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Comparative Study of Degree of Bilingualism in Lexical Retrieval and Language Learning Strategies

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Abstract

This study compares lexical retrieval amongst monolinguals and intermediate bilinguals and advanced bilinguals. It also investigates the possible effects of their language learning strategies on their respective lexical retrieval advantage. The study used a mixed methods design and the groups consisted of 20 Persian near-monolinguals, 20 Persian-English intermediate level bilinguals, and 20 Persian-English high-proficiency bilinguals. Auditory and visual lexical Memory Span Tasks were utilized to evaluate the lexical retrieval of all the language groups. The way that bilinguals used their L2 on a daily basis was examined using semi-structured interviews. It was suggested that the knowledge of two languages will not necessarily result in lexical retrieval advantages in bilinguals when compared to monolinguals. However, it was found that the specific language learning strategies used by the bilinguals could potentially influence their lexical retrieval advantages. Furthermore, when comparing lexical retrieval in different language proficiency groups, the method by which bilinguals manage their two languages as well as the environment they are located in should be taken into consideration.

Keywords: Advanced Bilinguals, Degree of Bilingualism, Intermediate Bilinguals, Language Learning Strategies, Lexical Retrieval

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1. Introduction

There have been many studies in the past decades focusing on cognitive differences between monolinguals and bilinguals. The results suggest that bilinguals have an advantage over monolinguals in cognition (Blom, Kuntay, Messer, Verhagen, & Leseman, 2014; Bialystok, 2006; Bialystok, Craik, Klein, & Viswanathan, 2004; Kharkhurin, 2008; Ransdell, Barbier & Niit, 2006). This cognitive advantage is the result of bilinguals' mastery in simultaneous processing and management of two activated languages whenever they use one of their languages (Gollan & Kroll, 2001). Considering the fact that bilinguals simultaneously activate two languages in every language context, their working memories become twice as engaged as those of monolinguals, thus requiring a higher processing capacity. Studies on WM and cognitive capacity suggest that bilinguals' WM is influenced by the activation of two languages which result in the imposition of an extra cognitive load. Nevertheless, there have always been conflicting results in the bilinguals' WM advantage studies which cast doubt on the existence of such a concept. The present study is an attempt to shed some light on the existence of bilingual WM superiority through the comparison of monolinguals lexical retrieval with two bilingual groups possessing different levels of language proficiency as well as analyzing in depth the interview data with the same bilinguals to further understand the effect of bilinguals' employment of language learning strategies on WM and cognitive change.

2. Literature review

2.1. Bilingual Lexical Retrieval

WM is the function of the brain that sustains, exploits, and organizes the short-term information required for performing different tasks (Baddeley, 2007).

The executive nature of WM makes advanced cognitive activities such as problem solving, planning, reasoning, and language comprehension possible (Linck & Weiss, 2011; Martin, & Ellis, 2012). WM is presented in the Baddeley and Hitch model (1974) as the interaction of three components which are the central executive and its two subsystems: the phonological loop and the visuo-spatial sketchpad. The central executive specifies new information to either of its subsystems and decide on the "holding or draining" of information in case of a cognitive overload. The processing of visual and spatial information is the duty of the visuo-spatial sketchpad and the phonological loop is responsible for processing sound and phonological information. The three-fold collaboration of these three systems as WM results in the processing of all incoming information.

WM itself is a subsystem of Executive Functions (EFs) of the brain. EFs basic cognitive processes include WM, inhibitory control, and cognitive flexibility (Diamond, 2006; Miyake et al., 2000). Studies of Executive functions have so far reached the conclusion that bilinguals have enhanced inhibitory control and cognitive flexibility when compared to monolinguals (Bialystok et al., 2005; Bialystok, Craik, & Luk, 2008; Bialystok & DePape, 2009). Inhibitory control is the ability to suppress the distractions and cognitive flexibility is the ability to shift from one language to the other as well as the ease and efficiency with which it is done (Miyake et al., 2000). According to Miyake and Friedman (2012), although the components of EFs are separable, they are highly intercorrelated and function as a single unit. Therefore, based on the results of previous studies on inhibitory control and cognitive flexibility, there is a strong probability that WM in general and lexical retrieval in particular are affected by bilingualism.

