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Executive Functions, Metacognitive Awareness, and Cognitive Flexibility in Advanced English Language Learners in Comparison to other Students

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Abstract

Introduction: In recent years, an abundance of research has been conducted on the effects of bilingualism, with varying conclusions.

Aim: This study was designed to assess the executive functions of the brain (working memory, cognitive flexibility, and inhibitory control), metacognitive awareness, and cognitive flexibility between advanced English language learners and typical students.

Method: this applied comparative study was conducted in the academic year 2022-2023. The population included all primary school students in Tehran's districts 5 and 18 between the ages of 7 and 12 years old. Sample of the study consisted of 180 individuals, divided into two groups (90 individuals each), using the convenience sampling method. Data was collected by the use of the executive function questionnaire developed by Delis and Kaplan (2001), the metacognitive awareness questionnaire developed by Mokhtari and Richards (2002), and the cognitive flexibility test (Wisconsin card sorting) (2006). Using SPSS 24, an independent t-test was conducted on the collected data.

Results: The findings indicated that the advanced language learners outperformed the general group in all aspects of working memory, including mental flexibility and inhibitory control, general study strategy, problem-solving strategy, supportive study, and the number of correct categories. However, the general group exhibited a higher average perseveration error compared to the advanced language learners ($P<0.05$).

Conclusion: The superiority of bilingual students over monolingual students in executive functions, metacognitive awareness, and cognitive flexibility, can be suggestive for early planning of second language instruction in schools.

Key Words: Brain Executive Function, Cognitive Flexibility, Inhibitory Control, Language Learner, Metacognitive Awareness, Working Memory.

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1- **INTRODUCTION**

The concept of bilingualism has been modified throughout the past few decades (1). Learning and maintaining more than two languages has never been simple and has garnered a great deal of attention (2) due to the fact that this benefit enables multilingual individuals to comprehend other cultures. And this superiority helps society and the economy (3, 4).

Bilinguals might possess greater cognitive abilities than monolinguals (5-7). Specifically, a large number of studies have demonstrated that bilingual individuals have superior executive function skills compared to their monolingual counterparts (8), and a substantial portion of empirical research on bilingualism has centered on comparative performance. It examines bilingual and monolingual populations in terms of executive function (9). Grundy (10) demonstrated through research that bilinguals perform better in executive functions than monolinguals.

Executive functioning entails the regulated and coordinated mental processes required for daily tasks such as planning and attention management (11-13). The executive functioning system is a general cognitive system that is essential for the flexibility and regulation of cognition and purposeful behavior (14). The bilingual advantage refers to the greater performance of bilinguals in activities requiring executive processing, such as inhibitory control, cognitive flexibility, and working memory (10, 15, 16, 17). There are two inhibitory control areas: cold control and hot control. Cold control, also known as inhibition of attention, refers to the ability to block the shift of attention to external stimuli (11). It is typically tested with conflict tasks and requires participants to inhibit the stimulus. Distractions hinder productive performance (18). Another way is warm control, which is typically measured using delayed tasks, such as the delay in completing activities (19). Cognitive flexibility, also known as the ability to shift attention from one stimulus to another (20), is believed to be central to bilingual cognitive advantage (6, 21). The ability to manage multilingual systems and move between them effectively is essential for bilingual communication, and it is believed that cognitive flexibility skills acquired in linguistic contexts can be transferred to non-linguistic contexts, so to Daily tasks aid in the development of cognitive flexibility (8). Even in preverbal infants, a correlation between language status and cognitive flexibility has been observed (22). Comishen, K. J., Bialystok, E., & Adler (23) reached the conclusion that cognitive flexibility might be greater in bilingual infants. Working memory is also an executive function. Greater second-language proficiency may be associated with enhanced working memory (24). Grundy & Timmer (24) demonstrated in a study that bilinguals have an advantage in working memory development, and that this advantage is more pronounced in children, indicating that working memory skills between monolingual and bilingual individuals develop early in life. It is believed that these advantages in the executive functions of bilinguals are due to this population's need to manage multiple languages and constantly monitor the most appropriate language for each communication situation (12). According to Bialystok (6), bilinguals have an advantage in executive functions because they are continuously trained to conduct a conversation that is context-dependent and requires constant access to information in working memory. In addition, it is necessary to select the appropriate language for the specific communication situation (another language barrier) and to monitor the interaction (cognitive flexibility) (25). In addition to these advantages, the use of multiple languages has been suggested to improve executive

functions, and the advantages of multilingual people's executive functions can be explained by the way our brain processes multiple languages (24).

