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The Effect of Bilingualism/Monolinguals on L2 Working Memory Capacity and Verbal Intelligence

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Abstract

Issues related to bilingualism and the effects which might have on language learners' cognitive and meta-cognitive variables have attracted the attention of a couple of researchers in the field of Second Language Acquisition (SLA). Since a couple of decades ago, there has been a plethora of studies on cognitive and metacognitive differences between bilinguals and monolinguals. However, the impact of bilingualism on EFL learners' WMC and verbal intelligence has not been explored yet. The present study aimed at comparing the WMC and verbal intelligence of bilingual and monolingual language learners. In so doing, 30 Baluch EFL learners and 30 Persian speaker EFL learners were selected through convenience sampling. The data of the study were collected through running WMC measure and verbal intelligence test. The data of the study were analyzed through running descriptive and inferential statistics tests (independent samples-t-tests). Results showed that bilingual language learners outperformed the monolingual language learners in both WMC measures and verbal intelligence test. Therefore, it could be concluded that bilingualism affects EFL learners' WMC and verbal intelligence. The findings have theoretical implications for applied linguists and psycholinguists and practical implications for teachers and syllabus designers.

Keywords: Bilingualism, Monolinguals, WMC, Verbal Intelligence

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1. Introduction

More than fifty percent of the world's population speak more than one language in their everyday life (Kroll & Gollan, 2014). Therefore, issues related to bilingualism and the effects which might have on language learners' cognitive and meta-cognitive variables have attracted the attention of a couple of researchers in the field of Second Language Acquisition (SLA). In the same stream, a great number of studies have investigated the cognitive effects of bilingualism (Yang, 2017).

Since a couple of decades ago, there has been a plethora of studies on cognitive and metacognitive differences between bilinguals and monolinguals (Bialystok, 2001; 2011; Kapa & Colombo, 2013; Kovács & Mehler, 2009; Ransdell, Barbier& Niit, 2006). The review of the related studies also shows that whether bilingualism influences cognitive functions beyond language is a subject of intense debate. On one hand, behavioral studies in children (Calvo & Bialystok, 2014; Kapa & Colombo, 2013), young adults (Vega-Mendoza et al., 2015) and older adults (Bak, 2015; 2016, Bak, et al., 2014a, Bak et al., 2014b; Kavé et al., 2008) have reported better performance in bilinguals than monolinguals on certain cognitive tasks, particularly those measuring the ability to ignore conflicting and/or irrelevant information (Bialystok et al., 2004; Costa et al., 2009). Some studies also report differences in visual memory and spatial processing (Kerrigan et al., 2016). Bilinguals have also been reported to develop dementia 4 years later than monolinguals (Bialystok et al., 2007, Woumans et al., 2015) and to have a better cognitive outcome after stroke (Alladi et al., 2016). The behavioral data are further supported by neuroimaging results, suggesting systematic differences in brain activation between mono- and bilingual subjects (Bialystok et al., 2016).

Some of the related studies confirmed the cognitive advantages of bilingualism in different areas such as problem-solving (Bialystok, 1992; 2006)

metacognitive awareness (Ransdell, Barbier & Niit, 2006) divergent thinking (Kharkhurin, 2010) and attention control (Bialystok, Craik, Klein & Viswanathan, 2004). Bilinguals have also been reported outperform monolinguals in some experimental tasks which require inhibition of task-irrelevant information, such as the Stroop task (Bialystok, 2009) and Simon task, and Flanker task (Costa et al., 2009). Such superiority of bilinguals lead many scholars to conclude that bilingualism improves executive functions (Blumenfeld & Marian, 2011; Bialystok, 2010; Bialystok et al., 2004). Executive functions as Banich (2009) argues, are generally defined as cognitive abilities which guide goal-directed behavior in non-routine situations. They include three components: updating, shifting, and inhibition (Miyake et al., 2000).

