The Level of Working Memory for EFL University Iraqi Students

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Abstract:

The present study aimed to find out the level of Iraqi EFL university students' working memory. The sample consists of (210) students selected randomly from the Colleges of Education at Baghdad University. To achieve the aim of the study, the working memory test was adopted and applied to the instrument after ensuring its validity and reliability of it. The data collected then were normalized using a number of statistical tools. The current study found that the level of Iraqi EFL university students' working memory is medium. Finally, conclusions, recommendations, and suggestions are put forward.

***Keywords*: working memory, Iraqi EFL university students**

Introduction:

In recent years, academic specialists from different scientific fields have been attached to cognitive talents, memory, and intelligence, theories. The current study is concerned with presenting the psychological variable of working memory. A critical objective of the current study is to present an accurate meaning for the variable and its importance for the field of English language learning. English language learning is interesting for its students because of the separate differences. "Individual differences may lead to academic success or failure in the area of foreign or second language learning" (Salahzade & Lashkarianm, 2015).

Baddeley (1986, p. 34) defines working memory as" a system for temporarily holding and manipulating information during an extent of cognitive tasks such as comprehension, learning, and reasoning".

Language learning is mainly defined as developing the ability to communicate in a second/ foreign language (Ortega, 2011). In recent studies for adult learners based on cognitive theory, language educational achievement explores the predictive power of working memory. The current study sheds light on working memory which is prioritized in the foreign language learning process. Language and working memory are two interconnected systems.

Working memory is the human's ability to process and remember information and is linked to various cognitive activities, from reasoning tasks to verbal comprehension (Kane & Engle,2003). Working memory is a critical contributor to many essential cognitive functions such as reasoning, language comprehension, learning, planning, and general fluid intelligence (Cowan, 2008).

1. Aim

The present study aims at finding out:

1. The level of Iraqi EFL university students' working memory.

2. Literature Review:

"The major purpose of reviewing the literature is to identify information that already exists about the research problem" (Mills & Gay, 2019). The current study reviews the literature and highlights previous research about the psychological variable working memory.

The cognitive difference between an infant who is overwhelmed by new experiences and a toddler who is more assertive about his or her preferences might be attributed to the development of working memory (WM), which acts as a translator between sensory information and long-term memory. Developing a desire takes time, energy, focus, emotion, imagery, and a whole lot of practice. Insufficiencies in WM lead to instability while standing. Life stress may reduce WM capability, and depression can drastically change its path, both of which can have far-reaching consequences for other facets of behavior and memory. Problems with attention caused by impairments in WM's executive subsystem have a ripple effect on cognition and behavior. Reading impairments are also associated with problems in the visual sketchpad and phonological loop of working memory. As a result, WM engages with the external world, shaping into a buffer based on an individual's genetics and life experiences. The study was conducted by many researchers (Oberauer et al., 2003).

Language instruction, neuro-rehabilitation, and special ed are just few of the many contexts in which working memory has been put to use. Much of the study of working memory has focused on the rudimentary mechanisms by which we are able to manipulate representations of our immediate surroundings. Children's working memory is directly related to their ability to learn and succeed in school (Gathercole & Pickering, 2000), as well as their ability to hear and understand speech (Brenneman et al., 2017), recognize speech in the presence of background noise

(McCreery et al., 2017), and perform mathematical tasks (Chalmers & Freeman, 2018).

If humans are trying to solve a math issue, for instance, they need to bring up and keep in working memory some kind of representation of the numbers they will need to manipulate to get to the solution (Cowan, 2017).

2.1 Models of Working Memor

- Baddeley and Hitch's Model 1974
- Daneman and Carpenter's Model 1980
- Hasher and Zack's Model 1988
- Schneider's Model 1993
- Wright's Model 1993
- Malim's Model 1994
- Cowan's Model 1999
- Waters and Caplan's Model 1999
- Schneider's Model 1999
- Baddeley's Model (2000)

2.2 Characteristics of Working Memory

According to Tijani (2015), the main characteristics of WM are:

1. WM has a limited capacity because overburdening storage or processing difficulties in the stream of continuous cognitive operations may result in information being lost from the uncertain memory system.