Moreover, there are two conflicting hypotheses regarding bilingualism and WM. Some believe that the heavier cognitive load of two activated languages in bilinguals might have an adverse effect on WM; overloading it and slowing down the processing speed which makes lexical retrieval challenging. Some scholars, on the other hand, believe that bilinguals develop more efficient WM and lexicon as shown in their superior inhibitory control and cognitive flexibility.

2.2. Existing Research in Bilingual Working Memory and Lexical Retrieval

Whereas most studies on the effects of bilingualism on inhibitory control and cognitive flexibility have shown a significant advantage in bilinguals over monolinguals, the investigations into the WM of bilinguals have been far less conclusive and have not yield consistent results (Bialystok et al., 2005; Bialystok, Craik, & Luk, 2008; Bialystok & DePape, 2009).

The WM was measured as a part of the bilinguals' executive control function in a number of studies. Bialystok et al. (2004) investigated the effects of age on the EF advantage of bilinguals using the Simon task. The study involved subjecting participants to stimuli with various degrees of WM manipulation and measuring their reaction times. In the tasks with lower levels of WM manipulation, the monolinguals and bilinguals did not show significant differences in performance. However, the bilingual participants showed superior performance to their monolingual counterparts in the tasks with higher levels of WM manipulation, suggesting two things: a) Bilinguals have enhanced WM when compared to monolinguals, and b) WM and Executive Function are possibly interrelated. A similar study with child participants yielded similar results, i.e., the bilingual children consistently performed better than monolingual children in all the tasks involving larger WM loads (Morales,

Calvo, & Bialystok, 2013). This indicates that children who are bilingual can manage and organize information more efficiently than monolingual children.

Notably, some contradictory results were found in studies involving simple, lighter WM tasks. The verbal and Visuo-Spatial differences in the WM of Turkish-Dutch Bilingual children and those of Dutch monolinguals were examined by Blom et al. (2014). The study pointed to enhanced verbal and Visuo-Spatial WM in bilinguals. But studies also exist with findings contrary to the above. Gutierrez-Clellen, Calderon, & Weismer (2004) found that children with high fluency in L1 and L2 performed no better than bilinguals with lower L2 fluency in lexical retrieval. Further studies are therefore needed to offer more conclusive findings regarding the WM advantages of bilinguals.

2.3. Intermediate Bilinguals versus Advanced Bilinguals

The majority of the studies cited above used participants of pre-adolescent age who were concurrently learning their L1 and L2, or people who immigrated to their L2 environment at a young age and those who achieved a balanced level of L2 fluency compared to their L1. Bilinguals who first learned their L1 and then later on, their L2 (known as sequential bilinguals) with different levels of L2 fluency have not been studied adequately. The findings of such a study could have significant implications because if bilingualism indeed affects an individual's cognitive performance, then it can be expected that this effect appears gradually as the bilinguals L2 proficiency increases i.e. they do get more of the bilingual cognitive benefit as they improve their bilingualism. Cummins's threshold hypothesis (Cummins, 1979; Cummins 2000) states that for a bilingual to possess enhanced cognitive performance, they must first achieve a certain level of L1 and L2 proficiency i.e., a threshold L1 and L2 proficiency. However, this possible link between bilinguals' language

proficiency and their consequent cognitive advantages has not been conclusively proven. As such, investigating bilinguals' WM and their level of L2 proficiency can help shed light on the subject.

2.4. Language Use and Working Memory Advantage

There is existing literature pointing to the possibility that bilinguals' dual language practice acts as mental training and can improve their cognitive abilities (Bialystok et al., 2004; Bialystok et al., 2005; Martin-Rhee & Bialystok, 2008). Bilinguals' activation of two languages, and the restriction of one while using the other, help enhance their inhibitory control and their almost constant switching between their two languages serves to develop their cognitive flexibility (Bialystok et al., 2004; Bialystok et al., 2005; Martin-Rhee & Bialystok, 2008).