However, studies on bilinguals' WM have provided conflicting results so it remains inconclusive whether bilingual WM advantages exist or not. The present study tests WM differences among three language groups with different second language (L2) proficiency levels to find out whether bilingualism grants any WM advantage and whether the advantage relates to bilinguals' L2 proficiency.

Another cognitive variable is verbal intelligence. Verbal intelligence refers to the ability to use language effectively and to be able to communicate sufficiently both in written and spoken forms. Those individuals with strong linguistic intelligence usually have a vast access to vocabularies, which can be used to encourage and persuade others to do what they want. The review of the related studies (Andreou & Karapetsas, 2004; Saeidi & Mazochi, 2013) revealed a bilingual advantage for almost all verbal subtests. That is, the highly proficient bilinguals outperformed others in different verbal tests.

There are reasons to believe that the working memory capacity of bilinguals and monolinguals might be different. Substantial evidence has also been provided that the two languages of bilinguals are activated in their brain

even when only of the acquired languages is used (Martin et al., 2009; Spivey & Marian, 1999; Thierry & Wu, 2007; Timmer et al., 2014; Wu & Thierry, 2010, 2012). Given that language processing is to a great extent dependent on different variables such as working memory verbal intelligence and that there is a significant positive correlation between working memory (WM) capacity and the majority of the higher-order executive functions (Engle, 2002), it can logically be claimed that bilinguals have greater WM capacity than do monolinguals. However, some research confirms this prediction (e.g., Morales et al., 2013; Soliman, 2014) but other some other studies contradict this finding and argue that bilingualism does not significantly affect the working memory capacity of the children (e.g., Namazi & Thordardottir, 2010; Ratiu & Azuma, 2015). As the results of such shortcomings to replicate and confirm the bilingual cognitive benefits, some researchers have argued that there is no significant bilingual advantage (Bak, 2015; Gold, 2015; Gasquoine, 2016; Kousaie & Taler, 2015; Woumans & Duyck, 2015).

On the other hand, it has been claimed that bilingualism is positively related to the capacity of working memory. This claim is also controversial. That is, some research supports this finding while some research contradicts this one assuming that bilingual and monolingual language learners are not different in terms of verbal/linguistics intelligence. It is therefore of much significance to discover the reality of these findings through a comparative study of WM capacity and verbal intelligence of EFL learners in the light of an EX post facto research design.

Bilingualism Advantages

Wodniecka, Craik, Lou, Bialystok (2010) assert that most of the recent findings that reveal a bilingual advantage have been reported in attentional tasks that need the resolution of conflicting information in the visual field such as Simon

task, Stroop task, and ANT task. They believe that this conflict resolution is done by the complex process of executive control. Executive control is needed for all forms of high processes done in the brain including the memory procedures used in everyday cognitive tasks, neglecting interference, performing on the ongoing streams of information, using effective retrieval procedures, and processing materials sufficiently. They claim that memory retrieval consist of two major components: familiarity and recollection. The difference between familiarity and recollection can be described in everyday lives and while recognizing someone you may know beforehand, for example. The face may give you some hints of familiarity, but you cannot recollect the details about that specific person at that moment (Wodniecka et al., 2010). It is generally agreed that the two processes of familiarity and recollection are supported by different mechanisms; familiarity shows the general strength of memory trace while, recollection involves the retrieval process of remembering the details of different events and situations in which the individual is involved (Wodniecka et al., 2010). Wodniecka et al. (2010) had compared younger and older bilinguals and monolinguals on a memory task that involved separate measures of familiarity and recollection. The results obtained revealed that younger adults outperformed older adults on those measures and there was a minimal support for a bilingual advantage in the younger group. Older bilinguals were superior, especially in the non-verbal task.

This study is also supported by the findings of the recent study done by Andreou and Karapetsas (2004). The findings of Andreou and Karapetsas (2004) revealed study show a bilingual advantage for almost all verbal subtests.

