluid intelligence with second language reading comprehension. This emphasis that low reading achievement in second language might be because of not enough improvement of cognitive abilities that should be considered by teachers and educational policy-makers and even curriculum developers.

Finucane, 2016). The cognitive nature of first language reading and its influence on learners L1 ability has long been investigated. In the areas of reading comprehension, Grabe (2012) stated that under normal processing rates, reading for general understanding involves a very large recognition vocabulary, automaticity of word recognition for most of the words in the text, a practically rapid reading speed, and general text comprehension. This set of processing abilities could be the main goal of most advanced L2 reading instruction.

Accordingly, some research studies have been directed to observe the reading process in second language learners. Many of them focus on readers' competence (Baghaei & Ravand, 2015; Block, 1986; Goh & Fatimah, 2006; Oakley, 2011; Upton, 1997). However, there are still gaps in reading, especially to the second/foreign language readers (ESL/EFL); moreover, the extent to which cognitive knowledge is needed by L2 readers remains uncertain in the current research. Thus, the present study seeks to investigate any significant cognitive correlates of reading comprehension in English as a Foreign Language.

2. Literature review

2.1. Reading

Effective reading is critical for success in acquiring a second/foreign language, and considered to be the foundation of instruction in all phases of language learning such as using books for language courses, writing, revising, acquiring vocabulary and grammar (Mikulecky, 2008), though very little studies paid attention and investigated the role of second/foreign language reading comprehension as a cognitive process. In general, research shows that there are still gaps in reading, especially to the second/foreign language and studies on second language acquisition of individual differences have typically dealt with affective and sociocultural factors rather than cognitive abilities (Baghaei, Hohensinn, & Kubinger, 2014).

Mikulecky (2008) stated that the written information motivates prior knowledge, and the prior knowledge, sequentially, activates expectations about what is in the text. This interactive, unconscious process continues till the comprehension has occurred. Readers' first language and mental schemata determine noticing in a text and applying the mental schemata to that information, however, second language readers' mental schemata are built on the basis of their first language and cultural background. Therefore, what second language readers notice in the text and how they interpret it will differ as a result of differing prospects about language structure and cultural attitudes.

Mikulecky (1990) proposed that in the cognitive and language fields and particularly in reading development, a variety of abilities such as linguistic proficiency, verbal memory, lexical and syntactic skills, general language abilities, and phonological awareness, recognizing patterns of relationships (identifying the relationships between ideas), drawing inferences and using evidence, visualizing (picturing, or actually drawing a picture or diagram, of what is described in the text), and reading faster are considered as crucial factors. Furthermore, Oakley (2011) in a study of measuring the cognitive strategies of reading comprehension, introduced five cognitive strategies: summarizing, visualizing, questioning, making inferences, and predicting.

In contrast with L1 readers, L2 readers start learning to read without the preliminary language base that can be expected to be present among L1 readers. Most first language readers begin reading with a strong implicit knowledge of basic grammatical structures and vocabulary of the language and different cognitive abilities. Thus, cognitive reading strategies signify what happens mentally in the process of manipulating the text for getting the meaning.

2.2. Cognitive abilities

One of the well-validated models of cognitive abilities is the Cattell–Horn–Carroll (CHC) theory (Flanagan & Ortiz, 2001; McGrew & Flanagan, 1998; Woodcock, McGrew, & Mather, 2001). CHC theory

is the result of more than half a century of factor analytic research, and grounded in developmental studies in different areas such as cognitive abilities, genetic heritability research, and neurocognitive analyses (see Horn & Noll, 1997).

Mental testing in America was generated by Alfred Binet in France (Carroll, 1993). In 1905, Binet and Simon made an intelligence test that successfully differentiated normal children from those with intellectual incapacities (Siegler, 1992). It involved some tasks which were crucial for understanding of language and the skill to use verbal and nonverbal reasoning (spatial and numerical).

Other studies have shown significant differences in language and knowledge-based skills regarding poor comprehenders and their reading decoding skills (Nation & Snowling, 1998; Stothard & Hulme, 1992). Aryadoust and Baghaei (2016) also demonstrated the power of lexical and grammatical knowledge, both being intelligence factors, in predicting reading comprehension.

Cattell (1943) represented fluid and crystallized intelligence as two main types of intelligences, which is similar to Hebb's ideas of *Intelligence A* and *Intelligence B*. Fluid intelligence refers to skills needed for advanced mental processes, thinking and reasoning. Crystallized intelligence shows abilities that result from education and experience.