Metacognitive awareness is another influential variable in students' success and comprehension of the effects of language classes (26). The concept of metacognition dates back to the time of Aristotle, who believed that there are two thinking processes (26). The first process relates to the mind's prior knowledge and information, while the second relates to the mind's use of previous knowledge and information to comprehend new or unknown concepts (24). Global communication is a part of our daily lives in a multilingual world, and it is crucial to teach metacognitive strategies to improve language learners' proficiency, fluency, and confidence, particularly in a classroom setting (27, 28). In the field of second language, Rubin (29) asserts that cognitive and metacognitive linguistic learning strategies contribute to the development of the language system and have a direct impact on learning. Researchers suggest that language learners who have acquired more than one language can have a wide range of cognitive, metacognitive, and intercultural skills as a result of their learning experiences, which enable them to interact with their environments in a more complex manner and lead to an increase in cognitive, metacognitive, and intercultural skills (30, 31).

These strategies aid students in understanding what to do when they encounter learning difficulties (32). Metacognitive strategies and knowledge can assist students in maintaining their cognitive processes and understanding why they engage in these processes, how to monitor them, and when to do so. It is considered a more advanced method in which students become active participants (32).

Cognitive flexibility differs between bilingual and monolingual individuals, according to a number of studies (33). Cognitive flexibility is typically defined as the capacity to shift one's focus between competing concepts and alternative behavioral strategies in order to adapt to a rapidly changing environment (34). People with sufficient cognitive flexibility, according to Stahl & Pry (35), can effectively deal with novel and challenging situations and generate alternative thoughts and ideas. To develop cognitive flexibility, students must acquire knowledge in a variety of ways and for a variety of purposes in flexible learning environments. This personality trait exists to varying degrees in different individuals and determines the manner in which individuals respond to new experiences (36). Cognitive flexibility increases in bilinguals as a result of the inherent flexibility requirements of language production (5, 37). Some empirical evidence supports the theory that language skills, such as speech production, influence cognitive flexibility (38). Cognitive flexibility may be enhanced if a person can communicate in multiple languages (39). This connection between bilingualism and cognitive adaptability is supported by research and comparisons between bilinguals and monolinguals (40).

It is evident that the majority of studies in this domain have focused on contrasting bilingual and monolingual individuals. However, examining these cognitive factors in students with varying levels of proficiency may yield more intriguing outcomes regarding the impact of classroom engagement. Demonstrate exceptional outcomes in the cognitive abilities of students. Also, In light of the fact that language has a significant effect on the cognitive development and thinking levels of students, it is crucial to investigate the effects of bilingualism on students and to compare the cognitive

factors and functions of bilingual and monolingual students. Families can be taught effectively using language. Therefore, the purpose of the present study was to compare the executive functions of the brain (working memory, cognitive flexibility, and inhibitory control), metacognitive awareness, and cognitive flexibility between advanced English language learners and typical students.

2- METHOD

Practical and comparative causal methodology was utilized in this study. In the academic year 2022-2023, the statistical population included all primary school students in Tehran's districts 5 and 18 between the ages of 7-12 years old. Considering that, for experimental and causal-comparative research, a sample size of at least 30 individuals per group is recommended (41), and taking into account the possibility of subject non-cooperation, the sample size for each group is 180 individuals. 90 was decided upon. Consequently, using the convenience sampling method, a sample group of 180 people, divided into two groups of 90, was selected. The first group consisted of male and female students (in equal numbers) who participated in advanced levels of English language classes, and the second group consisted of general male and female students from this region's schools who only participated in general classrooms. In order to conduct the study, each group was composed of 90 students from the second through the sixth grades. The inclusion criteria for participation in the research study include enrollment in public schools within the second to sixth grade range, and a lack of documented learning disorders within the students' counseling records. The criteria for exclusion are: Students enrolled in non-profit and non-governmental model schools who have repeated the first grade and are older than 12 years old. A written consent form from all parents was considered for the purpose of evaluating the children and the moral obligation to maintain and maintain the results and the confidentiality of the research results. In this study, descriptive statistics such as frequency, percentage, mean, and standard deviation, as well as inferential statistics such as the independent t-test, were employed for analysis. The data were analyzed using SPSS version 24 software at a significance level of 0.05.

2-1. Delis Kaplan Executive Function System (D-KEFS)

Delis and Kaplan in 2001 developed one of the reliable instruments for assessing the crucial facets of executive functioning in both childhood and adulthood. The purpose of this neuropsychological test is to evaluate the verbal and non-verbal executive functions of children and adults aged 9 to 90. This test measures cognitive flexibility, problem solving, verbal fluency, working memory, logic, and inhibitory control. Only three components of working memory, cognitive flexibility, and inhibitory control were employed in this study. The test consists of nine sub-tests, each of which measures a component of the executive function: Mental flexibility was assessed using the first subtest, the sequential construction test, which has five questions. Working memory was assessed using the fifth subtest, the card sorting test, which has four questions. Inhibitory control was assessed using the fourth subtest, the Stroop color test, which has four questions. This instrument is reliable and valid. According to the test manual, its reliability coefficient ranges from 0.84 to 0.98 (Delis and Kaplan, 2001; cited by 42). Ghawami & et al. (42) utilized the Persian version of the test in Iran and reported Cronbach's alpha to be 0.95. In the current study, Cronbach's alpha method was utilized to determine the reliability of the questionnaire. The mental flexibility component yielded a score of 0.87, the

working memory component yielded a score of 0.83, and the inhibitory control component yielded a score of 0.74. The current investigation computed the reliability rate for the entire test using Cronbach's alpha method, yielding a value of 0.84.

