A Study of the Memory, Attention Span, and Working Speed of Schoolers of School with Chinese Language Training — On the Example of 9-year-old Schoolers of Elementary School

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Abstract: Studying the cognitive processes of bilingual people helps us understand how language affects thinking and how people from different cultures process information. Among them, the study of memory is important for understanding human cognitive processes. Within the scope of this study, the results of the study of short-term visual memory, short-term auditory memory, meaning memory and the speed of attention of 9-year-old Mongolian students of elementary school with Chinese language training and presented the results. The study used questionnaires developed by the National Institute of Educational Research to assess the attention span, processing speed, short-term visual attention (image recognition), short-term auditory attention, and the ability to interpret information for 8-10 year old children. Such as sample of 76 9-year-old children from Uy Tsai general education school in the capital city was selected and analyzed. The results of the study showed that 9-year-old children in bilingual schools had normal average levels of attention span, processing speed, and auditory memory, while visual memory and semantic memory were above average.
***Keywords*:** visual memory, auditory memory, semantic processing, ability to concentrate, and working speed

1. Introduction

In today's era of globalization, multilingualism is becoming more common. The Bialystok study has shown that bilinguals have a distinct advantage in cognitive functions, including memory and attention span (Bialystok, 2009). Bilinguals frequently use two languages interchangeably, and long-term language control may affect working memory, attention, and cognitive control (Kroll & Bialystok, 2013). The cognitive advantages of bilinguals vary across age groups. For example, it affects children's cognitive development, while for the elderly, bilingualism plays a role in slowing cognitive aging. Researchers often use number repetition tasks to assess working memory. In a study by Asadollahpour et al. (2015) comparing the working memory of monolingual and bilingual children, bilingual children performed better than monolingual children on both number repetition tasks, indicating that bilingual children are more capable of understanding and updating information over time. In addition, Hansen et al. (2016) found that bilingual children performed better on the n-back task than monolingual children. Cognitive flexibility is associated with creative thinking and involves the ability to change thinking and adapt to different rules. Białystok et al. (2009) found that bilingual children had better cognitive flexibility than monolingual children when compared using a face task. And Barak et al. (2012) found that three groups of children with different second languages responded faster than children with all two languages using the color-shape transformation method. In this study, we examined the memory characteristics of 9-year-old Mongolian children who were learning Chinese.

2. Methodology of research

The study used four questionnaires to assess children's memory and attention, developed by the National Institute of Educational Research (2021). For example, the attention span and processing speed questionnaire has a table with numbers from 1-9, and there are symbols written under each number. Observe them carefully and record them according to the numbers in the table. The short-term memory (image) test is a task that requires you to see, identify, and immediately recall 12 images. The short-term listening comprehension test is a task to identify and immediately recall 10 words after hearing them, and the information comprehension test is a task in which children are read a two-line story and then asked to immediately recount the events of the story.

3. The result of the study

Results of a study examining the attention span and working speed of bilingual school students are as follows.

The ability of bilingual school students to perform simple pictorial notation in a short period of time was studied using a simple pictorial notation method for single-digit numbers. The results of the study showed that the attention span and

working speed of students in bilingual schools were at a normal average level (M-3.04). This appears to be higher than the average short-term attention span (M-2.13) of a typical 9-year-old school child, as measured by the Institute of Education. For example, students in bilingual schools have higher attention spans and faster working speeds.

Table 1. Average indicators of attention span and working speed

Task	N	Range	Minimun	Maximun	Mean	Std.Deviation
Ability to concentrate and work speed	76	2	2	4	3.04	0.04