2. Its usefulness and worth may be seen in the mental ability to store knowledge while being cognitively busy with other relevant tasks. In other words, WM is used to finish one sub-plan while mentality has the crucial interconnected sub-plans and the master plan.

3. An important distinguishing feature of WM is its involvement in what an individual thinks in the present moment; therefore, psychologists consider WM to be equal to awareness, including what a student possesses of panic, anxiety, or stress when handling a problem or finding answers.

2.3 The Role of Working Memory in FL Learning

The function of WMC as a cognitive element in learning FL has received little attention from researchers. Cognitive, emotional, and personality-related variables commonly lead to divergences across students (Kormos & Sáfár, 2008).

Ellis (2001) adds that the WMC idea should be given considerably greater study in FL research since the accomplishment of complex cognitive tasks such as FL comprehension and production necessitates using a system or mechanism that supports the temporary storage of information.

It is suggested that WM "acts as a bottleneck for learning"; students with WM deficits cannot keep enough knowledge in their minds to cope with and complete FL tasks (Gathercole & Alloway, 2008). According to Alloway (2006), WM provides a source for students to integrate LTM and temporary storage knowledge. Losing critical knowledge, such as forgetting where they are in hard work, will have a detrimental impact on them. As a result, they will struggle to reach average learning rates and likely make slow verbal progress (Alloway, Gathercole, Kirkwood, & Elliott, in press).

The functions that represent a student's ability in the FL learning process are:

(1) language analytic ability (metalinguistic capacity),

(2) phonetic coding ability (phonological awareness) in FL; it is a crucial foundational skill in reading success, like a student's ability to analyze a word into its parts as rhyming words and the ability to assign names to images quickly, and

(3) memory capacity (WM); the ability to get phonology (Mikaye & Friedman, 1998). A recent trend is how WM can influence (cold) and (hot) cognition. Thus, a contrast is drawn between cold processing, which reflects unconscious, logical components of cognition, and hot processing, which includes emotive domains (Unsworth et al., 2005).

- Reading performance: Hummel's reading span test measures the importance of the relationship between WMC and FL proficiency (2002). The scores on operational WM activities for typically developing adults are an excellent predictor of reading performance; as a result, WMC is also seen to predict reading achievement (Swanson & Beebe-Frankenberger, 2004).

One reason for the crucial role of WM in Reading is the employment of WMC to remember all necessary speech sounds, match them up with the corresponding letters, and then combine them to read the words. These complex span tasks correlated much better with verbal abilities, including Reading than simple digit span tasks (Daneman & Carpenter, 1980), though it was later discovered that complex span tasks correlate well with aptitudes across domains, not just language aptitudes (Cowan et al., 2005; Kane et al., 2004)

Since FL focuses on information-processing properties, the primary focus of FL research has been on various element processing. As a result, interest has been drawn to examine the role of WM in various FL language features and processes involving Reading (Leeser,2007), writing (Adams & Guillot, 2008), speaking (Fortkamp, 1999), sentence processing (Juffs, 2005), vocabulary (Daneman & Green, 1986), vocabulary improvement (Papagno & Vallar 1995), grammar (Williams & Lovatt 2003), reasoning (Kyllonen & Christal, 1990), orthographic development (Abu-Rabia 2001), discourse comprehension (Walter 2006), and the processing of input and intake (Mackey et al. 2002). Moreover, WM has been a significant portion on L2 aptitude (Dörnyei & Skehan 2003) and an interpreter of general proficiency (Van den Noort et al., 2006).

The concept of WM looks to be a perfect design for SLA objectives. Service (1992) is one of the first to investigate the relationship between non-word repetition and acquiring new words in FL. The test results (non-word repetition task) were initially calculated and correlated with English performance levels. After three years, it was observed that non-word gaps were a significant and independent predictor of FL proficiency.

In sentence processing, students must go through various mental processes, including message conception, formulation, and articulation. However, in the Case of monolingual speech production, the focus on attention needs is more remarkable, particularly during the conceptualization phase, in which students must use more regulated processes to develop a mental representation of content and form for what they wish to express (Just & Carpenter, 1992).

According to the findings of McDonald (2006), Sagarra (2007), Havik et al. (2009), and Sagarra and Herschensohn (2010), WMC can be a valuable indication of FL students' ability to understand morphology (2010).