Metacognitive Awareness of Reading Strategies Inventory (MARSI): In 2002, Mokhtari and Richard developed the metacognitive awareness questionnaire of study strategies. This questionnaire evaluates 30 questions and three areas. 13 general reading strategies (items 1-3-4-7-10-14-17-19-22-23-25-26-29), eight problem-solving strategies (items 8-11-13 -16-18-21-27-30), and nine reading support strategies (2-5-6-9-12-15-20-24-28). Each option's responses are measured on a five-point Likert scale. For each scale, average scores of 3.5 or higher are regarded as favorable, those between 2.5 and 3.4 as average, and those below 2.4 as subpar. The scores of each scale are added together, and then the information is interpreted using the conventional methods for compact scales. Based on the results obtained by the standardization group, this interpretation is proposed. Mokhtari and Richard (43) determined the questionnaire's validity through a comprehensive literature and research review, with the approval of experts and specialists. The method of factor analysis was used to examine the structure of the scale and its multiple implementations on various groups. The test's reliability was calculated using Cronbach's alpha coefficient of 0.89. Hossein Chari, Samavi, and Kurdashani (44) standardized this questionnaire with Iranian students. Using exploratory factor analysis with varimax rotation, validity was examined. Following a factor analysis, the three factors of general, supportive, and problem-solving metacognitive strategies were extracted to account for 59.27% of the total variance. The alpha coefficient for the questionnaire's reliability was 0.70. Cronbach's alpha was calculated to be 0.91 for the entire test in the study by Bayanfar and Rahali Moghadam (45).

2-2. Cognitive Flexibility Test (CFT)

The Wisconsin card sorting test, The first version of which was compiled by Berg et al. in 1948, is a neuropsychological test that measures abstract reasoning, cognitive flexibility, persistence, problem solving, concept formation, set change, the capacity to test hypotheses and utilize feedback. Errors quantify the strategy for initiating and terminating action and maintaining focus. This examination consists of 64 duplicate cards. The participant is provided with a set of 64 cards featuring symbols in the shapes of triangles, stars, crosses, and circles. These symbols are engraved in colors of red, green, yellow, and blue, respectively. The task presented to the testee involves selecting one card out of four, each of which displays a distinct shape (triangle in red, star in green, cross in yellow, and circle in blue). The cards are dissimilar to one another, and the testee is required to make a selection based on the principle that the placement of the examiner's answers has a relative effect on the pattern. The individual infers the cards independently and sequentially arranges the remaining cards beneath the four primary cards, each of which exhibits a red triangle, two green stars, three yellow crosses, and four blue circles, respectively. The Wisconsin test primarily evaluates executive functions associated with the frontal and prefrontal regions of the brain (46). This test is commonly used to evaluate the executive functions of the brain. In accordance with the investigated executive function, the target index of this test can be used to score this test in any research setting; Therefore, according to the opinion of Strauss, Sherman & Spreen (47), two indicators "the number of classes completed or obtained" and "the number of errors in remaining" should be used to

measure the executive functions of cognitive flexibility; this opinion has been accepted by the vast majority of researchers. Several studies have supported the Wisconsin Card Sorting Test's validity and dependability (47). According to Lezak (1995), this test's validity for measuring cognitive deficits after brain injuries is greater than 0.86. With the retest method, this test's reliability in the Iranian population has been reported as 0.85. (46). In the present study, the reliability of the instrument was reported as 0.91 using Cronbach's alpha.

3- RESULTS

180 individuals participated in the study. The average age of the language learning group was 9.42 years, while the average age of the general group was 9.69 years. In terms of gender, each group of boys and girls who participated in the study comprised 90 individuals. **Table 1** shows the frequency of the studied groups based on educational level.

Table-1: Frequency distribution of studied groups based on educational level

Grade	Language learners		general		total	
	Frequency	%	Frequency	%	Frequency	%
Second	36	40	34	37.7	70	77.7
Third	14	15.5	13	14.5	27	30
Fourth	11	12.2	12	13.3	23	25.5
fifth	14	15.5	15	16.6	29	32.1
sixth	15	16.6	16	17.7	31	34.3

The data presented in **Table 1** suggests that there is minimal variation between the groups with regards to the influential factor of educational attainment.

In **Tables 2** and **3**, the assumptions of data generality and homogeneity of error variances have been examined.