The highly proficient bilinguals outperformed others in different verbal tests. They claim that the use of two languages can increase cognitive elaboration and the ability to adopt more efficient learning strategies. The positive transfer between languages can increase the bilinguals' vocabulary and

language understanding as well. Andreou and Karapetsas (2004) believe that the bilingual individuals can make effective use of their rich linguistic background and acquire the ability to make a connection between two languages through abstract learning. The bilinguals are also able to express the same ideas with two different languages. This provides the bilinguals with the efficient foundations for higher mental flexibility and assists them to acquire more cognitive control in the processing of the information (Andreou & Karapetsas, 2004). They further claim that some other scholars such as Cummins, Carroll, and Spark have asserted that cognitive benefits can be gained only among those individuals who have attained higher stages of balanced bilingualism. Andreou and Karapetsas (2004) believe that these researchers are supporting the "Threshold Theory", put forwarded by Cummins (1976). This theory refers to the minimal level of language proficiency needed to achieve functional abilities in second language. (Richards & Schmidt, 2002). It also maintains that bilinguals should attain high levels of linguistic proficiency in both of their languages to promote cognitive development.

According to Portocarrero et al. (2007) assessment of verbal fluency usually consists of phonetic and semantic fluency tasks. They examined the bilinguals' and monolinguals' phonetic and semantic fluency. The findings revealed that both groups of the participants had similar performance on phonetic fluency. However, the bilinguals showed significantly lower abilities in semantic fluency. Portocarrero et al. (2007) believe that bilinguals performed weaker in semantic fluency because of cross-language interference. They were also lower in receptive and expressive English vocabularies. In another study, Bialystok, Luk, and Craik (2008) examined the bilinguals' and monolinguals' working memory, lexical access, and executive control. The results obtained revealed that bilinguals and monolinguals had a similar performance on

working memory tasks, and bilinguals performed better on executive control tasks. Monolingual participants were better on lexical retrieval tasks.

Working Memory and Second Language Learning

A considerable amount of research has linked WM to second language learning in areas including interactional feedback (e.g., Ando, Fukunaga, Kurahachi, Stuto, Nakano, & Kage, 1992; Mackey, Adams, Stafford, & Winke, 2010; Shahnazari & Adams, in press) and reading comprehension (e.g., Alptekin & Erçetin 2009; Walter, 2004).

Research on the role of WM in learning from L2 corrective feedback suggests that WM may shape, explain, and predict the way that learners respond to corrective feedback (e.g., Trofimovich, 2007). Research conducted by Payne and Whitney (2002) suggests that learners with high WMC benefit more from feedback in face-to-face interaction, whereas those with low WM capacity benefit more from feedback delivered via computer-mediated communication.

Recent studies implicate WM in the production of modified output following interactional feedback. They suggest that individuals with higher WMC benefit more from corrective feedback and produce more modified output (e.g., Mackey et al., 2010; Mackey & Sachs, 2011), which in turn promotes L2 learning (e.g., Swain, 2005). For example, Mackey et al. (2010) examined the relationship between learners, production of modified output and their WMC. In their study, a total number of 42 college-level, L1 English learners of Spanish participated in dyadic task-based interaction. They were given opportunities to modify their erroneous utterances on a wide range of forms followed by a range of corrective feedback types such as recasts and clarification requests. They also completed a listening span test, as a measure of WMC, as well as an exit questionnaire, as an index for the level of the

learners' involvement in the tasks. Mackey et al. suggested that learners with higher WMC produced more modified output following corrective feedback.

Shahnazari and Adams (in press) also investigated the relationship between modified output and WMC. In their study, a total of 56 L1 Persian EFL learners completed three WM measures, a reading span test, a math span test, and a non-word recognition task, as well as a grammatical judgment test. They also participated in a teacher-learner interaction task where they were given opportunities to modify their problematic utterances on simple present and past tense forms following corrective feedback in the form of simple clarification requests, as a type of elicitation. The results of their study, consistent with those of Mackey et al. (2010), indicated that learners with higher WMC, as measured by the reading span test and math span test, produced more modified output following oral corrective feedback.