More recent studies have suggested that the cognitive advantages that bilinguals benefit from is influenced by more than just bilingualism itself. It may also be influenced by the way they use their languages and the way they experience their languages in daily life (Blackburn, 2013; Green, & Abutalebi, 2013). The way that bilinguals use their two languages can vary depending on the L1, the L2 as well as the cultures of these languages and the cultures that the individuals are exposed to (Heredia, & Altarriba, 2001; Myers-Scotton, Namazi, & Thordardottir, 1997). Relatively few studies have investigated if and how the cognitive changes in bilinguals are linked to their language practices. It is thus significant to take bilinguals' language practices into account when studying any possible cognitive advantages that they might possess.

This study aims to examine possible cognitive differences in WM of Persian monolinguals, intermediate Persian-English bilinguals, and advanced Persian-English bilinguals. Second, the study aims to explore any possible

relationships between bilinguals' WM and their daily use of language learning strategies and communication strategies. The convergent parallel mixed method design (Teddlie, & Tashakkori, 2009) was used to investigate the experimental WM test results and juxtapose them with descriptive results of the language practice interviews. Visual and auditory lexical span memory tests were used to measure monolinguals' and bilinguals' verbal short term memory and a semi-structured interview is employed to investigate bilinguals' strategy use and language practice.

3. Method

3.1. Participants

The study sample consisted of three groups of 20 adults (all in their 20s and 30s); a Persian near-monolingual group, a Persian-English bilingual group with intermediate English proficiency, and a Persian-English bilingual group with advanced English proficiency. The participants' gender, age, field of study and socio economic status (SES) were considered via a questionnaire, and in order to minimize their effects on the final result of the study, such characteristics were meticulously controlled for in order to have a homogeneous sample. Most of the participants categorized their socio-economic status as middle or upper class. Furthermore, almost all of the participants shared similar educational background.

Since English is taught in schools in Iran, it is impossible to find true monolingual Iranians who have never been exposed to English; therefore, the term "near-monolingual" is used in the study. The near-monolinguals had started learning English through the second grade of middle school to the pre-university, and although they were exposed to the basic grammar structure and reading comprehension, they had very limited practical knowledge of English.

According to Bialystok et al. (2004), language proficiency, amount of language use and age of acquisition are three factors that have a crucial role in the degree of bilingualism. Since all of the participants started English language learning at school, they can be considered sequential bilinguals. Intermediate language proficiency group participants had been studying English academically for over 4 years and their range iBT TOFEL scores were set between 65 and 90 with mean score of 84.2. Advanced language proficiency group participants had been studying English academically for over 6 years and their range of iBT TOFEL scores was set between 94 and 120 with a mean score of 103.2. All participants were majoring in the field of the English Language at university.

3.2. Instruments

In order to minimize the effects of age and general intelligence on the WM test results, a nonverbal culture free IQ test was administered. The results of age and IQ one-way ANOVA test showed that there were no significant differences between the three experimental groups. The mean values were as follows: Mean age, $F(2,57)=0.023$, $p>0.025$. Mean IQ score, $F(2,57)= 0.493$, $p>0.025$.

In order to measure visual and auditory Lexical span of the participants, the computer version of Lexical span memory task was employed. There are two ways presenting lexis which are the forward method to test short term memory and the backward method to test the manipulation of WM. In the auditory trails Lexical span memory test, a sequence of auditory lexis was played and participants were asked to listen and memorize the sequence of frequent vocabulary items and record the words in the voice recorder either in the order of presentation or in reverse. In the visual Lexical span memory task participants see the presented lexis on the screen before them. In order to

counterbalance the effect of visual or auditory personation, half of the participants took the auditory version first, and the rest of them participated in the visual task first.

In order to investigate how intermediate and advanced English Persian bilinguals employ the two languages in their daily lives and the cognitive effect of bilingualism, three one-hour interview sessions were conducted. The first interview had a pre-developed protocol to obtain a complete picture of their language learning cognitive effort and their everyday language practice. The second individual interview was conducted to complete and elaborate on the information gathered from the first interview. The third interview was held in groups to check the similar and different opinions of participants about their language practice, their cognitive effort and their memory strategies and management.