This theory, referred to as Gf-Gc theory or Cattell–Horn model, was practically established by Horn (1965), a student of Cattell, and demonstrated fluid and crystallized intelligences in conjunction with overall visualization and speed factors as second-order factors.

Carroll (1993) signified the structure of cognitive abilities in the Three-Stratum Theory, which represented the most comprehensive and theoretically supported model of human cognitive abilities according to an enormous correlation study. The highest level (Stratum III) is *g* or general intelligence. Stratum II includes eight broad abilities, including fluid intelligence, crystallized intelligence, general memory and learning, broad visual perception, broad auditory perception, broad retrieval ability, broad cognitive speediness, and processing speed (reaction time/decision speed). Each of the broad abilities at Stratum II subsumes several narrow abilities at Stratum I. For example, abilities under crystallized intelligence are Cloze ability, reading comprehension, reading speed, spelling ability, writing ability, foreign language proficiency, lexical knowledge, listening ability, and verbal language comprehension (Carroll, 2005).

As a result of the similarities between Gf-Gc theory of Horn (1965) and the Three-Stratum model of Carroll (1993), they were combined into the Cattell-Horn-Carroll (CHC) model (Flanagan, McGrew, & Oritz, 2000).

Although a number of studies have studied the CHC model in predicting English L1 reading achievement, research on the relationship between cognitive abilities and reading comprehension in a second language is scarce (Baghaei & Tabatabaei, in press). McGrew (1993) stated that Auditory Processing (*Ga*) and Processing Speed *(Gs)* were significantly related, until early adulthood, to Basic Reading Skills. Moreover, Fluid Reasoning (*Gf)* was significantly correlated with Reading Comprehension between ages 5 and 30. Moreover, moderate correlation of Processing Speed (*Gs*) was seen with both Basic Reading Skills and Reading Comprehension in ages 6–I0 years (Carroll, 1993).

Therefore, this study aims at studying the correlation of fluid intelligence (*Gf*), crystallized intelligence (*Gc*), and speed of processing (*Gs*) to identify the cognitive correlates of these variables in relation to reading comprehension in English as a second/foreign language.

Research Questions

Consequently, the study addresses the following research questions:

- Does cognitive speed processing have any significant relationship with participant reading comprehension?
- Does fluid intelligence have any significant relationship with participant reading comprehension?
- Does Crystallized intelligence have any significant relationship with participant reading comprehension?

3. Method

3.1. Participants

Participants of the current research who were eighty-four male (15.5%) and female (84.5%) undergraduate students in English as a foreign language were voluntarily taking part in the study during two sessions of normal class periods. Students were from different ages, ranging from 20 to 40. They were studying for their bachelor's degree at Azad University of Mashhad and Tabaran institution of Higher Education.

3.2. Instruments

3.2.1. Pearson test of English general

The reading comprehension test as the study's dependent variable was extracted, to estimate the correlation of specific cognitive abilities with the Second Language reading achievement of English Foreign Language (EFL) university students, from the official past papers (July, 2011) of the Pearson Test of English General. The Cronbach's alpha reliability of the reading test was 0.71.

3.2.2. Raven's advanced progressive matrices

For reducing administration time, nonverbal short form intelligent test of Raven which is a measure of visual–spatial working memory (Arthur & Day, 1994) was used to measure *Gf*. It consists of 12 items of the 36-item original Advanced Progressive Matrices. The 12 items were selected by Arthur and Day (1994) on the basis of psychometric criteria with the purpose of reducing administration time. The Cronbach's alpha reliability of the Raven test was 0.70.

3.2.3. C-test

The C-test, which is introduced as an integrative measure of crystallized intelligence, is a variation of the Cloze test (Oller, 1979). A C-test battery consisted of four to six short passages in which the first and the last sentence of each text is left intact, then the second word in the second sentence, the second half of every second word is deleted (Eckes & Baghaei, 2015; Klein-barely & Raatz, 1982). The ability to complete the uncompleted text is supposed to be a sign of general first and second language ability.

Recently, Baghaei and Tabatabaee (2015) argued that the C-test can be measure of crystallized intelligence. In this study, a four-passage C-test in the participants' native language was used by the researchers as a measure of crystallized intelligence (Gc). In order to circumvent the problem of dependency among individual C-test items, each passage was considered a testlet or a super-item (Baghaei & Aryadoust, 2015; Baghaei & Ravand, 2016). The Cronbach's alpha reliability of the C-test was 0.75.