Mackey and Sachs (2011) examined the relationship between WMC and interaction-driven learning with older adult learners. They recruited nine L1 Spanish adult ESL learners, four men and five women, ranging from 65-89 years of age, as their participants. The participants completed a listening span test as a measure of WMC, and a non-word recall test as a measure of PSTM. They also participated in some communicative tasks with native speakers of English, who provided corrective feedback in the form of recasts in response to their erroneous utterances on English question forms. They all completed a pretest, and three post-tests on the target structures, which also consisted of communicative tasks that elicited question forms. Mackey and Sachs (2011) found a significant correlation between WMC and L2 development. More specifically, they found that two thirds (6/9) of the participants indicated development in question formation on at least one post-test

Bialystok, Craik, Klein, and Viswanathan (2004), investigating adults in an Indian context, found that bilinguals (Tamil and English) outperformed

monolinguals (English) in three different tasks: the Simon task (with extra memory demands), the alpha span task and the sequencing span task. Participants were young and older adults (overall mean ages of 43 and 71, respectively). Bilinguals in both age groups performed better: they were faster in the Simon task (especially in the incongruent condition) and could handle better the higher demands of having to hold four rules instead of two in WM. This may serve as evidence that the bilingual advantage might be more salient in situations requiring higher processing demands (p. 298). Also, bilingual advantage was greater for older adults, allowing the understanding that "the lifelong experience of managing two languages attenuates age-related decline in the efficiency of inhibitory processing" (p. 301).

Luo, Craik, Moreno, and Bialystok (2013) also tested younger and older bilingual (n=159) and monolingual (n=119) adults using different verbal (word span and alpha span) and spatial (Corsi blocks) WM tasks. Younger adults were between 18-35 and older adults between 60-80 years old. Monolinguals had English as their L1 and bilinguals had English as their 'dominant language' and also spoke different L2s, such as Russian, Spanish, Cantonese, Farsi, Punjabi, among others. Results have shown an advantage of bilinguals overall regarding the non-verbal domain: from both groups, the bilingual participants outperformed the monolingual ones in the WM spatial tasks.

Bialystok, Poarch, Luo, and Craik (2014) conducted two studies in order to investigate the effects of bilingualism and aging on EF (Study 1) and WM (Study 2). Regarding the second study, 108 participants performed complex verbal (letter task) and nonverbal (figure task) WM tasks which assessed proactive interference in WM. There were 36 younger monolinguals (English; mean age of 20 years) and 36 younger bilinguals (English/other languages), as well as 18 older monolinguals and 18 older bilinguals (mean age of 70 years).

Results show a bilingual advantage in the nonverbal task and for older adults; also, older adults showed 'reduced interference costs' in the Simon task, considered a complex task (p. 703). Researchers explain that advantages for bilinguals tend to appear in more demanding tasks because they involve processing which is more demanding (p.703); they also explain the advantages for both children and older adult bilinguals as being due to more efficient EFs - which develop in childhood and decline with older adulthood–as well as a 'functional ceiling effect' for younger adults: they are at the peak of their EF abilities, so bilingualism effects are minimal at this stage (p.703).

Namazi and Thordardottir (2010) explored the relationship between verbal WM, visual WM, and controlled attention (CA) in 5-year-old bilingual (15 English/French) and monolingual (15 French and 15 English) children. A listening span, a nonword repetition, a digit span, and an adapted version of the Pattern Recall Test were used for measuring WM, as well as the Simon Task (an inhibitory control task) for measuring CA. In the study, a bilingual advantage was not found either: bilinguals and monolinguals showed equivalent performances on the WM tasks.