3.4. Data Analysis

In order to analyze the scores from the lexical memory span tasks, a Multivariate Analysis of Variance (MANOVA) was employed given that the lexical memory span task produced four separate scores in Two-Error Maximum length: forward, backward, auditory and visual which measured the same construct of memory span. Type I error rate inflation was prevented by MANOVA and a series of post-hoc analyses were administered to spot any possible significant differences between the variables.

All the participants in intermediate and advanced bilingual groups participated in the semi-structured interview. The 40 interview recordings were transcribed and thematically analyzed. The analysis led to the formation of six categories which are as follow: contrastive analysis, monitoring, retention, self-

evaluation, learning to learn, degree of monitoring that were grouped into two basic themes of compensation strategies and metacognitive strategies.

4. Results

4.1. Analysis of Results from the Auditory and Visual Lexical Span Memory Tasks

Two-Error Maximum Length score was chosen for analysis since it would provide information on the actual maximum lexical span. Hence, the auditory and visual lexical memory span tasks have been done on forward and backward two errors maximum lengths. As it is presented in Table 1, the moderate range of correlations between dependent variables meets the appropriateness criteria of a MANOVA analysis.

Table 1. *Correlations between Two-Error Maximum Length Variables*

		1	2	3	4	M	SD
1	Visual forward TE-ML	1				8.62	1.67
2	Visual backward TE-ML	0.586**	1			7.91	1.08
3	Auditory forward TE-ML	0.439**	0.563**	1		7.34	1.64
4	Auditory backward TE-ML	0.391**	0.589**	0.762	1	8.12	1.58

TE-ML: Two-Error Maximum Length.**: Correlation is significant at the 0.01 level (two-tailed).

Box's Test of Equality of Covariance Matrices was used to test the homogeneity of convergence in dependent variables. P-values of 0.499 in addition to the Box's M value of 23.329 suggested that there was no significant difference between the convergences of dependent variables which met the presuppositions of the MANOVA test.

In order to test whether there was any mean difference between the Lexical memory span task results of monolinguals, intermediate bilinguals, and advanced bilinguals, a one-way MANOVA was conducted. A statistically significant F-value from MANOVA tests, Wilks' Lambda=0.745, F(8, 108). P<0.05, indicated a difference in memory scores among the three language groups. The estimation of the multivariate effect size at 0.164 indicated that 16.4% of the variance dependent variable was accounted for by the language groups.

In order to pinpoint the language group differences, a post-hoc procedure was administered through a serious of follow-up ANOVAs. To test the homogeneity of the variance assumptions of ANOVAs, a series of Levene's F-tests were administered for all four sections of the Lexical memory test. The results were satisfying with regards to the homogeneity of the variance assumption and therefore, the ANOVAs were employed in this study.

Table 2. *One-Way ANOVAs with Two-Error Maximum Length as Dependent Variables and Language Groups as Independent Variables*

	Levene's		ANOVAs		
	F (2,57)	ϱ	F(2,57)	ϱ	η^2
Visual forward TE-ML	1.12	0.321	4.32	0.042	0.082
Visual backward VB TE-ML	0.41	0.722	3.54	0.081	0.079
Auditory forward AF TE-ML	0.41	0.719	5.86	0.022	0.146
Auditory backward Ab TE-ML	0.94	0.392	7.86	0.003	0.316

The results of the series of one-way ANOVAs, as presented in table 2, reveal that although there were not any statistically significant differences between the visual Lexical span tasks, ANOVAs on both the auditory forward and backward Lexical span memory tasks were statistically significant, with large effect size which resulted in mean differences across language groups.

Fisher's LSD was used as post hoc analysis to determine mean differences amongst language groups, as presented in table 3.

Table 3. *Cohen's d Group Mean Comparison*

	N. M.		I. B.		H. B.		N. M. vs. I. B.	N. M. vs H. B.	I. B. vs H. B.
	M	SD	M	SD	M	SD	(Cohen's d)	(Cohen's d)	(Cohen's d)
Visual forward TE-ML	8.23	1.92	8.78	1.62	8.11	1.19	0.87* (0.59)	0.00	0.84* (0.68)
Visual backward TE-ML	7.23	1.22	8.23	1.22	7.23	1.06	0.41	0.46	0.79*(0.73)
Auditory forward TE-ML	8.35	1.79	9.15	1.48	8.46	1.33	1.73*(1.08)	0.33	1.51*(0.99)
Auditory backward TE-ML	7.42	1.33	8.50	1.13	7.62	1.49	1.28*(1.01)	0.18	1.28*(0.87)

N. M.: Near-monolingual group, I. B.: Intermediate bilingual group, A. B.: Advanced bilingual group. Cohen's d is reported when it is significant. *: The mean difference is significant at the 0.05 level.

