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Investigating relationship between fluid and crystallised intelligence and vocabulary size in students learning French as a foreign language

Investigando a relação entre a inteligência fluida e cristalizada e o tamanho do vocabulário em alunos que aprendem francês como língua estrangeira

Investigación de la relación entre la inteligencia fluida y cristalizada y el tamaño del vocabulario en estudiantes que aprenden francés como lengua extranjera

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ABSTRACT

In this study, the relationship between fluid and crystallised intelligence and vocabulary size was investigated among Iranian students learning French as a foreign language. Studies emphasised on the importance of vocabulary size and language comprehension and tried to discover mental and intelligence factors related to this issue. To administer the present quantitative study, the Persian Adaptation of Baddeley's (1968) Grammatical reasoning Test for Fluid Intelligence, Persian Test of Baghaei & Tabatabaee (2015) for Crystallised intelligence, and Nation's (2012) Test of Vocabulary Size were instrumented. Population of the study was 100 intermediate learners of French language from three branches of Safir institute in Tehran. Data was analysed using SPSS and correlational tools to specify the variables correlation. Result showed that there is a significant relationship between crystallised intelligence and size of vocabulary ($p<0.1$), while there was no significant relationship between fluid intelligence and vocabulary size ($p>0.5$). It was concluded that fluid intelligence does not predict learners' vocabulary size, but crystallised intelligence as grows gradually determines learners' vocabulary size.

Keywords: Crystallised intelligence. Fluid intelligence. Language learning. Memory. Vocabulary size.

RESUMO

Neste estudo, a relação entre inteligência fluida e cristalizada e tamanho do vocabulário foi investigada entre estudantes iranianos que aprendiam francês como língua estrangeira. Estudos enfatizaram a importância do tamanho do vocabulário e da compreensão da linguagem e buscaram descobrir fatores mentais e de inteligência relacionados a essa questão. Para administrar o presente estudo quantitativo, a Adaptação Persa de Baddeley (1968) Teste de raciocínio gramatical para Inteligência de Fluidos, Teste Persa de Baghaei & Tabatabaee (2015) para Inteligência Cristalizada e Teste de Tamanho de Vocabulário de Nation (2012) foram instrumentados. A população do estudo foi de 100 alunos intermediários da língua francesa de três filiais do instituto Safir em Teerã. Os dados foram analisados usando SPSS e ferramentas correlacionais para especificar a correlação das variáveis. O resultado mostrou que existe uma relação significativa entre inteligência cristalizada e tamanho do vocabulário (p <0,1), enquanto não houve relação significativa entre inteligência fluida e tamanho do vocabulário (p> 0,5). Concluiu-se que a inteligência fluida não prediz o tamanho do vocabulário dos alunos, mas a inteligência cristalizada conforme cresce gradualmente determina o tamanho do vocabulário dos alunos.

Palavras-chave: Aprendizagem de línguas. Inteligência cristalizada. Inteligência fluida. Memória. Tamanho do vocabulário.

RESUMEN

En este estudio, se investigó la relación entre la inteligencia fluida y cristalizada y el tamaño del vocabulario entre los estudiantes iraníes que aprenden francés como lengua extranjera. Los estudios enfatizaron la importancia del tamaño del vocabulario y la comprensión del lenguaje y trataron de descubrir factores mentales y de inteligencia relacionados con este tema. Para administrar el presente estudio cuantitativo, se instrumentaron la Adaptación persa de la Prueba de razonamiento gramatical de Baddeley (1968) para la inteligencia fluida, la Prueba persa de Baghaei & Tabatabaee (2015) para la inteligencia cristalizada, y la Prueba del tamaño del vocabulario de Nation (2012). La población del estudio fue de 100 estudiantes intermedios de francés de tres ramas del instituto Safir en Teherán. Los datos se analizaron utilizando SPSS y herramientas correlacionales para especificar la correlación de las variables. El resultado mostró que existe una relación significativa entre la inteligencia cristalizada y el tamaño del vocabulario (p <0,1), mientras que no hubo una relación significativa entre la inteligencia fluida y el tamaño del vocabulario (p> 0,5). Se concluyó que la inteligencia fluida no predice el tamaño del vocabulario de los alumnos, pero la inteligencia cristalizada a medida que crece determina gradualmente el tamaño del vocabulario de los alumnos.