3.2.4. Letter-digit substitution test

The letter-digit substitution test (Van der Elst, Dekker, Hurks, & Jolles, 2012), which is principally speed-dependent task that asks contributor to match particular signs—symbols, digits, or letters—to other signs within a specified time period, was used as a measure of processing speed. The test was administered in paper and pencil format within 120 s assigned time. The Cronbach's alpha reliability of the substitution test was 0.88.

3.3. Procedure

The present study seeks to find out any significant correlation between the cognitive abilities of eighty-four EFL university students studying for their bachelor's degree, with their reading achievement. Subjects were selected based on convenience sampling because of their convenient accessibility and proximity to the researcher. Collecting data started at August 2015 and lasted for about 3 months. Gathering data were summarized by the use of SPSS software (Version 18). Then, the multiple regression was run to assess any significant power of independent variables in enplaning second language reading comprehension.

4. Results

Summing up, the study endeavored to discover a significant correlation of reading comprehension in English as a foreign language with measures of *Gf*, *Gc*, and *Gs* that participants may apply in attempting to comprehend the texts.

The participants in this study consisted of 84 EFL students studying for their bachelor's degree, 71 (84.5%) females and 13 (15.5%) males, aged between 20 and +40 years old.

Multiple regression was conducted to examine the role of independent variables of the study for explaining respondents' reading comprehension scores. Initial analyses displayed no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Results showed that the total variance explained by the model as a whole was .14%, F (3, 80) = 3.64, $p < .005$, $R^2 = .12$, $R^2_{Adjusted} = .087$) (Table 1).

The analysis showed that *Gs* did not significantly predict Reading Comprehension (Beta = 0.1, $p = .38$), nor did *Gc* (Beta = .12, $p = .30$). Only fluid intelligence significantly predict RC (Beta = .25, $p < .05$), which specifies that Raven's test which is a nonverbal measure of *g* is clearly an interpreter of reading comprehension (Table 2).

The regression coefficients in this analysis were significant at the level of .05 or below.

Table 1. Model summary

R	R^2	Adjusted R^2	Sig.
.346[a]	.120	.087	.01*

[a]Predictors: (constant), C-test, letter-digit matching, raven.

*$p < .05$.

Table 2. Regression analysis summary for predicting reading comprehension

Coefficients[a]

	Standardized coefficients		
	Beta	***T***	**Sig.**
(Constant)		2.518	.014*
Raven	.247	2.106	.038*
LDM	.096	.886	.378
C-test	.120	1.051	.296

Note: LDM: letter-digit matching.

[a]Dependent variable: reading comprehension.

*$p < .05$.

5. Discussion and conclusion

SLA literature asserted that an extensive portion of the studies in first language reading comprehension is related to finding out the cognitive correlates of reading and poor readers' cognitive abilities (Benson, 2008).

Accordingly, a number of researchers have studied CHC model in predicting English first language reading achievement. McGrew (1993) stated that Auditory Processing (*Ga*) and Processing Speed *(Gs)* were significantly related, until early adulthood, to Basic Reading Skills. Moreover, Fluid Reasoning (*Gf)* was significantly correlated with Reading Comprehension between ages 5 and 30.

However, Enquiries on the cognitive correlates of reading comprehension in a second language seem to be so restricted.

Therefore, in this study, researchers apply C-test as a measure of Crystallized intelligence, nonverbal test of Raven as Fluid intelligence, and substitution test as a measure of processing speed and intended to regress reading comprehension as a second language on each of the above mentioned measures of *Gf*, *Gc*, *Gs*.

In view of that, the final analysis of the current study indicated that .14% of the variance in reading comprehension is explained by the independent variables. It was revealed that Raven's test which is a nonverbal measure of *g* could be considered as a predictor of reading comprehension ($p < .05$), that is in line with Kuncel, Hezlett, and Ones (2004) who noted that analogical reasoning is a measure of *g*. This finding revealed that nonverbal intelligence is obviously an interpreter of reading comprehension. Results is also in accordance with Nation, Clarke, and Snowling (2002) that demonstrated poor and skilled readers are significantly different on nonverbal reasoning ability.

The results also indicated that C-test as a crystallized intelligence and Letter-digit substitution test were not a predictor of reading comprehension which is in contrast with Carroll (1993) who showed a moderate correlation of Processing Speed (*Gs*) with both Basic Reading Skills and Reading Comprehension. Furthermore, Joshi and Aaron (2000) stated that cognitive speed seem to be important for comprehension of print.