The results proved that the intermediate bilingual performance in the visual forward lexical span task in total-error medium length was significantly higher than other groups with medium effect size at 0.59 (the between near-monolingual and the intermediate bilingual groups) and at 0.68 (between the intermediate bilingual and high bilingual groups) as estimated by Cohen's d as well as auditory forward and backward total error medium length with a large Cohen's d value effect size ranging 0.87 to 1.08.

In sum, the statistical results revealed that the intermediate bilinguals outperformed the near-monolinguals and the advanced bilinguals in visual and auditory memory maintenance measures with a higher auditory effect size. Further, the WM capacity of the high bilingual group wasn't significantly higher than near-monolinguals. This suggests that bilingualism does not necessarily result in a WM advantage.

4.2. Results of Semi-Structured Interview

WM is related to the mechanism of holding information in mind. The semi-structured interview data revealed that Persian-English bilinguals in the present study enhanced their cognitive ability to retain incoming English input by developing language learning strategies when using second language. Based on the analysis of the data, two themes of compensation strategies and metacognitive strategies (and their subcategories) emerged.

4.2.1. Compensation Strategies

The bilingual participants announced that they had develop three major compensation strategies to manage the two languages, which they specifically employed at their earlier stages of L2 learning. The three major strategies are contrastive analysis, monitoring, and retention. These strategies and their implications are explained below.

1. *Contrastive analysis*. The fundamental difference between Persian and English was mentioned by all bilingual participants in the study. This difference was one of the major sources of learning difficulties for them. However, in order to overcome this difficulty, the bilingual participants developed their own language learning strategies. For example, most of them used to memorize the whole sentence in order to translate it to Persian in their minds and understand the sentence meaning and concept in their early stages of language learning.
2. *Monitoring.* Most of the participants monitored their performance and tried to pinpoint and avoid their possible mistakes by paying extra attention to their output. In other words, they focused on form. Participants reported

that they tried to monitor their pronunciations, vocabulary usages, and their grammar.

3. *Retention*. Participants also reported that they tried to retain the previous message in the conversation. However, the pattern of remembering was different across the language groups. While advanced bilinguals only kept the gist of the ideas available in their WM, intermediate bilinguals tried to remember sentences to avoid losing track of the conversation. Some of them even mentioned that they tried to keep the whole sentence in mind and replayed it to their conversation partner to provide themselves with some time to decode the meaning of the sentence. During the early stages of language learning, almost all of the participants tried to hold a sentence in their minds and translate it back to Persian in order to understand its meaning. Their lack of English proficiency in the early stages of language learning made them resort to developing strategies like holding a sentence active in their WM and replayed it to translate it back to Persian in order to manage the conversation. However, most of the advanced bilinguals reported that with improved English proficiency they did not use translation or mental replay techniques in order to process the information. But some intermediate bilinguals still resorted to these strategies in complicated conversation contexts.

4.2.2. Metacognitive Strategies

As presented in compensation strategies, participants in the process of becoming bilinguals developed some compensation strategies to make up for their lack of English proficiency. In practicing bilingualism, some metacognitive strategies were observed in the results of interview analysis. Participants in the process of L2 learning used different metacognitive strategies based on their

level of English proficiency. The metacognitive strategies are presented below under three categories:

1. *Self-evaluation:* All participants reported that as they became more proficient in English, they became less likely to resort to translation for understanding sentences. Improving language proficiency eliminated the need to hold the sentences in mind and translate them to Persian in order to understand their meaning. Advanced bilinguals also reported that English came naturally to them and they did not need to think about the process of their comprehension and production anymore. Some of them even claimed that they used English the way they used Persian. Advanced bilingualism seemed to relieve them of the need to use compensation strategies.
2. *Learning to learn.* Language learning is a lifelong process. Although the advanced bilinguals did not hold the incoming information in their minds in order to translate them, they reported that they tried to memorize new phrases and expressions in interaction with native speakers, while reading books, or watching the news.
3. *Degree of monitoring.* Intermediate bilinguals and advanced bilinguals demonstrated different degrees of monitoring. While intermediate bilinguals tried to intentionally monitor their production based on appropriateness and correctness of meaning and form, the process of monitoring had become procedural for the advanced bilinguals and they did not focus on forms anymore.