Palabras clave: Aprendizaje de idiomas. Inteligencia cristalizada. Inteligencia fluida. Memoria. Tamaño de vocabulário.

INTRODUCTION

The impact of multiple intelligences on learning was emphasised by Howard Gardner (2000), but a decade back, it was Raymound Cattell, that for the first time introduced fluid and crystallised intelligence as effective intelligences on language learners. As discussed by YusufŞen & MesutKuleli (2015) in Cattell's (1963) the term, fluid intelligence, was considered as "the ability to reason and to solve new problems and difficulties independently by previously acquired knowledge" (p. 556) useful for variety of cognitive tasks influential on language learning. Crystallised intelligence as an influential intelligence on educational tasks refers to "memory or information saved and stabilised in long term memory which required to be revived immediately" (Sen & Kuleli, 2015, p. 556). According to Cattell (1963) crystallised

intelligence refers to acquired knowledge and information added to memory during the time. Many studies emphasised on the importance of fluid and crystallised intelligence on learning at school (Haavisto & Lehto, 2005) and attributed it to non-biological environmental factors (Rindermann et al., 2010).

Marja-Leena & Lehto Juhani (2005, p. 1) studied the fluid and crystallized memory and its effect on working memory and indicated that "verbal WM might be related to verbal ability and learning at school, while visuospatial WM is relatively strongly related to nonverbal reasoning and spatial visualisation". They argued that inelegances work together and studding them may not provide reliable result.

Students' vocabulary size develops over time and by growing older, it is discussed that their crystallised and fluid intelligences would be stronger. It is hypothesised that by growing the age and having bigger vocabulary knowledge the correlation between fluid and crystallised intelligences with individuals' vocabulary size increases. While studies (Nation & Waring, 1997; Laufer & Nation, 1999; Nassaji, 2004; Uena & Kuleli, 2015; Assadi & Vaskehmahalleh, 2017) emphasised on the influence of vocabulary size on students' developing four language skills, the problem is that previous studies did not reveal the influence of fluid and crystallised intelligence on students' vocabulary size specifically. In addition, scholars have tested the relationship between variables of vocabulary size, reading comprehension, and fluid and crystallised intelligences separately. Such devotion to examining vocabulary size resulted in developing standard tests examining vocabulary size. One popular test of vocabulary size was developed by Nation (2012) classifying words into 14 categories so that from each category with 1000 words, 10 words can be chosen for testing the size of vocabulary. Accordingly, the test involves 140 multiple-choice questions. The test can be similitude for other languages as the present study in which the same test was organised for French language so that the entire testing algorithm was taken into account.

The relationship between crystallised and fluid intelligence and vocabulary size was examined among French students of Safir institute in Tehran. To measure fluid intelligence the Persian Adaptation of Baddeley's (1968) Grammatical reasoning Test was implemented and for crystallised intelligence the Persian Test of Baghaei & Tabatabaee (2015) was applied. To measure the size of vocabulary a French version of Nation's (2012) test was organised and implemented.

LITERATURE REVIEW

There are two major components of intelligence, which are distinguishable and amenable to precise operational or empirical descriptions (Chamorro-Premuzic & Furnham, 2005; McGrew, 2009). Fluid intelligence (*GF*), a term known as General Factor for intelligence introduced by Raymond Cattel (1971), was defined as the ability to reason and to solve new problems and difficulties independently by previously acquired knowledge. According to Kamphaus et al. (2005) *GF* is abbreviated of Fluid Intelligence because once it was considered as a general intelligence factor. *Gf* is critical for a wide variety of cognitive tasks, and it is considered one of the most significant factors in learning. Fluid intelligence is related to educational and professional success. Another intelligence that is necessary for educational tasks is crystallised memory (General Cognitive or GC) means information saved and stabilized in long term memory which required to be revived immediately. According to Cattell (1971) crystallized intelligence in psychology is considered as indication of general cognitive and relies on acquired knowledge and information added to memory. McGrew (2009, p. 5) defined fluid intelligence (Gf) as "the use of deliberate and controlled mental operations to solve novel problems that cannot be performed automatically". Gf is highly related to general intelligence (g), the ability to learn and acquire new knowledge and skills (Ackerman et al., 2002; Blair, 2006). Crystallised intelligence (Gc) is defined as "the knowledge of the culture that is combined

by individuals through a process of acculturation. Gc is obviously described as a person's breadth and depth of acquired knowledge of language, information and concepts of a specific culture" (p. 5). Usually, intelligence tests were designed to forecast individual differences in achievement, such as educational and occupational performance (in particular, school success). A body of research has established that intelligence is the best predictor of educational performance (Gottfredson, 2002; Kuncel et al., 2004).