Morphology is complex for FL students, who regularly make agreement blunders in production, such as plural marking, e.g., the cows, and frequently do not process agreements as quickly as native speakers (Jiang, 2007).

- grammatical structures: The variable use of and sensitivity to grammatical structures among FL students could be attributed to difficulties in primary cognitive operations, which are "low FL working memory capacity, poor FL decoding ability, and slow FL processing speed," which are partially dependent on grammatical

knowledge and thought to improve with increasing proficiency (McDonald, 2006: 382).

- Phonological Loop: It appears that PL (Phonological Loop) or verbal WM is required to maintain ownership of the surface structure of a phrase in order to make the correct syntactic interpretation. Sentences can be syntactically tricky when there are significant gaps between related-activity components, such as the gap between the subject and the direct action in a phrase, for example, (when the girl with the red hood, who was dancing in the wood, saw). Furthermore, certain statements are domestically unclear and would need some form of reanalysis, which is abundantly seen in well-known (garden-path sentences). Students are more likely to struggle with parsing such phrases since the preferred interpretation of an utterance does not match the correct structure of the sentence, for example (the horse that was chased vs the horse that was chasing) (Vallar & Baddeley, 1984, p.159). It is reasonable to suppose that students with a big WMC will do better on sentence parsing than students with a bit of capacity since its job is to maintain word order information until the correct syntactic interpretation is established (Swets et al., 2007, p.70).

- listening comprehension: WMC is crucial in FL understanding and may also be relevant in EFL listening comprehension. When information storage and processing of job needs are prioritized, computation slows, and certain fractional products from WM processing are lost. The appropriate analysis is that EFL listeners frequently appear to be able to receive all words but either swiftly forget what they have heard or are unable to transform what they have heard into meaningful associations (Shanshan & Tongshun, 2007).

- Writing processes: Numerous reasons demonstrate the importance of WM in the operations of the writing processes; first, it provides temporary stores for fleeting thoughts that are generated during writing composition; for example, students may need to remember an idea that they just thought about while transcribing a sentence, or they may need to briefly hold a long sentence while writing all the words down. As a result, various parts of the composition process, such as semantic, syntactic, lexical, morphologic, and orthographic information, must be temporarily stored in WM storage throughout the composition process. Second, the WM processing supervisory functions are heavily entrenched in switching and coordinating among the different writing processes. Third, in terms of text building, WM is frequently used while writing to establish the student's multidimensional representation. They

must compare their previously formed text with the mental picture of the text they aim to compose, both on the grammatical and semantic dimensions, much as they do when revising a piece of writing (Olive, 2012).

The controlled attention will also be involved to effectively execute different FL activities once the mechanical language processing practices are deficient; thereby, understanding as proficiency might be very harmful to the production of fluent, errors-free discourse (Robinson, 2001).

Controlled attention will also be required to successfully execute various FL tasks, indicating a lack of mechanical language processing techniques, which may be detrimental to creating fluent, error-free conversation (Robinson, 2001).

2.4 Previous Studies on working memory:

According to Van den Noort et al. (2006) The purpose of his research was to examine whether or not multilingual individuals' performance on simple and complex working memory tasks differed based on their level of fluency in a foreign language, in line with the study's hypothesized relationship between WMC and FL competence. Thirty-six undergraduates took part in the research; all were native Dutch speakers who were also fluent in German and just beginning their Norwegian studies. Seventy questions were administered based on (Vingerhoets et al., 2003) to assess the participants' linguistic knowledge and experience with several languages. Tasks requiring simple digit span (forward and backward order) and complex WM (reading span task and letter number ordering) were employed across all three languages. The results as a whole reveal that native speakers of one language (L1) and FLs (WMC) perform differently on both simple and complex WM tasks. In another study named "Working Memory Capacity Across L2 Speech Proficiency Levels" is to look at how variances in WMC are associated with progress in FL. Thirty-two students from a prestigious Brazilian federal university in the country's north-eastern region took part in the study of English as a foreign language. There were 11 males and 21 females in the cohort, with ages ranging from 18 to 35. Two months separated the use of two different data collection tools: the working memory (WM) test speaking span test, which was based on two versions of Daneman's (1991) test, and a speech production task, which required participants to narrate a tale that was prompted by images. Samples of the individuals' spoken language were also evaluated for their fluency, accuracy, and complexity. There is no correlation between greater competency and improved WMC, and the results demonstrate that only pupils with shorter attention