Taking a closer look at the result, we should admit that low reading achievement in the second language might be because of not enough improvement of cognitive abilities which is in accordance with Wenden (1991) who stated in processing the data, reading linguistically or not, cognitive strategies signify what happens mentally in carrying out the task. Moreover, reading comprehension is recognized as a key predictor for academic achievement which stems from the early childhood (Mansor, Rasul, Rauf, & Koh, 2013). In addition, Cubakcu (2008) signified the impact of the metacognitive strategy training in evolving vocabulary and enhancing reading comprehension skills.

Accordingly, in first language reading, different researchers have come out with diverse conclusions on the tactics practiced among readers. However, the literature remains us with uncertainty about the specific cognitive abilities that are essential for reading comprehension in the second language. Moreover, the current study puts its attention just on three cognitive abilities and focused on 84 participants. To overcome and delimit these limitations, further researches are in need to evaluate the effects and correlates of other probable cognitive and also linguistic variables with reading comprehension. Also a broader range of sampling would be of great benefit.

To summarize, the current research revealed the role of nonverbal measure of *g* (fluid intelligence) as a predictor of reading comprehension in the second language, the researchers also emphasized that cognitive differences could be considered as a crucial factor in understanding the nature of reading comprehension in second language, therefore, attention and investigation should be invested in second language acquisition research principally regarding the role of cognitive abilities in reading comprehension.

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References

Arthur, Jr. W., & Day, D. V. (1994). Development of a short form for the raven advanced progressive matrices test. *Educational and Psychological Measurement, 54*, 394–403. http://dx.doi.org/10.1177/0013164494054002013

Aryadoust, V., & Baghaei, P. (2016). Does EFL readers' lexical and grammatical knowledge predict their reading ability? Insights from a perceptron artificial neural network study. *Educational Assessment, 21*, 135–156. http://dx.doi.org/10.1080/10627197.2016.1166343

Baghaei, P., & Aryadoust, V. (2015). Modeling local item dependence due to common test format with a multidimensional rasch model. *International Journal of Testing, 15*, 71–87. http://dx.doi.org/10.1080/15305058.2014.941108

Baghaei, P., & Ravand, H. (2015). A cognitive processing model of reading comprehension in English as a Foreign language using the linear logistic test model. *Learning and Individual Differences, 43*, 100–105. http://dx.doi.org/10.1016/j.lindif.2015.09.001

Baghaei, P., & Ravand, H. (2016). Modeling local item dependence in cloze and reading comprehension test items using testlet response theory. *Psicológica, 37*, 85–104.

Baghaei, P., & Tabatabaee, M. (2015). The C-Test: An integrative measure of crystallized intelligence. *Journal of Intelligence, 3*, 46–58. http://dx.doi.org/10.3390/jintelligence3020046

Baghaei, P., & Tabatabaee, M. (in press). Cognitive correlates of reading comprehension in English as a foreign language. *Perceptual & Motor Skills*.

Baghaei, P., Hohensinn, C., & Kubinger, K. D. (2014). Persian adaptation of foreign language reading anxiety scale: A psychometric analysis 1. *Psychological Reports, 114*, 315–325. http://dx.doi.org/10.2466/08.11.PR0.114k16w1

Benson, N. (2008). Cattell–Horn–Carroll cognitive abilities and reading achievement. *Journal of Psychoeducational Assessment,* 27–41.

Block, E. (1986). The comprehension strategies of second language readers. *TESOL Quarterly, 20*, 463–494. http://dx.doi.org/10.2307/3586295

Carroll, J. B. (1993). *Human cognitive abilities*. Cambridge, England: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511571312

Carroll, J. B. (2005). The three-stratum theory of cognitive abilities. In D. P. Flanagan & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (2nd ed., pp. 69–76). New York, NY: Guilford Press.

Cattell, R. B. (1943). The description of personality: I foundations of trait measurement. *Psychological Review, 50*, 559–594.

Cubukcu, F. (2008). Enhancing vocabulary development and reading comprehension through metacognitive strategies. *Issues In Educational Research, 18*(1), 1–11. http://www.iier.org.au/iier18/cubukcu.html

Eckes, T., & Baghaei, P. (2015). Using testlet response theory to examine local dependence in C-Tests. *Applied Measurement in Education, 28*, 85–98. http://dx.doi.org/10.1080/08957347.2014.1002919

Flanagan, D. P., & Ortiz, S. O. (2001). *Essentials of crossbattery assessment*. New York, NY: John Wiley & Sons.