In the Iranian context some studies investigated the relationship between multiple intelligence and different language skills. For instance, Yeganehfar (2005) studied multiple intelligence and language proficiency, and Rahimian (2005) in a study specified multiple intelligences and learning style that correlated language proficiency. In addition, Akbari and Hosseini (2008) have investigated the connection between the use of language learning strategies and multiple intelligences. Also, recent studies (Mahdavi, 2014) emphasized on vocabulary learning and intelligence. However, fluid and crystallized intelligences influence on language learning and vocabulary acquisition is not investigated.

The previous literature lacks studies exploring interaction between vocabulary knowledge and EFL learners crystallised and fluid intelligence and it is not clear to what extent crystallized and fluid intelligences are significant indicators for student's vocabulary size. Having proper knowledge about such intelligences, learners would be able to build up the size of their vocabulary through promoting and activating their crystallised and fluid intelligences. Accordingly, in the present study, the role of crystallised and fluid intelligences on the vocabulary size of Iranian EFL learners was examined.

As Primi et al. (2010) discussed fluid reasoning abilities encompass the set of basic cognitive processing abilities necessary to assimilate and integrate critical information about a problem or decision. According to Kensinger (2009) crystallised abilities, in contrast, involve an understanding of culturally based values and knowledge about the world. There exists a large and growing body of research to suggest that as one pass through adolescence into adulthood and old age, these dual intellectual capacities undergo change (Baltes, 1987; Li et al., 2004). Crystallised abilities (world knowledge) increase throughout young adulthood and middle-age, and then plateau, showing little or no growth into old age (Li et al., 2004). Financial knowledge can be thought of as one of many different subtypes of crystallised abilities. Fluid abilities, in contrast, show a pattern of increasing development throughout young adulthood, but then a slow pattern of decline beginning in middle-adulthood, which continues throughout old age (Li et al., 2004).

Laufer & Nation (2001) presented results from her previous studies proposing a vocabulary threshold of 3000-word families for effective reading and incidental vocabulary learning from context. Nation (1988) believes that language learners need a minimum vocabulary size of 2000 word families and a good knowledge of academic vocabulary to cover about 90% of simplified English texts. Even with this vocabulary size, the learners may need to deal with a number of unfamiliar words, comprising 10% of the words in the text. Although the ratio of the required vocabulary differed according to the nature of the text, e.g., fiction works call for the use of a larger variety of vocabulary items, a minimum vocabulary size of 3000-word families seems to be the threshold for successful L2 reading.

Based on the assumption that both fluid and crystallised abilities jointly contribute to our ability to make complex financial decisions (Li et al., 2013), it is plausible that younger and older adults demonstrate differing degrees of financial competence at their respective points in the life span for different reasons. That is, when making every day financial decisions, older adults facing declines in fluid abilities would be expected to rely more heavily on crystallised knowledge gained through personal experience. Younger adults, on the other hand, would be expected to rely more heavily on fluid reasoning abilities when confronted with a novel financial problem, given their (relative) lack of domain-specific knowledge. Consistent with this notion of trade-offs between fluid and crystallised abilities, Agarwal et al. (2009) concluded

that financial mistakes surrounding a variety of different credit behaviours is minimised around the age of 53, which is when crystallised knowledge has nearly peaked and fluid abilities have yet to substantially decline. One implication of this finding is that we could expect to see increases in within-person variability in the quality of individuals' financial decisions as we stray from the 50s, with poorer performance (i.e., increased decision error) down the age range into the 40s and 30s (due to limited experiential knowledge), and up the age range into the 60s and 70s (due to declining fluid resources).

Another factor believed to influence financial decision-making, is domain-specific financial knowledge that has been found to be one of the most powerful determinants of financial decision-making performance. One's experiential knowledge of a financial task (i.e., expertise), in the form of habits, computational strategies, or decision-making scripts (Hershey et al., 2003), is in most circumstances likely to outweigh the relative value of more general crystallised knowledge and fluid abilities.

Fry & Hale (2012) indicated that domain-specific knowledge increases in a cumulative fashion over the course of adulthood, as individuals encounter different types of financial tasks and have repeated experiences with many of the same types of decisions. The slope of this knowledge-acquisition function is presumably steeper for some and flatters for others depending on the nature of their exposure to, interest in, and involvement with different types of personal financial decisions.

