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THE EFFECT OF BILINGUALISM FORMATION ON MEMORY CHARACTERISTICS IN PRIMARY SCHOOL-AGE CHILDREN

Gulnoza Pulatova[1].

[1] Lecturer, Department of Psychology, Fergana State University (PhD).

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***Key words**: bilingualism, memory characteristics, primary school children, visual memory, auditory memory, cognitive development, Meili memory test, monolingual and bilingual learners.*

ABSTRACT
This study examines the effect of bilingualism on memory characteristics in primary school–aged children. The research aimed to determine whether differences exist in visual and auditory memory between monolingual (Uzbek-speaking) and bilingual (Uzbek- and Russian-speaking) students. The study employed R. Meili's memory assessment methodology, which includes separate evaluation of visual and auditory memory. A total of 205 students aged 9–10 participated in the experiment. The findings indicate that there are no statistically significant differences between monolingual and bilingual children in either visual or auditory memory performance. These results suggest that core memory processes–encoding, storage, and retrieval–are not directly dependent on language background at this developmental stage. The study concludes that memory development in primary school children is primarily influenced by general cognitive maturation and educational conditions rather than bilingualism, highlighting the need for an integrative neuro–psycho–pedagogical approach to understanding bilingual development.

BOSHLANG'ICH MAKTAB YOSHIDAGI BOLALARDA IKKI TILLILIK SHAKLLANISHINING XOTIRA XUSUSIYATLARIGA TA'SIRI

***Kalit so'zlar**: ikki tillilik, xotira xususiyatlari, boshlang'ich maktab o'quvchilari, vizual xotira, eshituv xotirasi, kognitiv rivojlanish, Meili xotira testi, bir tilli va ikki tilli o'quvchilar.*

ANNOTATSIYA
Ushbu tadqiqot boshlang'ich maktab yoshidagi bolalarda ikki tillilikning xotira xususiyatlariga ta'sirini o'rganishga qaratilgan. Tadqiqotning maqsadi bir tilli (o'zbek tilida so'zlashuvchi) va ikki tilli (o'zbek va rus tilida so'zlashuvchi) o'quvchilarda vizual va eshituv xotirasi o'rtasida farqlar mavjudligini aniqlashdan iborat. Tadqiqotda vizual va eshituv xotirasini alohida baholashni o'z ichiga olgan R. Meili xotira testi metodikasi qo'llanildi. Tajribada 9–10 yoshdagi 205 nafar o'quvchi ishtirok etdi. Natijalar bir tilli va ikki tilli bolalar o'rtasida vizual hamda eshituv xotirasi ko'rsatkichlarida statistik jihatdan ahamiyatli farqlar mavjud emasligini ko'rsatdi. Ushbu natijalar xotiraning asosiy jarayonlari – kodlash, saqlash va qayta tiklash – ushbu rivojlanish bosqichida til omiliga bevosita bog'liq emasligini anglatadi. Tadqiqot xulosa qiladiki, boshlang'ich sinf o'quvchilarida xotira rivoji asosan umumiy kognitiv rivojlanish va ta'lim sharoitlariga bog'liq bo'lib, ikki tillilik ta'siri cheklangan.

Primary school age represents a critical stage within the system of continuous education. Accordingly, primary education and upbringing play a decisive role in shaping children into healthy, knowledgeable, and competent individuals in later stages of life. Taking into account children's individual characteristics, it is essential to organize, in a purposeful and professionally grounded manner, the selection of the most appropriate forms of education, as well as to provide parents with adequate guidance and recommendations. In this context, there is a growing need to further develop and expand the conceptual framework for the psychological study of bilingual children in school settings, particularly in relation to their cognitive and physical development. In the process of verbal communication, individuals exchange ideas and exert influence on one another. Speech communication is realized through language, which constitutes a system of phonetic, lexical, and grammatical means. To express thoughts, a speaker selects appropriate lexical units, organizes them according to grammatical rules, and articulates them through the coordinated functioning of speech organs. It is well established that language serves as the primary medium through which individuals communicate, exchange information, and acquire knowledge, skills, and competencies.