Flanagan, D. P., McGrew, K. S., & Ortiz, S. O. (2000). *The WechslerIntelligence scales and Gf-Gc theory: A contemporary approach to interpretation*. Boston: Allyn & Bacon.

Goh, H. S., & Fatima, H. (2006). Use of L1 in L2 reading coprehensiom among tertiary ESL learners. *Reading in a Foreign Language, 18*, 29–54.

Grabe, W. (2012). Reading in a second language. *The Oxford Handbook of Applied Linguistics*. doi:10.1093/oxfordhb/9780195384253.013.0006

Horn, J. L. (1965). *Fluid and crystallized intelligence: A factor analytic and developmental study of the structure among primary mental abilities* (Unpublished doctoral dissertation). University of Illinois, Champaign.

Horn, J. L., & Noll, J. (1997). Human cognitive capabilities: *Gf-Gc* theory. In D. P. F1anagan, J. L. Genshaft, & P. L. Harrison (Eds.), *Contemporary intellectual assessment: Theories, tests, and issues* (pp. 53– 93). New York, NY: Guilford.

Horowitz-Kraus, T., & Finucane, S. (2016). Separating the different domains of reading intervention programs. *A Review, 6*(2), doi:10.1177/2158244016639112.

Joshi, M. R., & Aaron, P. G. (2000). The component model of reading: Simple view of reading made a little more complex. *Reading Psychology, 21*, 85–97.

Klein-Braley, C., & Raatz, U. (1982). Der C-Test: ein neuer Ansatz zur Messung allgemeiner Sprachbeherrschung [The C-test: A new approach for measuring general language proficiency]. *AKS-Rundbrief, 4*, 23–37.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all? *Journal of Personality and Social Psychology, 86*, 148–161. http://dx.doi.org/10.1037/0022-3514.86.1.148

Mansor, A. N., Rasul, M. S., Rauf, R. A., & Koh, B. L. (2013). Developing and sustaining reading habit among teenagers. *The Asia-Pacific Education Researcher, 22*, 357–365. http://dx.doi.org/10.1007/s40299-012-0017-1

McGrew, K. S. (1993). The relationship between the WJ-R Gf-Gc cognitive clusters and reading achievement across the life-span. *Journal of Psychoeducational Assessment, Monograph Series WJ-R,* 39–53.

McGrew, K., & Flanagan, D. (1998). *The intelligence test desk reference: Gf-Gc cross-battery assessment*. Boston: Allyn & Bacon.

Mikulecky, B. S. (1990). *A short course in teaching reading skills*. London: Longman.

Mikulecky, B. S. (2008). *Teaching reading in a second language*. Pearson Education.

Nation, K., & Snowling, M. J. (1998). Semantic processing and the development of word-recognition skills: Evidence from children with reading comprehension difficulties. *Journal of Memory and Language, 39*, 85–101. http://dx.doi.org/10.1006/jmla.1998.2564

Nation, K., Clarke, P., & Snowling, M. J. (2002). General cognitive ability in children with reading comprehension difficulties. *British Journal of Educational Psychology, 72*, 549–560. http://dx.doi.org/10.1348/00070990260377604

Oakley, G. (2011). The assessment of reading comprehension cognitive strategies: Practices and perceptions of Western Australian teachers. *Australian Journal of Language*

& Literacy, 34, 279–293. http://www.alea.edu.au/documents/item/265
Oller, Jr. J. W. (1979). *Language tests at school*. London: Longman.
Siegler, R. S. (1992). The other Alfred Binet. *Developmental Psychology, 28*, 179–190. doi:10.1037/0012-1649.28.2.179
Stothard, S. E., & Hulme, C. (1992). Reading comprehension difficulties in children. *Reading and Writing, 4*, 245–256. http://dx.doi.org/10.1007/BF01027150
Upton, T. A. (1997). First and second language use in reading comprehension strategies of Japanese ESL students. *TESL-EJ, 3*, 1.
Van der Elst, W., Dekker, S., Hurks, P., & Jolles, J. (2012). The letter digit substitution test: Demographic influences and regression-based normative data for school-aged children. *Archives of Clinical Neuropsychology, 27*, 433–439. http://dx.doi.org/10.1093/arclin/acs045
Wenden, A. (1991). *Learner strategies for learner autonomy*. London: Prentice-hall international.
Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson psychoeducational battery-third edition*. Itasca, IL: Riverside Publishing.

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