Table-2: Shapiro-Wilk test for determining the generality of the data.

Variables	Scales	Group of language learners		General	
		Index	Sig	Index	sig
Executive functions of the brain	working memory	0.936	0.069	0.865	0.112
	cognitive flexibility	0.865	0.490	0.613	0.123
	Inhibitory control	0.965	0.215	0.864	0.235
Metacognitive awareness	General study strategy	1.14	0.069	0.968	0.136
	Problem solving strategy	1.25	0.074	1.12	0.112
	Support study	0.978	0.075	1.35	0.154
Cognitive flexibility indicators	The correct number of classes	0.929	0.063	0.947	0.132
	Perseverative error	0.936	0.217	0.935	0.125

The results of the Shapiro-Wilk test to determine the generality of the data are presented in **Table 2**. Based on the obtained test index and the significance level of the Shapiro-Wilk test of the variables, which is greater than P0.05, the distribution of scores is therefore general.

Table-3: Levene's test to examine the homogeneity of error variances.

Variables	scales	F	DOF of numerator	DOF of denominator	Sig.
Executive functions of the brain	working memory	2.81	1	178	0.162
	cognitive flexibility	1.017	1	178	0.296
	Inhibitory control	2.314	1	178	0.432
Metacognitive awareness	General study strategy	1.801	1	178	0.321
	Problem solving strategy	1.017	1	178	0.396
	Support study	3.81	1	178	0.061
Cognitive flexibility indicators	The correct number of classes	0.017	1	178	0.896
	Perseverative error	0.814	1	178	0.465

The significance level of Levene's statistic for research variables is greater than P0.05, whereas the F ratio is not significant, as shown in **Table 3**. Consequently, the assumption of homogeneity of the error variances of the grades has been established, and the independent t-test can be used to analyze the results.

Table-4: Independent t-test results comparing two groups' executive functions, metacognitive awareness, and cognitive flexibility

Variable		Group of language learners		General		T	DOF	Sig.
		Mean	Std	Mean	std			
Executive functions of the brain	working memory	34.9	10	19.7	10.8	4.08	178	0.001
	cognitive flexibility	35.5	11.8	18.9	9.8	4.32	178	0.002
	Inhibitory control	41.2	6.8	21.1	10.04	5.16	178	0.03
Metacognitive awareness	General study strategy	31.58	5.58	25.12	3.32	6.72	178	0.001
	Problem solving strategy	25.55	4.32	19.82	2.21	4.65	178	0.003
	Support study	18.98	3.75	13.46	3.41	7.36	178	0.001
Cognitive flexibility indicators	The correct number of classes	3.84	1.12	2.01	0.96	9.12	178	0.001
	Perseverative error	29.11	10.02	34.13	9.96	8.14	178	0.003

Table 4 compares the executive brain functions, metacognitive awareness, and cognitive flexibility of two groups of advanced language learners and general individuals. According to the t-test significance level, all the components of the executive functions of the brain, including working memory, cognitive flexibility, and inhibitory control, differ significantly between the two groups of advanced language learners and general individuals (05/05). 0>P). The components of metacognitive awareness, which include general study strategy, problem-solving strategy, and supportive study, differ significantly between the two groups (P 0.05). In addition, there is a statistically significant difference between the two groups on the dimensions of cognitive flexibility, including the number of correct classes and remaining errors (P 0.05). In all aspects of working memory, cognitive flexibility, inhibitory control, general study strategy, problem-solving strategy, supportive study, and number of correct classes, the average score of the advanced language learners group was higher than that of the general group, but the average

error scores were higher. The general group had a higher survival rate than the advanced language learners.

4- DISCUSSION

The purpose of this study was to compare the executive functions of the brain (working memory, cognitive flexibility, and inhibitory control), metacognitive awareness, and cognitive flexibility between bilingual and monolingual students. The results demonstrated that there is a significant difference between the executive functions of the brain in bilingual and monolingual students, such that bilingual students perform better in executive functions (working memory, cognitive flexibility, and control inhibitor) than monolingual students do. This research finding is consistent with the findings of Papastergiou et al., Perovic, Filipović Đurđević & Halupka-Rešetar (15), Park, Ellis Weismer & Kaushanskaya (48), Filippi, Ceccolini, Booth, Shen, Thomas & et al (49). Research by Papastergiou et al. (15) demonstrated that bilingual children are either equivalent to or superior to monolingual children in executive functions such as working memory and inhibitory control. In addition, Parovich & et al. (50) demonstrated, in accordance with the present finding, that bilinguals perform better than monolinguals in situations that are more complex and require more supervision and change. It is believed that these advantages in the executive functions of bilinguals are due to this population's need to manage multiple languages and constantly monitor the appropriate language for every communication situation (12). According to Bialystok (6), bilinguals have an advantage in executive functions because they are continuously trained to conduct a conversation that is context-dependent and requires constant access to information in working memory. In addition, it is necessary to select the appropriate language for the particular communication situation (another language barrier) and to monitor what is occurring during the interaction (cognitive flexibility) (25).