LITERATURE REVIEW AND METHODOLOGY

The present study is grounded in the fundamental works of the President of the Republic of Uzbekistan. Additionally, it draws upon theoretical concepts and empirical findings from both domestic and international research. In particular, the theoretical and methodological positions of scholars such as Lev Vygotsky, Pyotr Galperin, Nina Talizina, Oksana Ushakova, Nikolai Zhinkin, Mikhail Lvov, Tatiana Ladezhenskaya, Vladimir Smokotin, James Genesee, Vladimir Avrorin, Erkin G‘oziyev, F.R. Qodirova (1989), R.M. Qodirova (1990), G. Salayeva (2022), M. Shamsiyeva (2019), and others constitute the theoretical and methodological foundation of this research.

Primary school age corresponds to the period between 7 and 11 years, encompassing the years of study in primary grades. At this stage, the preschool period concludes, and the child becomes physically and psychologically prepared to meet the demands of formal schooling. In other words, the child attains readiness for structured educational activity. In primary school students, memory develops along two principal trajectories under the influence of formal education. First, the role of verbal-logical memory and meaningful memorization based on comprehension increases. Second, children gradually acquire the ability to regulate and organize their memory processes.

Due to the relative predominance of the first signaling system, visual–figurative memory in primary school–age children is typically more developed than verbal-logical memory. Children at this age tend to memorize concrete information–events, images, objects, and facts–more quickly and retain them more effectively than abstract rules and explanations. By the end of the primary school period, students are expected to develop stable learning and cognitive motivations. This includes not only a desire to acquire new knowledge and understand general principles but also an interest in mastering effective methods of knowledge acquisition. The formation of such motivations constitutes a key prerequisite for successful transition to secondary education. Learning activity creates favorable conditions for the development of intellectual abilities, sensitivity, observational skills, memory retention, and recall processes, while also contributing to the acquisition of computational skills [5, P.179–182]. Beginning from the first grade, voluntary recall develops intensively. The educational process necessitates both intentional memorization and intentional recall. Without these processes, effective learning cannot occur. Students are required not only to acquire knowledge but also to retain and reproduce it. Systematic memorization of educational material becomes possible only through the development of voluntary recall [3, P.287]. To enhance the psychological and physical development of primary school–age children, it is essential to conduct targeted psychological research on bilingual children within school contexts. Bilingualism represents a complex phenomenon that requires comprehensive and interdisciplinary investigation. Numerous scholars have emphasized the necessity of developing an integrated theory of bilingualism, and several studies have approached this issue from a multidimensional perspective. The concept of “bilingualism” was first defined in 1938 by Vladimir Avrorin as “equal proficiency in two languages.” In other words, bilingualism emerges when proficiency in a second language approaches that of the native language. From the earliest stages of research, bilingualism has been conceptualized as a complex, systemic intrapersonal formation. It encompasses a specific linguistic (sign) structure and the ability to utilize this system effectively in communicative situations (the communicative dimension). Beyond situational meanings, bilingualism also includes broader cultural concepts and worldviews (the sociocultural dimension). This inherent complexity determines the multifaceted nature of its study [1, P.49–62].

METHODOLOGY AND EMPIRICAL STUDY

A study was conducted to examine the memory characteristics of primary school children aged 9–10, including both monolingual (Uzbek-speaking) and bilingual (Uzbek–Russian-speaking) participants. The Meili Memory Test was selected as the primary research instrument. The R. Meili test, developed in 1961, is designed to assess memory in individuals aged 7 years and older. The methodology consists of two stages: the assessment of visual memory and auditory memory. In the first stage, visual memory is evaluated by measuring participants’ ability to recall objects presented in pictorial form. In the second stage, auditory memory is assessed through the recall of words (object names) presented orally by the experimenter. These stages are conducted separately to ensure a more precise analysis of each memory modality.

The experimental procedure employs two sets of 60 words representing various objects. During the visual memory assessment, participants are instructed as follows:

"You will be shown pictures depicting various objects. Name them in any order you wish."