2. The Present Study

The present study aimed at investigating the effect of bilingualism/ monolinguals on L2 Working Memory Capacity and Verbal Intelligence of Iranian EFL learners. To be more specific, the following research questions were addressed:

1. Is there any significant difference between monolingual and bilingual speakers in verbal intelligence?
2. is there any significant difference between monolingual and bilingual speakers in L2 working memory capacity?

3. Methodology

3.1. Participants

Participants of the study were selected among Iranian upper-elementary EFL students majoring in English-related fields such Teaching English as a Foreign Language (TEFL), English language literature, and English language translation studies at university of Sistan and Baluchestan in Zahedan The participants included both males and females. Upper-elementary students were selected because, in order to draw meaning negotiation attempts, language competence should not be at a high level. All participants were selected through purposive sampling. There were two criteria for selecting the participants: being upper elementary and being either monolingual or bilingual. To have the same number of both status, 30 monolinguals and 30 bilinguals were selected. The participants were all selected from freshman students and included both genders (male and female). They were all assured that the collected data do not directly or indirectly affect their scores on the courses which they took/will take during the treatment.

3.2. Instruments

Two different types of instruments were used. The first type of the study consisted of WM measures (two tests) and the second type was used to measure the learners' verbal intelligence.

WM measures

Reading Span Test (RST)

Reading span tests were originally introduced by Daneman and Carpenter (1980). They were used to measure WMC. In a reading span test (RST), participants are asked to read sets of sentences, report on the semantic

acceptability of each sentence and then recall the final word of each sentence when prompted (storage assessment). This test has been used in different studies as a measure of WMC (e.g., Daneman & Carpenter, 1980; Lesser, 2007).

In this study, a Persian RST was used to measure WMC. Literature review indicates that WM is language independent (Miyake & Friedman, 1998; Osaka, Osaka & Groner, 1993). Therefore, WMC can be measured in the L1. The test included 64 sentences, 10 practice session sentences, and 54 test sentences, all of which were in an active and affirmative form within a range of 13-16 words. As Shahnazari (2014) argues, half of the sentences were constructed as 'nonsense' sentences. This was done by rearranging a few content words in such a way that sentences were syntactically possible but semantically anomalous. This test was administered individually using a computer-based format. Because Persian sentences follow SOV syntax (the sentences initiate with a subject followed by an object and a verb respectively), each sentence ends in a verb. Each verb appeared only once in the test. Therefore, the final words in this test were 64 different three syllable verbs. The verbs in each set were not semantically related. The sentences in the test were arranged in three sets of 3, 4, 5, and 6 sentences. Half of the sentences in each set were nonsense. Each sentence appeared on screen for 7 seconds, when the computer transitioned to the next slide. After each set, a slide with 3 hash keys and a two-second auditory prompt appeared. This was to signal to the participants to recall the final word of each sentence in the set.

To score the test, one mark was given to the participants' correct judgment and one mark to their correct recall of the test session items, with a total of 54 each. Therefore, as there were 54 sentences across all the trial sets, the range of the participants' processing and recall scores was between 0 and 54 for each participant. No marks were given to the practice session items. This was

consistent with the scoring method in recent studies (e.g., Alptekin & Erçetin, 2009, 2010). The reliability of the test was estimated through running Cronbach's alpha, and the obtained alpha was 0.89, which seemed to be acceptable.

Non-Word Recognition

A non-word recognition task was also used to measure phonological short term memory (e.g., Gathercole, Frankish, Pickering, Peaker, 1999; Trofimovich, Ammar, & Gatbonton, 2007). Phonological-short term memory controls the temporary storage and processing of verbal information (e.g., Baddeley, 1996; Ellis, 2001). In the non-word recognition task, the participants hear two consecutive sequences of pronounceable non-words and judge whether they are in the same or different order (e.g., Trofimovich et al., 2007). Non-words are used because they minimize the influence of vocabulary knowledge on phonological short-term memory and yield a relatively accurate estimate of it (Shahnazari, 2014).