According to the common active model proposed by Green (51), bilingualism involves the activation of both languages in the brain, even when only one language is used. This situation appears to have a positive impact on multiple cognitive functions, including executive functions (21). When assessing inhibitory control and cognitive flexibility, evidence supporting the existence of the bilingual effect is found (25). Therefore, it can be stated that bilinguals should choose the appropriate language for any given situation, pay attention to language-specific signs, select the appropriate vocabulary, and avoid the interference of other languages. General executive function benefits generate, inhibit (6, 51). This continuous exposure to a context that requires consistently high cognitive performance may contribute to high cognitive performance (9). In a study that investigated the role of executive functions in bilingual and monolingual English comprehension, Taboada Barber, Cartwright, Hancock & Klauda (52) concluded that bilingual and monolingual individuals have distinct executive functions. The direct relationship between listening comprehension and reading comprehension is significantly stronger for bilinguals than for monolingual English speakers.

In a study comparing bilingual and monolingual children, Papastergiou, Pappas, and Sanodaki (9) found that bilingual children are 6.5% more efficient in five executive functions compared to monolingual children and that bilingual children perform better overall. After controlling for differences in age, non-verbal intelligence, grammar skills, expressive vocabulary skills, receptive vocabulary skills, and language use, they

perform better in terms of executive performance than their monolingual counterparts. In explaining the findings of this study, it can be acknowledged that bilinguals have greater cognitive flexibility than monolinguals because they must be able to use two languages simultaneously, and they must also be able to avoid disturbing factors that cause the working memory, a subset of the short-term memory, to serve an inappropriate function in the conversation process.

This hypothesis was questioned after the publication of positive evidence on the bilingual effect due to the difficulty of replicating previous results (53-55). This difficulty appears to be due to the specific circumstances involving multiple factors (e.g., participants' age, socioeconomic status, and experimental tasks) (54, 56).

There is a significant difference between metacognitive awareness in bilingual and monolingual students, with bilingual students performing better in metacognitive awareness than monolingual students, according to another finding of the current study. This result is consistent with the findings of Fala-Wood and Varges (26), Ingole and Pandya (57), Adespo et al. (5), and Samadi, Maqsoodi and Azimohammadi (58). According to the findings of Tafarji Yeganeh's (59) research, monolingual and bilingual students employ different metacognitive listening strategies. In addition, Samadi et al. (58) found that the use of cognitive and metacognitive strategies differs significantly between bilingual and monolingual language learners. Keshavarz and Ghomoshi (60) also concluded that there is a significant difference between monolingual and bilingual learners' use of metacognitive strategies. Bilingual students utilize metacognitive knowledge more than monolingual students due to their greater experience and metacognitive strategies, which can be used to explain this finding. When receiving language through the acquired skills of reading and listening or producing language through speaking and writing, the process of strategies and metacognitive knowledge is continuously monitored and checked, and given that bilinguals have acquired two languages, they have had more opportunities to employ metacognitive strategies. Additionally, they must constantly monitor their output so as not to mix the languages they know (61).

The research also revealed that cognitive flexibility differs between bilingual and monolingual students. Thus, the cognitive flexibility of bilingual students is greater than that of monolingual students; these findings are consistent with those of Gholamipour, Khazri Mohadam, and Fazaldepour (62), Seçer (63), Bakr et al. (33), and Amini-Masoleh, Qaramelki, and Ahmadi (64). In a study, Seçer (63) determined that bilingualism influences cognitive flexibility. In addition, Gholamipour et al. (62) found that there is a significant difference in cognitive flexibility between monolingual and bilingual students, and that bilingual children perform better than monolingual children. Bialystok (12) believes that the cognitive flexibility advantage of bilinguals over monolinguals is due to the fact that bilinguals constantly switch between their native language and their second language and use the appropriate language in different situations. Due to these displacements and changes, it can be concluded that bilinguals are superior to monolinguals in terms of cognitive flexibility and cognition-related systems, and can pay greater attention and concentration to information. In order to deal with environmental changes and adapt to a new situation, they are required to have and disregard any confusion-causing factors (65).

Becker & et al. (33) concluded in their study that bilingual and monolingual individuals use distinct neurocognitive

mechanisms to monitor conflict in order to adapt flexibly to novel situations. Cognitively flexible individuals are able to think creatively outside of established frameworks, see things from different perspectives, and quickly adapt to changing circumstances (50). One of the reasons for the cognitive flexibility advantage of bilinguals over monolinguals can be attributed to these characteristics of cognitive flexibility.