spans exhibit a statistically meaningful improvement. Also, the Speaking Span Test is not a good predictor of future speech accuracy improvement, despite its high predictive validity for complexity and fluency in 70 areas of FL discourse. Another study of Prebianca (2013) named "EFL Speech Production: Exploring the relationship between working memory capacity and proficiency level" is the title of this research project. The goals of the research are to identify whether or not WMC correlates with EFL speaker competency, whether or not WMC scores for FL change with speaker proficiency, and whether or not WMC scores for LI remain stable. Forty-one Brazilian Portuguese speakers signed up for an English course at a private institute. Fortkamp (1999) developed the LI (monolingual form) of the speaking span test based on Daneman's (1991) test, and the researcher made some adjustments to make it more equivalent to the FL version of the test. Weissheimer developed a translation of Daneman's (1991) speaking span test into other languages in order to evaluate WMC (2007). A statistical study showed that there was a correlation between FL WMC scores and proficiency, and that there was a correlation between FL WMC scores and LI WMC scores. For the most part, the best findings indicate that WMC is, at least on the surface, a function of FL competence; that is, a learner's performance on the bilingual version of WMC tests will improve as their FL knowledge increases.

The purpose of the research is to examine the impact of task difficulty and preparation on FL students' oral fluency in speech output while maintaining individual differences in WMC. The study included 61 advanced students of FL (MA students of TEFL at Yazd University and the instructors teaching English at Iran Language Institute in Yazd).

3. Methodology:

The whole population of this Study comprises Iraqi EFL university students at English department Education colleges. According to Mills & Gay (2019) accessible population is the population from which the researcher can realistically select subjects. The accessible population of this Study is second-year students in the English departments at the College of Education/ Ibn Rushd for Human Sciences at the University of Baghdad and the College of Education for Women at Al-Iraqia University. Second-year students are chosen as the access of the demographic since they have previously finished around two years of English studies at their colleges. Students are advanced enough at this level to answer the working memory test and

the verbal intelligence questionnaire. The entire amount of the population is (460) students, as shown in table (1)

Table (1)

The population of the Study

Level	College of Education Ibn Rushd Baghdad University	College of Education For Women Al-Iraqia University	Total
2nd Stage	264	196	460

Data Collection Instrument

For achieving the goals of the present study, working memory tests have been adopted.

3.1 Working Memory Tests:

Generally, a test is "a documenting process for students' skills, knowledge, beliefs, and attitudes in measurable terms and procedural methods" (Poehner, 2007). According to Stone & Towse (2005), the varieties existing for an examiner demanding to use working memory tasks are (1) to use a standardized test tool or (2) to construct a tool that provides flexibility to design items that suites their study design (3) to adopt a version of constructed 'non-standardized' working memory task that have been developed for specific research which could have been reused because it suites their study design. The working memory test (Al-Mutalebi, 2020) is adopted to assess students working memory levels. The test takes in six tasks that include all ranges of working memory. Each task comprises (40) unconnected objects divided into (10) cards, each representing one of 5 levels. A sequence of two attempts calculates each level. In terms of the figure of items, the levels vary. For each correct item attempted, the task score is measured as (0.5) on easy tests and one on complicated tests.

3.2 Pilot Administration:

According to Mills & Gay (2019), the pilot administration's value is that it aims at completing necessary information on item functioning to gather test forms. Consequently, a sample of (30) second-year students (College of Education for Women/ Baghdad University) has been chosen to represent the pilot sample to achieve this aim. Therefore, the pilot administration of both the test has been conducted to:

1. Scrutinize the clearness of the objects on the measure

2. Checkered the period contributors take to reply.
3. Regulate the trustworthiness of the measure

In agreement with the pilot management, there is no dubiety in the objects of the tools. Moreover, the appropriate period for students to complete the WM test is (40) minutes.