The major role of vocabulary size in reading comprehension is distinct and essential (Al-Nujaidi, 2003). It may be an exact predictor of the complication of a particular text despite the fact that it is not the only component which leads to reading comprehension (Nation & Coady, 1988). There is no consensus about the amount of vocabulary that individual should achieve in order to decode a text. In the domain of second language, the amount of vocabulary size depends on a factor like genre. Laufer & Hulstijn (2001) suggested the threshold of 3000 word for efficient reading in a text. On the other hand, the threshold of 2000 word and adequate vocabulary's knowledge for ninety percent of texts were proposed by Barnard (2003). Furthermore, about 10 percent of the words are related to the unknown words in the context that learners might encounter. In fact, the amount of vocabulary depends on the type of text. According to successful L2 reading, the threshold of 3000-word families may be sufficient. Evaluation of the needed vocabulary size indicates the importance of vocabulary in reading problems (Laufer, 1997). Insufficient vocabulary knowledge affects reading comprehension since, it is an essential limitation in predicting the meaning a word (Laufer & Nation, 1999).

In Uena & Kuleli (2015, p. 555) "vocabulary size and vocabulary depth were both significantly correlated to reading performance, but vocabulary depth predicted reading performance better". This study emphasised on both size and depth of vocabulary. According to Uen & Kuleli (2015) depth refers to "dimension, which could involve such components as pronunciation, spelling, meaning, register, frequency, morphological, syntactic, and collocation properties, each interacting with the others so that the best comprehension can be achieved. In this regard, Nassaji (2004) found that lexical analysis skills and strategies used by students are related to the depth of vocabulary. It indicated that understanding of the text at first depends on depth of vocabulary then size of vocabulary.

The study performed by Assadi & Vaskehmahalleh (2017) showed that "there was a strong relationship among vocabulary size, text coverage, and reading comprehension test at different genres" (p. 49) that implies the importance of vocabulary size and its importance in reading the second language; therefore, acquisition of language and understanding the text depends of the vocabulary economy the learners have. Also, Sen & Kuleli (2015, p. 562) indicated that, longitudinal studies could obtain data from students from lower level to higher level, measuring their size of vocabulary, depth of vocabulary and reading performance in each level of English learning and coming up with findings regarding how much vocabulary helps students achieve higher performance in reading and when students' depth of vocabulary starts

to improve and even surpass breadth of vocabulary, in this way predicting their reading performance better.

The present orientation as the studies indicated has been devoted to considering both size and depth of vocabulary. However, measuring the size of vocabulary is not a simple task that is discussed here.

There are some suggestions for testing the size of vocabulary. Nation's (2012) vocabulary size test was used to measure the vocabulary size of the participants. The test includes 140 multiple-choice questions that from every 1000 words 10 words is presented to measure the words with the same range of difficulty and the final score will be multiplied in 100 scores to determine the size of words.

According to the framework of the study and consideration of research variables, the following questions were proposed: Q1: Is there any significant relationship between Iranian French Learner's crystallised intelligence and their vocabulary size? Q2: Is there any significant relationship between Iranian French Learner's fluid intelligence and their vocabulary size? Q3: How well can fluid or crystallised intelligences predict Iranian French Learner's vocabulary size?

METHODOLOGY

In this study, 100 French Learners from Safir institutions in Tehran were selected based on Morgan's table. The participants were selected from both genders with the age ranging from 17 to 35. They underwent three tests: Persian Adaptation of Baddeley's (1968) Grammatical reasoning Test for Fluid Intelligence, Persian Test of Baghaei & Tabatabaee (2015) for Crystallised intelligence, and Nation's (2012) Test of Vocabulary Size.

To measure the participants' fluid intelligence the Persian Adaptation of Baddeley's Grammatical reasoning Test was administered. The test is a translation of the original Baddeley's (1968) Grammatical reasoning Test into Persian. The test consists of two parts. One part asks about the personal information such as name, gender, age, field of study and the other part asks provided 64 statement items using the two verbs of "follow" and "proceed" using different time expressions to measure fluid intelligence. The items are in True or False type and the participants have to decide which item is true and which one is false. The time allocated for the test was three minutes. The Cronbach's alpha reliability of the test is reported .91 as measured by Eckes & Baghaei (2015) and to ensure the applicability of the test, it was examined using the result of present test.