5- CONCLUSION

In terms of brain executive functions, metacognitive awareness, and cognitive flexibility, there are differences between students who attend language classes and those who attend traditional schools, according to the findings of the present study. It exists, and because these variables can have a positive impact on a person's academic life, cognitive development, and even daily life, families can send their children to language classes with greater enthusiasm. Non-random sampling (convenience sampling method), which may produce biased results, represents one of the most significant limitations of the current research. In addition, the research samples consisted of elementary school students; therefore, caution should be exercised when extrapolating the results to other age groups. In future studies, it is suggested that this research be conducted on students from other academic fields and their results compared to those of the current study. It is suggested that this research be carried out with random sampling methods and in larger samples in order to provide the possibility of generalizing the results with more confidence. In addition, researchers should employ longitudinal and long-term designs rather than the cross-sectional designs utilized in this study.

6- REFERENCES

1. Kremin LV, Byers-Heinlein K. Why not both? Rethinking categorical and continuous approaches to bilingualism. International Journal of Bilingualism. 2021; 25(6):1560-75.

2. Kwon YH, Yoo K, Nguyen H, Jeong Y, Chun MM. Predicting multilingual effects on executive function and individual connectomes in children: An ABCD study. Proceedings of the National Academy of Sciences. 2021; 118(49):e2110811118.

3. Guo T, Liu F, Chen B, Li S. Inhibition of non-target languages in multilingual word production: Evidence from Uighur–Chinese–English trilinguals. Acta psychologica. 2013; 143(3):277-83.

4. Aronin L, Singleton D. Multilingualism as a new linguistic dispensation. International journal of multilingualism. 2008; 5(1):1-16.

5. Adesope OO, Lavin T, Thompson T, Ungerleider C. A systematic review and meta-analysis of the cognitive correlates of bilingualism. Review of educational research. 2010; 80(2):207-45.

6. Bialystok E. The bilingual adaptation: How minds accommodate experience. Psychological bulletin. 2017; 143(3):233.

7. Gunnerud HL, Ten Braak D, Reikerås EKL, Donolato E, Melby-Lervåg M. Is bilingualism related to a cognitive advantage in children? A systematic review and meta-analysis. Psychological Bulletin. 2020; 146(12):1059.

8. Beaudin K, Poulin-Dubois D. Testing the bilingual cognitive advantage in toddlers using the Early Executive Functions Questionnaire. Languages. 2022; 7(2):122.

9. Papastergiou A, Pappas V, Sanoudaki E. The executive function of bilingual and monolingual children: A technical efficiency approach. Behavior research methods. 2021 Sep 10:1-27.

10. Grundy JG. The effects of bilingualism on executive functions: An updated

quantitative analysis. Journal of Cultural Cognitive Science. 2020 Oct; 4(2):177-99.

11. Arizmendi GD, Alt M, Gray S, Hogan TP, Green S, Cowan N. Do bilingual children have an executive function advantage? Results from inhibition, shifting, and updating tasks. Language, Speech, and Hearing Services in Schools. 2018 Jul 5; 49(3):356-78.

12. Bialystok E, Craik FI, Green DW, Gollan TH. Bilingual minds. Psychological science in the public interest. 2009 Dec; 10(3):89-129.

13. Del Maschio N, Sulpizio S, Fedeli D, Ramanujan K, Ding G, Weekes BS, Cachia A, Abutalebi J. ACC sulcal patterns and their modulation on cognitive control efficiency across lifespan: a neuroanatomical study on bilinguals and monolinguals. Cerebral Cortex. 2019 Jul 5; 29(7):3091-101.

14. Best JR, Miller PH. A developmental perspective on executive function. Child development. 2010 Nov; 81(6):1641-60.

15. Papastergiou A, Sanoudaki E, Tamburelli M, Chondrogianni V. A study on the executive functioning skills of Greek–English bilingual children–a nearest neighbor approach. Bilingualism: Language and Cognition. 2023 Jan; 26(1):78-94.

16. Monnier C, Boiché J, Armandon P, Baudoin S, Bellocchi S. Is bilingualism associated with better working memory capacity? A meta-analysis. International Journal of Bilingual Education and Bilingualism. 2022 Jul 3; 25(6):2229-55.

17. Morales J, Calvo A, Bialystok E. Working memory development in monolingual and bilingual children. Journal of experimental child psychology. 2013 Feb 1; 114(2):187-202.

18. Lowe CJ, Cho I, Goldsmith SF, Morton JB. The bilingual advantage in children's executive functioning is not related to language status: A meta-analytic review. Psychological science. 2021 Jul; 32(7):1115-46.

19. Mischel W, Shoda Y, Rodriguez ML. Delay of gratification in children. Science. 1989 May 26; 244(4907):933-8.

20. Calcott RD, Berkman ET. Neural correlates of attentional flexibility during approach and avoidance motivation. PloS One. 2015 May 22; 10(5):e0127203.