The analysis of interview data suggested that language learners in early stages of language learning resorted to remembering and monitoring strategies to compensate for their lack of L2 proficiency which are both relayed on the capacities of WM and resulted in improved their L2 memorization and

monitoring. Although the advanced bilinguals did not try to occupy their WM by memorizing sentences for translation anymore and monitoring had become an instinctive, "second nature" process for them, they would still try to memorize new expressions whenever they encountered them and tried to use them in appropriate contexts in order to sound more native-like.

5. Discussion and Conclusion

The study aimed to investigate possible WM differences among a) monolingual Persian speakers, b) Persian-English intermediate bilinguals, and c) Persian-English high proficiency bilinguals. It further aimed to determine whether there are any changes in the cognitive processes of these groups in relation to their daily language use.

The WM in all three groups were measured using the Lexical Memory Span Task. It should be noted that in order to control for the possible effects of the general intelligence of the participants on the test results, individuals with similar IQ levels were chosen for the study. Statistically significant differences were found among the tests of among the three groups using the MANOVA analysis. A post hoc analysis was thus carries out and it was found that when asked to remember the lexis presented in both visual and auditory forms, and later to recall the reverse order of the lexis presented in auditory form, the low bilingual groups scored the highest. This points to possibly superior visual/auditory memory maintenance and auditory memory manipulation in the intermediate bilingual groups when compared to the other groups. It is noteworthy that when investigating the superior performance of the intermediate bilinguals compared to the other two groups, large effect sizes were found, particularly in the auditory forward and backward Lexical Memory Span Tasks, suggesting that the dual language practice of the intermediate

bilinguals had a considerable effect on the development of their auditory WM capacity. The monolinguals and the advanced bilinguals showed no significant difference in the Lexical Memory Span Tasks results, indicating that only the intermediate bilinguals possess those possible WM advantages. These results support the possibility that the relatively shorter time that intermediate bilinguals have been practicing and exposed to L2 for, may in fact provide them with a WM advantage. But the findings show no evidence that the high bilinguals enjoy an enhanced WM when compared to near-monolinguals or intermediate bilinguals, which is contradictory to the existing findings on the WM advantages of bilinguals (Bialystok et al., 2004; Morales et al., 2013).

But a possible explanation for the unexpected Lexical Memory Span Tasks findings exists based on the interview data. The interview data suggest a possible explanation for the results of Lexical Memory Span Tasks. When the interviews were analyzed, it was observed that when learning their L2, Most bilinguals created their own strategies and despite variations between the individual strategies, the general patterns were similar: 1. Monitoring L2 information 2. Holding L2 information, 3. Replaying L2 information for understanding. Reports were mostly made by intermediate bilinguals, and primarily when discussing the earlier stages of their L2 learning. In the earlier stages, the bilinguals actively paid attention to the information they were given in order to retain it. This information was then held and replayed in their minds so that they could better understand it. Later into their L2 learning, as they began to understand the L2 information instantaneously (especially the high bilinguals) they became more comfortable in their L2 learning and started to use the "memorize-and-replay" techniques less and less often until they would barely even notice whether they were using them. The high bilinguals employed these strategies for other, less frequently-occurring purposes: to monitor and

check the correctness of their L2 usage, and when learning new words or expression that they wished to use in their future.