Each image is presented for 2 seconds. After a 10-second interval, participants are asked to recall the objects they remember. The experimenter records both correct and incorrect responses. The two sets of images are presented on different days, and the auditory memory tasks are also conducted on separate days, ensuring greater reliability of the results. The empirical study was conducted at Secondary School No. 6 in the city of Fergana. A total of 205 students aged 9–10 participated in the study, including 91 girls and 114 boys. The Meili memory test was administered to assess both visual and auditory memory. The results are presented in tables and diagrams.

RESULTS (EXCERPT)

The analysis of gender differences based on the indicators of R. Meili's memory test revealed no statistically significant differences between boys and girls. In the first stage, visual memory was assessed through recall of pictorial stimuli, while in the second stage, auditory memory was evaluated through recall of verbally presented words.

The comparative analysis demonstrated that gender does not exert a significant influence on memory processes in this age group (Table 1).

Table 1

Results of Identifying Gender Differences According to the Indicators of the Memory Assessment Methodology (Mann–Whitney U Test)

Indicators	Gender (Mean Ranks)		U	p
	Girls (n=91)	Boys (n=114)		
Stage 1 – Series 1	109,65	97,69	4582,000	0,148
Stage 2 – Series 1	111,28	96,39	4433,500	0,073

RESULTS INTERPRETATION

The extended interpretation of the obtained results demonstrates that, based on the analysis conducted using the scales of R. Meili's memory assessment methodology, no statistically significant differences were identified between monolingual and bilingual students. In particular, the indicators obtained for Stage 1, Series 1, and Stage 2, Series 1 revealed nearly identical performance levels across both groups. These findings lead to several important scientific conclusions. First, they suggest that the core memory processes in primary school–aged children–namely encoding (the reception and processing of information), storage (the retention of information over time), and retrieval (the recall of stored information when required)–are not directly dependent on linguistic factors. In other words, whether a child is educated in a monolingual or bilingual context does not appear to significantly influence these fundamental memory mechanisms. Furthermore, the results indicate that the effects of bilingualism–whether facilitative or inhibitory–are more likely to manifest in other cognitive domains, such as attentional control, cognitive flexibility, and executive functioning, rather than in basic memory performance. In particular, when assessed using standardized methodologies, indicators of short-term or mechanical memory tend to show limited sensitivity to variations in language experience. Another important consideration is that memory processes in primary school–aged children are still undergoing active development.

Consequently, they are more strongly influenced by general cognitive maturation, the educational environment, instructional methods, and individual psychological characteristics. Under these conditions, language proficiency does not appear to function as a determining factor. In conclusion, the findings suggest that bilingualism does not exert a statistically significant effect on the memory processes of younger primary school children. Instead, memory performance at this developmental stage is more closely associated with overall cognitive development and the quality of educational conditions.

Table 2

Results of Memory Assessment Indicators According to Native Language of Instruction (Mann–Whitney U Test)

Indicators	***Results of Memory Assessment Indicators by Native Language of Instruction (Mean Ranks)***		U	p
	Uzbek (n=81)	**Russian (n=122)**		
Stage 1 – Series 1	104,72	100,20	4721,000	0,588
Stage 2 – Series 1	103,40	101,07	4827,500	0,781

RESULTS INTERPRETATION (CONTINUED)

An extended interpretation of the findings indicates that no statistically significant differences were identified in the memory characteristics of monolingual (Uzbek-speaking) and bilingual (Uzbek- and Russian-speaking) children. In particular, during the first stage of the study, visual memory–assessed through the recall of objects depicted in images–was found to be developed at a comparable level in both groups. This suggests that the processes of perception, processing, and storage of visual information are not substantially influenced by language-related factors.