21. Bialystok E, Craik FI. How does bilingualism modify cognitive function? Attention to the mechanism. Psychonomic Bulletin & Review. 2022 Aug; 29(4):1246-69.

22. Kovács ÁM, Mehler J. Cognitive gains in 7-month-old bilingual infants. Proceedings of the National Academy of Sciences. 2009 Apr 21; 106(16):6556-60.

23. Comishen KJ, Bialystok E, Adler SA. The impact of bilingual environments on selective attention in infancy. Developmental science. 2019 Jul; 22(4):e12797.

24. Grundy JG, Timmer K. Bilingualism and working memory capacity: A comprehensive meta-analysis. Second Language Research. 2017 Jul; 33(3):325-40.

25. Giovannoli J, Martella D, Federico F, Pirchio S, Casagrande M. The impact of bilingualism on executive functions in children and adolescents: A systematic review based on the PRISMA method. Frontiers in Psychology. 2020 Oct 6; 11:574789.

26. Falla-Wood J, Varghese K. Bilinguals, monolinguals and their choices of metacognitive strategies in reading, writing, listening and speaking. Advances in Social Sciences Research Journal. 2020 Jun 25; 7(6):69-86.

27. Forbes K, Fisher L. The impact of expanding A Level students' awareness and use of metacognitive learning

strategies on confidence and proficiency in foreign language speaking skills. The Language Learning Journal. 2015; 43(1):1-5.

28. Graham S. Learner strategies and self-efficacy: Making the connection. Language Learning Journal. 2007 Jun 1; 35(1):81-93.

29. Rubin J. Learner strategies: Theoretical assumptions, research history and typology. Learner strategies in language learning. 1987; 15:29.

30. Jessner U. A DST model of multilingualism and the role of metalinguistic awareness. The modern language journal. 2008 Jun; 92(2):270-83.

31. Paquet-Gauthier M, Beaulieu S. Can language classrooms take the multilingual turn? Journal of multilingual and Multicultural Development. 2016 Feb 17; 37(2):167-83.

32. Mohd Nasim S. Metacognitive Listening Comprehension Strategies of Arab English Language Learners. Education Research International. 2022 Jul 19; 2022.

33. Becker TM, Prat CS, Stocco A. A network-level analysis of cognitive flexibility reveals a differential influence of the anterior cingulate cortex in bilinguals versus monolinguals. Neuropsychologia. 2016 May 1; 85:62-73.

34. Rastelli C, Greco A, Kenett YN, Finocchiaro C, De Pisapia N. Simulated visual hallucinations in virtual reality enhance cognitive flexibility. Scientific reports. 2022 Mar 7; 12(1):4027.

35. Stahl L, Pry R. Attentional flexibility and perseveration: Developmental aspects in young children. Child Neuropsychology. 2005 Apr 1; 11(2):175-89.

36. Eichorn N, Marton K, Pirutinsky S. Cognitive flexibility in preschool children with and without stuttering disorders. Journal of fluency disorders. 2018 Sep 1; 57:37-50.

37. Martin MM, Rubin RB. A new measure of cognitive flexibility. Psychological reports. 1995 Apr; 76(2):623-6.

38. Hermer-Vazquez L, Moffet A, Munkholm P. Language, space, and the development of cognitive flexibility in humans: The case of two spatial memory tasks. Cognition. 2001 May 1; 79(3):263-99.

39. Kozulin A. Reality monitoring, psychological tools, and cognitive flexibility in bilinguals: Theoretical synthesis and pilot experimental investigation. International Journal of Psychology. 1988 Jan 1; 23(1-6):79-92.

40. Mepham KD, Martinovic B. Multilingualism and out-group acceptance: The mediating roles of cognitive flexibility and deprovincialization. Journal of Language and Social Psychology. 2018 Jan; 37(1):51-73.

41. Delawar A. Research method in psychology and educational sciences. Fifty-fifth edition, Tehran: Ed; 2022.

42. Ghawami H, Raghibi M, Tamini BK, Dolatshahi B, Rahimi-Movaghar V. Cross-Cultural adaptation of executive function tests for assessments of traumatic brain injury patients in Southeast Iran. Behavioral Psychology/Psicologia Conductual. 2016; 24(3):513-54.

43. Mokhtari K, Reichard CA. Assessing students' metacognitive awareness of reading strategies. Journal of educational psychology. 2002 Jun; 94(2):249-59.

44. Hosseinchari M, Samawi A, Kurdestani D, Imamgholivand F, Kadivar P, Pasha Sharifi H. Psychometric Indexes Students of the Social Emotional Competence Questionnaire (SECQ). Quarterly of Educational Measurement. 2019; 9(33):79-101.

45. Bayanfar F, Raheli Moghadam N. Structural model of academic adjustment based on cognitive load, cognitive flexibility and metacognitive awareness of study strategies, mediating role of social-emotional competence and time perspective. Social Cognition. 2022; 11(1):55-71.