The non-words used in this test were adapted from Gathercole et al., (2001) by Shahnazari (2014). The test consisted of 22 pairs of sequences of English non-words. The length of each sequence was gradually increased across the pairs within the range of 4 to 7 non-word syllable length. There were 4, 5, 6, and 7 sets of 4, 5, 6, and 7 non-word sequences respectively in this test. This test was conducted in a classroom environment. The participants were required to listen to each pair of sequences to determine whether the order of non-words in both sequences was the same or different by checking the boxes next to each choice in their answer sheet. To score the test, the total number of correct answers was calculated. This was an index of phonological short-term memory. The participants' phonological short-term memory scores ranged between 0 and 22 in this task.

Verbal Intelligence Test

To determine the monolingual and bilingual language learners' verbal intelligence scores, the researcher used the MIDAS test. As Saeidi and Mazoochi (2013) argue MIDAS is a measurement scale recommended by Howard Gardener (1983), who put forward the theory of Multiple Intelligence" (p.324). This test takes 35 minutes to finish and contains 119 Likert-type items, which cover eight areas of intelligence. For eliminating the probable misunderstanding, which might arise from language proficiency limitation of some participants, a translated version of MIDAS developed and validated by Saeidi and Mazoochi (2013) was used. The translated version of the MIDAS test enjoyed the reliability of 0.92.

4. Procedure

The present study was carried out in different stages. At first, the participants of the study were selected through purposive sampling. At first, the two types of working memory tests were administered to participants. When each participant finished the working memory tests, s/he attempted the verbal/linguist component of multiple intelligence tests. Each participant's scores on the three different tests were summed. Therefore, each participant had three scores: verbal intelligence, reading span test, and word recognition test. The monolingual and bilingual participants were coded 1 and 2, respectively. In the end, the participants' scores of both monolingual and bilingual participants were compared through running appropriate statistical procedures.

5. Data Analysis

The data of the present study were analyzed in different ways. The data were submitted to descriptive statistics (mean & standard deviation) and inferential statistical. In order to see whether the difference between the groups' means on the amount of meaning negotiation was significant, independent samples-t-tests were run (p=0.05).

6. Results

Monolingual and Bilingual Speakers' Working Memory Capacity

The first research question addressed the difference between the monolingual and bilingual speakers working memory capacity. In order to test this question, the following null hypothesis was stated. The participants scores on the two memory measures were analyzed and submitted to different independent samples t-tests. Results are presented in the following tables.

Table 1.*Descriptive Statistics of Monolingual and Bilingual Speakers' on RST and WRT*

	Groups	N	Mean	Std. Deviation	Std. Error Mean
RST	monolinguals	30	23.96	3.11	.57
WRT	bilinguals	30	26.53	3.170	.57
RST	monolinguals	30	10.4	2.1	.39
	bilinguals	30	12.5	1.8	.39

As it is shown in Table 4.1, the mean scores of the monolingual language learners on reading span test is 23.96, and the standard deviation is 3.11. However, the mean score of the bilinguals on RST is 26.53, and the standard deviation is 3.17. Therefore, it can be seen that the bilinguals outperformed the monolinguals.

Results also show that the mean scores of monolinguals and bilinguals on word recognition test (the second memory measure test) are 10.4 and 12.5, respectively. That is, bilingual language learners outperformed monolinguals on word recognition test. To see whether the difference between means scores of the groups was statistically different or not, the mean scores were submitted to an independent sample t-tests. Results are presented in the following table.