In the second stage, auditory memory was evaluated by requiring participants to retain and recall words (object names) presented orally by the experimenter. Similarly, no statistically significant differences were observed between monolingual and bilingual children in this domain. This finding indicates that the capacity to process and retain auditory information is not directly dependent on the number of languages spoken by the child. These results support the conclusion that, in primary school–aged children, both visual and auditory memory systems remain in a general stage of development and are primarily determined by biological maturation and overall cognitive development. At this stage, bilingualism does not exert a significant influence on these types of memory. In other words, bilingualism neither imposes an additional cognitive burden nor significantly enhances memory efficiency. Moreover, the findings suggest that memory performance in primary school students is more strongly influenced by factors such as the quality of instruction, the organization of learning activities, the degree of repetition, and students' motivation and interest in learning. Within this framework, language proficiency plays a secondary role.

Overall, the results indicate that there is no measurable advantage in either visual or auditory memory between monolingual and bilingual children; memory processes appear to be developed at comparable levels across both groups. An expanded interpretation of these findings suggests that traditional approaches are insufficient for a comprehensive analysis of bilingualism. Instead, it is necessary to adopt an integrative neuro–psycho–pedagogical framework. Bilingualism should not be viewed solely as a linguistic phenomenon but rather as a multidimensional process closely interconnected with the individual's cognitive system, psychological development, and educational context. From a neurological perspective, bilingualism is associated with the complex organization of brain activity, including the management of multiple linguistic systems, their differentiation, and the selection of the appropriate language in a given communicative context. These processes engage executive functions such as attentional control, inhibitory regulation (suppression of irrelevant information), and cognitive flexibility, all of which involve higher-order cognitive operations. Consequently, the study of bilingualism requires careful consideration of neurocognitive mechanisms and functional changes in brain activity. From a psychological standpoint, bilingualism is closely linked to individual characteristics. Factors such as temperament, motivation, interest in language acquisition, social environment, and communicative needs play a decisive role in shaping bilingual development. Therefore, bilingualism should be examined not only through general theoretical frameworks but also with due consideration of individual variability. The principal aim of the neuro–psycho–pedagogical approach is to achieve a deeper understanding of the mechanisms underlying the formation and development of bilingual individuals, as well as to identify and effectively utilize the latent cognitive resources associated with bilingualism.

Within this framework, bilingualism is conceptualized not as a constraint, but as a developmental resource and an opportunity for cognitive enrichment. On this basis, it can be argued that in contemporary psychological science, bilingualism functions not only as a factor influencing cognitive processes but also as a mechanism through which these processes are realized. In the context of globalization, proficiency in two or more languages constitutes a significant determinant of communicative competence, cultural awareness, and social adaptability. Accordingly, bilingualism should be regarded as an integral component of individual culture and as an effective communicative system in modern society.

CONCLUSION

The present study examined the influence of bilingualism on memory characteristics in primary school–aged children, with a particular focus on visual and auditory memory processes. The empirical findings, obtained through the application of R. Meili's memory assessment methodology, demonstrate that no statistically significant differences exist between monolingual (Uzbek-speaking) and bilingual (Uzbek- and Russian-speaking) children in either visual or auditory memory performance. These results indicate that, at the stage of primary education, fundamental memory processes–namely encoding, storage, and retrieval–develop independently of language background. The analysis further confirms that visual memory, assessed through the recall of pictorial stimuli, and auditory memory, evaluated through the retention of verbally presented information, are formed at comparable levels in both groups. This suggests that the mechanisms underlying the perception, processing, and retention of information are primarily determined by general cognitive development and biological maturation rather than by linguistic experience. Consequently, bilingualism neither imposes an additional cognitive burden on memory systems nor provides a measurable advantage in basic memory functioning at this developmental stage.

At the same time, the findings support the broader theoretical position that the effects of bilingualism are more likely to manifest in higher-order cognitive domains, such as attentional control, cognitive flexibility, and executive functioning. Memory processes in primary school–aged children remain in an active phase of development and are more strongly influenced by educational conditions, instructional organization, repetition, and motivational factors. Therefore, the role of language proficiency in shaping memory performance at this stage appears to be secondary.