46. Yazdi-Ravandii S, Shamsaei F, Matinnia N, Shams J, Moghimbeigi A, Ghaleiha A Ahmadpanah M. Cognitive Process in Patients with Obsessive-Compulsive Disorder: A Cross- Sectional Analytic Study. BCN. 2018; 9(6):448-57.

47. Strauss E, Sherman EM, Spreen O. A compendium of neuropsychological tests: Administration, norms, and commentary. American chemical society; 2006.

48. Park J, Ellis Weismer S, Kaushanskaya M. Changes in executive function over time in bilingual and monolingual school-aged children. Developmental Psychology. 2018 Oct; 54(10):1842.

49. Filippi R, Ceccolini A, Booth E, Shen C, Thomas MS, Toledano MB, Dumontheil I. Modulatory effects of SES and multi linguistic experience on cognitive development: a longitudinal data analysis of multilingual and monolingual adolescents from the SCAMP cohort. International journal of bilingual education and bilingualism. 2022 Oct 21; 25(9):3489-506.

50. Perovic A, Filipović Đurđević D, Halupka-Rešetar S. The effect of bilingualism on executive functions when languages are similar: a comparison between Hungarian–Serbian and Slovak–Serbian young adult bilinguals. Memory & Cognition. 2023 Apr; 51(3):561-81.

51. Green DW. Mental control of the bilingual lexico-semantic system. Bilingualism: Language and cognition. 1998 Aug; 1(2):67-81.

52. Taboada Barber A, Cartwright KB, Hancock GR, Klauda SL. Beyond the simple view of reading: The role of executive functions in emergent bilinguals' and English monolinguals' reading comprehension. Reading Research Quarterly. 2021 May; 56:S45-64.

53. Cespón J, Carreiras M. Is there electrophysiological evidence for a bilingual advantage in neural processes related to executive functions? Neuroscience & Biobehavioral Reviews. 2020 Nov 1; 118:315-30.

54. Mullane JC, Lawrence MA, Corkum PV, Klein RM, McLaughlin EN. The development of and interaction among alerting, orienting, and executive attention in children. Child Neuropsychology. 2016 Feb 17; 22(2):155-76.

55. Lewis FC, Reeve RA, Johnson KA. A longitudinal analysis of the attention networks in 6-to 11-year-old children. Child Neuropsychology. 2018 Feb 17; 24(2):145-65.

56. Paap KR, Johnson HA, Sawi O. Bilingual advantages in executive functioning either do not exist or are restricted to very specific and undetermined circumstances. Cortex. 2015 Aug 1; 69:265-78.

57. Ingole M, Pandya S. Interactive effect of meta-cognitive strategies-based instruction in mathematics and self-efficacy of students on their meta-cognitive awareness. InThird Asia Pacific Conference on Advanced Research 2016 (pp. 341-351).

58. Samadi F, Maghsoudi M, AzizMohammadi F. The Impact of Cognitive and Metacognitive Strategies on Iranian EFL Bilingual versus Monolingual Learners' Reading Comprehension ability. Journal of Advances in Linguistics. 2014 Feb 7; 2(1):51-60.

59. TafarojiYeganeh M. Metacognitive listening strategies awareness in monolingual versus bilingual EFL

learners. Procedia-Social and Behavioral Sciences. 2013 Jan 25; 70:1787-93.

60. Keshavarz MH, Ghamoushi M. A comparative study of metacognitive awareness of reading strategies among monolingual and bilingual Iranian EFL learners. Advances in Language and Literary Studies. 2014 Aug 1; 5(4):25-32.

61. Poorebrahim F, Tahririan MH, Afzali K. Bilingual and monolingual EFL learners' use of writing metacognitive strategies and writing performance. Applied Research on English Language. 2017 Jan 1; 6(1):1-22.

62. Gholamipour N, Khezri Moghadam N, Fazilatpour M. Comparison of working memory and cognitive flexibility of female bilingual Arabic-Persian and monolingual students. Journal of Educational Psychology. 2022 Feb 20; 12(4):30-41.

63. Seçer I. Skills of cognitive flexibility in monolingual and bilingual younger adults. The Journal of general psychology. 2016 Jul 2; 143(3):172-84.

64. Amini Masouleh M, Bafandeh Gharamaleki H, Ahmadi E. A Comparative Study of Cognitive Flexibility and Metacognitive Beliefs between Bilinguals and Monolinguals in Azeri Turkish and Persian Languages. Journal of Sociolinguistics. 2017 Mar 21; 1(2):37-45.

65. Canas J, Quesada J, Antolí A, Fajardo I. Cognitive flexibility and adaptability to environmental changes in dynamic complex problem-solving tasks. Ergonomics. 2003 Apr 1; 46(5):482-501.