Table 4.2. *T-tests for Bilingual and Monolingual Speakers' Means on RST & WRT*

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig.	Mean Difference
RST	Equal variances assumed	.016	.900	-3.13	58	.003	-2.56
	Equal variances not assumed			-3.13	58.0	.003	-2.56
WR	Equal variances assumed	1.080	.303	-4.2	58	.001	-2.16
	Equal variances not assumed			-4.2	56.4	.001	-2.16

As it is shown in the above table, the results of Levene's test for RST (F= 0.016, p=0.9) and word recognition test (F=1.08, p=0.30) show that the variances of monolingual and bilingual language learners on the memory tests were homogenous. Therefore, the researcher was safe enough to report the data for the condition of *"equal variances assumed".* As it can also be seen, the mean scores of the groups (monolingual vs., bilingual) on Reading span test (RST) was significantly different (t=-3.13, df=58, p=0.003<0.05, mean difference=-2.56), favoring the bilingual language learners.

Results also show that the difference between the groups' mean scores on the second memory test (word recognition) was statistically significant, favoring the bilingual language learners (t=-4.2, df=58, p=0.001<0.05, mean difference =-2.16). Therefore, as the means of the groups on the WMC tests are

statistically different, it could be argued that bilingual language learners outperform monolingual language learners in WMC. As the results, the null hypothesis can be strongly rejected, and it could be strongly claimed that bilingual language learners (in this case Baluch learners of English language) have a better working memory capacity than do the monolingual language learners (in this case, Persian learners of English as a foreign language).

Monolingual and Bilingual Speakers' Verbal Intelligence

The second research question addressed the difference between the monolingual and bilingual speakers' verbal intelligence. In order to test the hypothesis, the participants' scores on verbal intelligence measure were analyzed and submitted to an independent samples t-test. Results are presented in the following tables.

Table 3. *Descriptive Statistics of Monolingual and Bilingual Speakers' on Verbal Intelligence Test*

	Groups	N	Mean	Std. Deviation	Std. Error Mean
WR	monolinguals	30	47	4.5	0.92
	bilinguals	30	54	5.6	089

As it is shown in Table 4.3, the mean scores of the monolingual language learners' verbal intelligence test are 47, and the standard deviation is 4.5. However, the mean score of the bilinguals on verbal intelligence test is 54, and the standard deviation is 5.6. Therefore, it can be seen that the bilinguals outperformed the monolinguals on verbal intelligence test. To see whether the difference between means scores of the groups was statistically different or not, the mean scores were submitted to an independent sample t-test. Results are presented in the following table.

Table 4.4. *T-tests for Bilingual and Monolingual Speakers' Means on Verbal Intelligence Test*

		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig.	Mean Difference
Verbal intelligence	Equal variances assumed	3.5	.12	-2.8	58	.001	7
	Equal variances not assumed			-3.8	54.9	.001	7

As it is shown in the above table, the results of Levene's test (F=3.5, p= 0.12) show that the variances of monolingual and bilingual language learners on the verbal intelligence were homogenous. Therefore, the researcher was safe enough to report the data for the condition of *"equal variances assumed".* As it can also be seen, the mean scores of the groups (monolingual vs., bilingual) on verbal intelligence test was significantly different (t=-3.8, df=58, p=0.003<0.05, mean difference=-1.1), favoring the bilingual language learners. Results also show that the difference between the groups' mean scores on the second memory test (word recognition) was statistically significant, favoring the bilingual language learners (t=-4.2, df=58, p=0.001< 0.05, mean difference=-As the results, the null hypothesis can be strongly rejected and it could be strongly claimed that bilingual language learners (in this case Baluch learners of English language) have a better verbal intelligence than do the monolingual language learners (in this case, Persian learners of English as a foreign language).

7. Discussion

The present study had two main purposes. The first purpose of the study was to investigate the impact of bilingualism on the EFL learners' WMC. In so doing, the mean scores of monolingual and bilingual language learners on the two memory measures were submitted to statistical tests. Results showed that bilingual language learners had higher WMC. Therefore, the findings of the study confirms that bilingualism has cognitive advantages and in line with the other researchers, it can be strongly argued that bilingualism is associated with the enhancement of multiple executive functions, including efficiency (Blumenfeld & Marian, 2014), cognitive flexibility (Adi-Japha et al., 2010), task-switching (Gold et al., 2013; Prior & MacWhinney, 2010), and conflict resolution (Donnelly, Brooks, & Homer, 2015). Such an advantage can be the result of lifelong experience which manages multiple languages which compete for selection (Bialystok et al., 2012).