3.3 Final Administrations of the Instruments:

Final management of the instrument on the study taster includes (210) second-year EFL university students who have been selected to realize the levels of students working memory. The academic examiner administered the instruments electronically on Monday, March 22, 2022, with the Department of English Language for both College of Education, University of Baghdad, and Al-Iraqia University and continued for 20 days.

The working memory test has been applied electronically. Students are asked to store and retrieve the chunks as efficiently as possible within the time allowed for each task.

4. Presentation of Results

4.1 Result Related to the Aim

The first aim is to find " The level of Iraqi EFL university students' working memory "so that a test administers to the sample of study consisting of (210) students. To accomplish this aim, a t-test for one independent sample is used to compute students' mean scores compared to their theoretical mean.

The mean score of students' working memory is found to be (108.3000) with a standard deviation (of 80.215) while the theoretical mean of performance (is 100). Accordingly, the computed t-value is found to be (19.565), which is higher than the critical t-test value (1.96) when the level of significance is (0.05), and the degree of freedom is (209). This shows a significant difference between the two means of the level of Iraqi EFL university students' working memory in favour of the mean score. Accordingly, it can be revealed that the sample has a medium level of student's working memory (see table 4.1)

Table (4-1)

Mean, Standard Deviation, and One Sample t-test for the Level of EFL University Students' Working Memory

Variable	No	Mean	Standard deviation	theoretical mean	t-test		Level of significance
					Computed	Critical	0.05
working memory	210	108.3000	80.215	100	19.565	1.96	Significant

5. Discussion of Results:

According to the present study findings, a semantic feature of a student's working memory is shown by the following results:

1. Iraqi EFL with a middle working memory; perform well in basic working memory tests that show they can keep and remember information, whether verbal or visual.
2. Iraqi EFL university students do middle on complex working memory tests, indicating the excellent and appropriate capacity in informational processing, revising, and manipulating operations for most working memory elements, including the phonological, visual, and central executive.

6. Conclusion

The following results are drawn from the findings of the study:

1. Iraqi EFL university students have a middle working memory.
2. EFL university students' primary ability is visual-spatial working memory.

References

Alloway, T.P. 2006. How does working memory work in the classroom? Educational Research and Reviews, 1(4):134-139.

Baddeley, A. D. (1986). Working memory. New York, NY: Oxford University Press.

Cowan, N. 2008. What are the differences between long-term, short-term and working memory? In: W.S. Sossin, J.C. Lacaille, V.F. Castellucci & S. Belleville (Eds). Progress in Brain Research. Amsterdam: Elsevier. 323-338.

Cowan, N. (2017). The many faces of working memory and short-term storage. Psychonomic Bulletin & Review, 24(4), 1158–1170.

Gathercole, S. E., & Baddeley, A. D. (1990). Phonological memory deficits in language disordered children: Is there a causal connection? *Journal of Memory and Language, 29,* 336–360.

Just, M., & Carpenter, P. A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psycho- logical Review, 99,* 122–149.

Kane, M.J. & Engle, R.W. 2003. Working memory capacity and the control of attention: the contributions of goal neglect, response competition, and task set to Stroop interference. Journal of Experimental Psychology, General, 133:189-217.

Olive, T. (2012). Writing and working memory: A summary of theories and of findings Publisher: Psychology Press Editors: E. Grigorenko, E. Mambrino, D. Preiss.

Ortega, L. (2011). Second language acquisition. In *The Routledge handbook of applied linguistics* (pp. 191-204). Routledge.

McDonald, J. L. (2006). Beyond the critical period: Processing-based explanations for poor grammaticality judgment performance by late second language learners. Journal of Memory and Language, 55, 381–401

Mills, G. & Gay, L. (2019). *Educational Research: Competencies for Analysis and Applications (12th Edition).* Pearson, Toronto.

Salahzade, M., & Lasharian, A. (2015). The relationship between emotional intelligence and verbal intelligence in Iranian EFL learners. International Journal of Educational Investigations, 2(6), 2410-3446.

Swets, B., Desmet, T., Hambrick, D. Z., & Ferreira, F. (2007). The role of working memory in syntactic ambiguity resolution: A psychometric approach. *Journal of Experimental Psychology: General, 136,* 64–81.