To measure crystallised intelligence individuals should perceive words in the sentence even if spelling of the word is not clear or left blank intentionally. Baghaei & Tabatabaee (2015) used a standard test for measuring the crystallised intelligence and since it was implemented in the Iranian context using Persian language, it was used in the present study intact. The test includes four paragraphs in which each paragraph has 20 black spaces for incomplete words that are known as a gap fill test. The term that might be used in gaps is related to the specific topic. The total score of the exam is 80 due to 80 gaps, the amount of crystallised was measured from 100% in the study. Individuals were given four minutes time to complete the test.

The French version of Nation's (2012) was used to measure the vocabulary size of the participants. The test includes 140 multiple choice questions that must be answered in forty minutes. The test is designed so that from every 1000 words 10 words is presented to measure the words with the same range of difficulty. Accordingly, the test includes 14 multiplies 10 words. To specify the vocabulary size the final score will be multiplied in 100 scores to determine the size of words that are out of 14000 words. In multiple questions a term is used and four meaning is provided so that participants should select the most relevant answer. The test is organized from simple to the most difficult. The participants are given forty minutes to answer the items on the test. The Cronbach's alpha for reliability of the test was measured by

Beglar (2010) and it was .832 that is a reliable test of measuring vocabulary size to be used in the current study.

The result of the test was measured using SPSS software. At first, Cronbach's alpha reliability of the vocabulary test, the C-test, and Baddeley' grammatical reasoning test were tested, and then normality distributions were examined. Then the regression test for correlations between variables was tested, then multiple coefficient test to examine the Beta weight of variables. Finally, based on the result of the experiments research questions were answered.

RESULTS

The results of data analysis are reported based on measuring relationship between variables. First, the descriptive statistics are presented and then the analysis related to each research question is reported separately.

Table 1 shows the means, standard deviations, variances, minimum, and maximum for each of the variables in the study. Since the nature and the number of items in each test are different the tests cannot be compared directly. In all tests, for each correct response one point was awarded. The Cronbach's alpha reliability of the vocabulary test, the C-test, and Baddeley' grammatical reasoning test were .92, .69, and .95, respectively.

Table 1. Descriptive statistics for the tests used in the study.

	Baddeley	Vocabulary	C-test
Mean	30.2400	38.0600	46.4400
Median	29.0000	37.5000	47.0000
Mode	15.00	33.00[a]	47.00
Std. Deviation	13.90525	15.39567	10.62522
Variance	193.356	237.027	112.895
Range	59.00	70.00	52.00
Minimum	3.00	14.00	17.00
Maximum	62.00	84.00	69.00

The normality of the distributions of all the tests used in the study was checked. Skewness and Kurtosis values for the distributions were calculated. Skewness is a measure which shows the extent to which a distribution deviates from symmetry around the mean while Kurtosis shows the "peakedness" or "flatness" of a distribution. Skewness and Kurtosis values of zero indicate the data are perfectly normally distributed. However, values between ±1 are considered "very good" and values between ±2 are considered acceptable. As table 2 shows all values are within the "very good" range (West et al., 1995). Therefore, the normality of the distributions for all the tests in the study can be assumed.

Table 2. Test of normality for the measures used in the study.

	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Vocabulary	.70	.24	.32	.47
Baddeley	.42	.24	-.55	.47
C-Test	-.43	.24	.29	.47

Table 3 depicts the correlations between the vocabulary size, the grammatical reasoning test, and the C-Test.

Table 3. Matrix of correlations between the variables.

	Vocabulary	Baddeley	C-Test
Vocabulary	1	.195	.284**
Baddeley		1	.275**
C-Test			1

Note: **Correlation is significant at the 0.01 level (2-tailed).

Q1: Is there any significant relationship between Iranian French Learner's crystallised intelligence and their vocabulary size?

H01: There is no significant relationship between Iranian French Learner's crystallised intelligence and their vocabulary size.

Crystallised intelligence was measured by a Persian C-Test. As table 4 shows there is a positive and significant correlation between the vocabulary size test and the C-Test ($r=.28$, $p<.01$). Therefore, it can be concluded that null hypothesis indicating lack of significant relationship between Iranian French Learners' crystallised intelligence and their vocabulary size is rejected. Therefore, there is a significant relationship between crystallised intelligence and vocabulary size test, though the magnitude of the correlation is rather small.