It can also be claimed that as language processing is to a great extent dependent on WMC and there is a strong positive relationship between higher-order executive functions and WMC (Engle, 2002). It is, therefore, logical to expect that bilinguals would also have greater WM capacity than monolinguals. This finding is consistent with findings of some studies (e.g., Morales et al., 2013; Soliman, 2014) but it is unlike the other studies which found no effect (e.g., Namazi &Thordardottir, 2010; Ratiu, & Azuma, 2015).

Despite the existence of contradictory studies, there are reasons to expect that bilinguals might have greater working memory capacity than monolinguals (Spivey & Marian, 1999; Thierry & Wu, 2007; Wu & Thierry, 2010, 2012). The findings also verify the findings of some researchers (Bialystok, 1999; Bialystok et al., 2004; Costa et al., 2008) who claim that larger WM capacity represents greater ability to control attention. It is therefore especially important to discover the reality of these effects in light of the contentious nature of the

field. That is, through replication of the study and selecting a large number of monolingual and monolingual EFL learners, it can be better clarified whether bilingualism is advantageous or not.

The second purpose of the study was to see whether the bilingualism affects EFL learners' verbal intelligence or not. Results showed that bilinguals had a better score on verbal intelligence than do the monolinguals. This finding is consistent with many studies such as Clarkson (1992), Sampath (2005), Andreou and Karapetsas (2004), Bialystok, Luk, and Craik (2008), and Sanz (2000) who claim that bilingualism has positive effects of on different aspects of cognition, creative thinking, abstract reasoning, memory, verbal and non-verbal abilities, social judgment, and personality.

This finding supports the results claimed by Sampath (2005), who reported a high performance for bilinguals in terms of linguistic intelligence. Andreou and Karapetsas (2004) also found similar results. They found out that the proficient bilinguals performed better for almost all verbal sub-tests. They claim that the bilingual participants in their study have achieved high levels of linguistic abilities so that their bilingualism can enhance their cognitive development.

8. Conclusion and Implications

The present study aimed at investigating the impact of bilingualism on EFL learners' WMC and verbal intelligence. In so doing, two groups of Baluch language learners (as bilinguals) and Persian speakers learning English were selected through convenience sampling. The participants received two memory measures and a verbal intelligence test. The two groups' scores were analyzed by running appropriate descriptive and inferential statistics. Results showed that bilingual EFL learners outperformed monolingual language learners in both memory measures and verbal intelligence tests.

Therefore, in line with findings of the study, it can be concluded that bilingualism affects EFL learners' learning process as well as WMC which is assumed to be a cognitive variable. It can also be concluded that bilingualism has some advantages in comparison to monolinguals. It could also be concluded that bilingualism affects the language learners' verbal/linguistics intelligence of foreign language learners. In sum, it can be argued that bilingual language learners make use of the systems of the language they learned to control the process of language learning.

This study examined whether the relationship between WMC and bilingualism is significant. Like the prior studies, the present study indicated that bilingualism affects WMC and verbal intelligence. However, this study is distinguished from the prior studies in that it adds two unique theoretical implications to the research area of WM and bilingualism

The current study also provides some important implications for research processes for WM and verbal intelligence. The results obtained from this study should be interpreted with great cautious on the ground that there are so many factors which may affect linguistic intelligence and WMC of individuals. However, the findings may be very helpful for syllabus designers, policymakers, teachers, and also parents, who should be notified with the positive effects of bilingualism. In conclusion, from the data available, which showed higher performance of bilinguals in terms of linguistic intelligence and WMC, it is suggested that bilingualism may lead to enhanced levels of linguistic intelligence.

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