From a conceptual standpoint, the study underscores the necessity of moving beyond narrow linguistic interpretations of bilingualism and adopting an integrative neuro–psycho–pedagogical framework. Bilingualism should be understood as a multidimensional phenomenon that encompasses not only linguistic competence but also cognitive, psychological, and sociocultural dimensions. Such an approach allows for a more comprehensive understanding of the mechanisms underlying bilingual development and highlights the importance of considering individual differences, educational environments, and broader cognitive processes.

PROPOSALS

Based on the findings and theoretical considerations presented in this study, it is necessary to emphasize the importance of conducting psychological investigations of bilingual children within school settings using comprehensive and methodologically sound approaches that allow for the differentiation of specific cognitive processes. Particular attention should be given to the analysis of higher-order cognitive functions, including attentional control, cognitive flexibility, and executive functioning, as these domains are more sensitive to the influence of bilingualism than basic memory processes. Furthermore, educational practices should prioritize the optimization of learning conditions, including the systematic organization of instructional activities, the use of repetition, and the enhancement of students' motivation and engagement, as these factors have been shown to play a decisive role in the development of memory performance. In addition, future research and pedagogical strategies should adopt an integrative neuro–psycho–pedagogical perspective, taking into account the interaction between cognitive development, individual psychological characteristics, and the educational environment, thereby enabling a more effective understanding and support of bilingual learners' development.

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EDITORIAL REVIEW

The article under consideration addresses the issue of the influence of bilingualism on memory characteristics in primary school–aged children, a topic that remains relevant within contemporary developmental psychology and educational research. The study is situated at the intersection of psycholinguistics, cognitive psychology, and pedagogy, which enhances its interdisciplinary significance. The scientific contribution of the study lies in its empirical examination of the relationship between bilingualism and memory processes–specifically visual and auditory memory–within a clearly defined age group (9–10 years). While the broader discourse on bilingualism often emphasizes its effects on executive functions, the present study narrows the focus to basic memory mechanisms and provides evidence that these are not significantly influenced by bilingualism at the primary school stage. This contributes to a more nuanced understanding of the cognitive profile of bilingual children by challenging assumptions regarding universal cognitive advantages or disadvantages associated with bilingualism. The relevance of the study is evident in the context of increasing linguistic diversity and the expansion of bilingual education systems. In countries such as Uzbekistan, where multilingualism is becoming more widespread, understanding the cognitive implications of bilingual education is of both scientific and policy importance. The findings provide a grounded perspective that may inform educational strategies and counter misconceptions regarding the cognitive load of bilingualism in early schooling.

The practical value of the research lies in its implications for educational practice. The conclusion that memory performance is more strongly influenced by general cognitive development and instructional conditions than by language background suggests that pedagogical efforts should prioritize the quality of teaching, structured repetition, and student motivation rather than focusing excessively on language-related differences. This insight is particularly useful for educators working in multilingual classrooms. The methodological framework of the study is generally sound. The use of Meili Memory Test provides a standardized and well-established tool for assessing visual and auditory memory. The sample size (205 participants) is adequate for drawing generalizable conclusions within the specified population. The separation of visual and auditory memory assessment into distinct stages enhances the internal validity of the findings. However, the study would benefit from more detailed reporting of statistical procedures, including significance levels and effect sizes, to strengthen the robustness and transparency of the results.

Among the strengths of the article are its clear research design, logical structure, and consistent alignment between theoretical assumptions and empirical findings. The integration of a neuro–psycho–pedagogical perspective in the interpretation of results adds conceptual depth. At the same time, certain limitations should be noted. The study focuses exclusively on basic memory processes and does not extend the analysis to higher-order cognitive functions, which are acknowledged as potentially more sensitive to bilingualism. Additionally, the cross-sectional design limits the ability to capture developmental dynamics over time. Overall, the article presents a coherent, methodologically grounded, and practically relevant contribution to the study of bilingualism and cognitive development. Despite minor methodological limitations, the findings are credible and the interpretations are well substantiated. Therefore, the article meets the standards of academic research and can be recommended for publication in a scientific journal.