Q2: Is there any significant relationship between Iranian French Learner's fluid intelligence and their vocabulary size?

H02: There is no significant relationship between Iranian French Learner's fluid intelligence and their vocabulary size.

Fluid intelligence was measured by the Persian version of Baddeley's grammatical reasoning test. Table 4 shows that the correlation between vocabulary size test and the grammatical reasoning test is .19, which is not significant ($p>.05$) it means that the null hypothesis is approved and there is no relationship between between learners' fluid intelligence and their vocabulary size.

Q3: How well can Fluid or Crystallised Intelligences predict Iranian French language Learners' vocabulary size?

To answer the third research question multiple regression analysis was used. The variables representing fluid intelligence and crystallised intelligence, i.e., the grammatical reasoning test and the C-test were entered as independent variables and the vocabulary size test as the dependent variable. Results showed that the model explains a small but significant portion of the variance in the vocabulary size scores ($F(2, 97) = 5.09$, $p< .01$, $R^2 = .10$, adjusted $R^2 = .08$. That is, the two independent variables explain about 8 % of the variability in the vocabulary size test. The analysis showed that Gf, as measured by the grammatical reasoning test, did not significantly predict vocabulary size test (Beta = 0.12, $p=0.21$) but the C-Test did significantly predict vocabulary size (Beta = .24, $p< .01$). Table 4 shows the beta weights, their t-values, and significance for the independent variables.

Table 4. Beta weights for the variables in the regression analysis and their significance.

Model	Unstandardised Coefficients		Standardised Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	17.090	6.833		2.501	.014
BaddelyTotal	.140	.111	.126	1.256	.212
C_Total	.361	.146	.249	2.477	.015

DISCUSSION

The purpose of this study was to investigate the contribution of fluid and crystallised intelligence to foreign language vocabulary size. To this end, a vocabulary size test along with relevant measures of fluid intelligence and crystallised intelligence were given to 100 students

of French as a foreign language. The intelligence tests were the Persian adaptation of Baddeley's grammatical reasoning test and a Persian C-test.

Correlational analysis showed that only the crystallised intelligence measure, i.e., the C-test, had a small correlation with the vocabulary size test. Regression analysis also showed that only the C-test is a significant factor that can explain vocabulary size.

Result of the study implies that fluid intelligence does not predict vocabulary size, it means that students with different level of fluid intelligence may have the same degree of fluid intelligence, while crystallised intelligence by its stabilising feature regarding growing of age and increasing of crystallised intelligence predicts students' size of vocabulary. Accordingly, discerning vocabularies and learners word economy grows with growing older. Previous studies (Baltes, 1987; Li et al., 2004; Kensinger, 2009) emphasized on differences between crystallised and fluid intelligence in predicting language learning ability. Throughout these studies result of this study is in line with that of Li et al. (2004) indicating that crystallised intelligence growth from adulthood to the end of middle age (not old age), while fluid ability grows throughout young adulthood and decreases by the beginning in middle-adulthood and declines towards old age.

CONCLUSION

This study investigated the relationship between fluid and crystallised intelligence on French learners' vocabulary size. Participants were at the same level of language learning and their level of fluid and crystallised intelligence and their correlation with vocabulary size was important. Result indicated that there is a significant relationship between crystallised intelligence and vocabulary size and it is due to growing of age and experiences in exposure to language (Kensinger, 2009). Testing relationship between fluid intelligence and vocabulary size indicated that there is no significant relationship between these two variables that it was emphasised in previous study by Li et al. (2004) indicating that fluid intelligence does not predicts vocabulary knowledge. Agarwal et al. (2009) performed a study measuring the effect of fluid and crystallised intelligence on financial mistakes and reported a reversal relationship between two as the result achieved by Li et al. (2004) respecting language learning and the two intelligences indicating that crystallised intelligence predicts vocabulary size while by growing of age and becoming older the fluid intelligence declines. However, current study approves previous results and determining effect of crystallised intelligence was not so strong, other factors such as educational quality, efforts and environmental factors might be in work in predicting the influential factors on learners' vocabulary knowledge. The present study was limited to learners from 17 to 35 years of age and may not be able to claim the influence of fluid and crystallised intelligence in the middle age or old age. It referred to general linear relationship between the results of previous studies, accordingly large population of participants with different rages of age are required to answer the arising gaps.

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