It could be observed from the interview data that the monitoring and holding L2 strategy was employed by both bilingual groups, but that the intermediate bilinguals used it more than the high bilinguals, suggesting that practicing dual languages may be an additional cognitive load given that the L2 information had to be "held" in order to be processed. Hebb's (1947, 1949) study on the cognitive enrichment hypothesis, consistent usage of life-long activates, serves as a constant practice and thus improves the functions that are involved in said activities (Fratiglioni, Paillard-Borg, & Winblad, 2004; Green, & Bavelier, 2008; Potter, Helms, & Plassman, 2008). This theory could provide an explanation for enhanced WM in bilinguals: the bilinguals would be forced to manage the extra cognitive load, thereby enhancing their WM functions.***

This was further looked into by cross-examining the interview data with the test results. Results indicated that the intermediate bilinguals, who reported a higher usage of the remembering strategies, indeed scored higher in the auditory LMST. This further supports the notion that the higher mental load and consequent mental training, resulted in an enhanced WM. It was also observed that the intermediate bilinguals primarily reported their use of the remembering technique for the auditory information. Their superior performance in the auditory forward/backward LSTs is consistent with this finding. Their lower L2 proficiency would have meant that the auditory information given to them was an imposed load requiring higher WM performance to manage.

As mentioned before, the high bilinguals employed the same strategies as the intermediate bilinguals when dealing with L2 information presented to them. They, however, did not show an enhanced performance compared to the

monolinguals, i.e., they did not seem to enjoy the same advantages as the intermediate bilinguals. This could be explained by the fact that dual language practices had become second-nature to the high bilinguals. Once past the beginning and lower stages of bilingualism, they no longer needed the intensive use of the remembering and replaying strategy for understanding L2 like the intermediate bilinguals. They simply comprehended the L2 information upon hearing it, thus avoiding the need to retain the information. They resorted to the use of the retain-and-replay strategy only when encountering new words and expression that they wanted to learn. Moreover, they would encounter new words and expression less and less often with increasing L2 proficiency. As their command on the L2 improved in their 6 years of exposure, they became more confident in their use of L2 and had lighter cognitive loads to process. It would therefore follow that the high bilinguals had a lighter mental demand placed on them than the intermediate bilinguals when exposed to the auditory L2 information as a result of years of practice and increased efficiency, thus they did not exhibit an enhanced WM compared to the intermediate bilinguals in the tests.

These results are consistent with existing studies which point to bilingualism's cognitive benefits being a specific adaptation: they are the result of specific cognitive skills used for bilingualism. Priori and Gollan's (2011) as well as Soveri, Rodriguez-Fornells, and Laine's (2011) findings are examples of advantages in cognitive control in bilinguals who frequently switch between languages compared to those who do not.

The theory that the amount of cognitive demands placed on individuals as a result of practicing dual languages is further supported by Macnamara and Conway (2014). The significance of these finding is that they suggest a WM advantage does not necessarily occur in bilinguals as a result of their

bilingualism, but that it could come about as a result of their cognitive training due to using two languages. This notion is further supported by the current study, as the intermediate bilinguals (with higher cognitive loads to deal with) scored higher in the auditory DSTs than the high bilingual who, as previously discussed, had a lower cognitive load to process, and performed similarly to the near-monolinguals.

It could be concluded based on the findings of this study that the practice of dual languages contributes to improved cognitive functions by serving as a mental training, as the intermediate bilinguals were found to have enhanced WM, while the high bilinguals did not seem to possess such an advantage.

It is suggested that the high WM load that intermediate bilinguals are subjected to leads to the development of their WM. The constant use of two languages forced them to compensate for their lack of L2 proficiency by continuously monitoring, retaining, and replaying the L2 information that they were hearing.

The high bilinguals, on the other hand, exhibited no such advantages since they had mastered their second language and thus were able to process the L2 information presented to them almost instantly. This meant that their cognitive loads and the corresponding cognitive training were too low to result in any lexical retrieval improvement compared to the intermediate bilinguals or the near-monolinguals.

Finally, according to these findings, bilingualism itself will not necessarily lead to advanced lexical retrieval in bilinguals in comparison with monolinguals. The specific L2 environment (where bilinguals must employ specific cognitive functions accordingly) and to some extent, the cognitive learning techniques can influence the mentioned lexical retrieval advantages. Further, the working memory in general and lexical retrieval in particular

advantages investigated in any given study, may also differ based on the population being studied. As such, when studying the possible cognitive advantages of bilinguals, the method that bilinguals deploy to manage their two languages as well as the environment they are placed in should be considered.

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