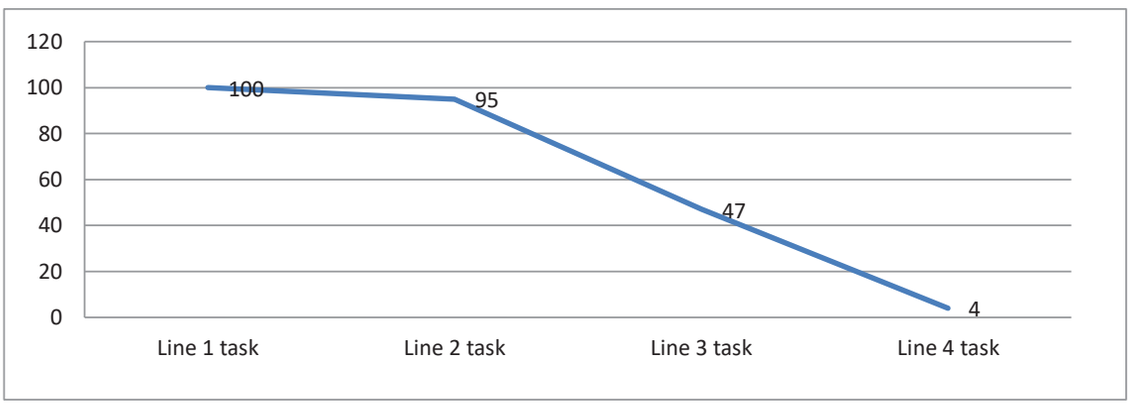

Figure 1. Attention span, working speed, and task completion (percentage)

Looking at the performance of the task in the picture, it is clear that for 9-year-old students in bilingual schools, fatigue and performance decline starting from the 3rd row. In this case, line 1 is fully completed, line 2 is 95 percent, line 3 is 47 percent, and line 4 is 4 percent complete. Thus, when comparing the results with the results of 8-10 year old regular school students published by the Institute of Education, there was a difference in the performance of line 2 and line 4. Students in bilingual schools have a 2nd line of 95 percent, while students in regular schools have a 60 percent. For the line 4, 4 percent of students in bilingual schools completed it, while 56 percent of students in regular schools completed it.

Results of a study examining the short-term visual memory (images) of bilingual school students are as follows.

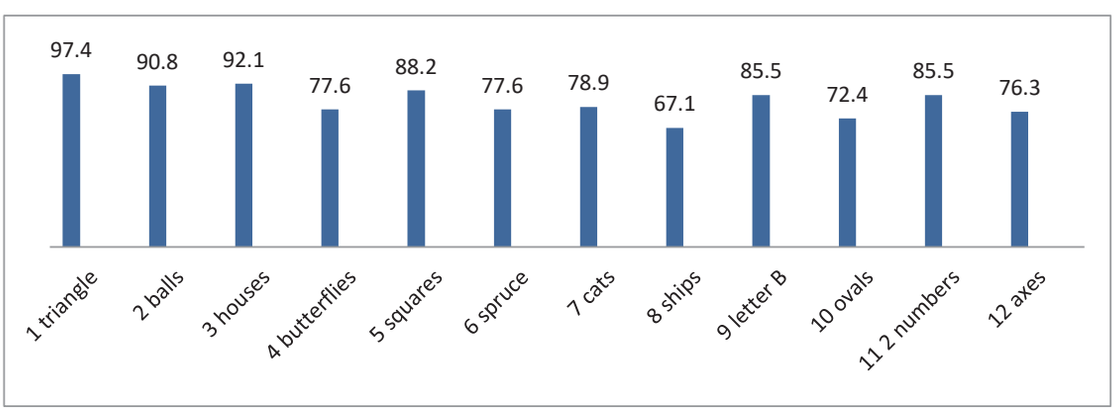

Figure 2. Performance (percentage) on short-term visual memory (image) retention tasks

Judging by the task performance, it appears that students are able to recall the first 3 images well. However, as time goes by, recall becomes less and less effective, and recall of things that are not used frequently becomes weaker. This includes the observation that people are able to recall a ship, an oval, and an axe with a certain percentage, and the number of people who are able to recall is basically the same as regular school children.

Table 2. Average performance on short-term visual memory (image) tasks

Task	N	Range	Minimun	Maximun	Mean	Std.Deviation
Visual memory	76	3	2	5	3.99	0.83

For 9-year-old students in a bilingual school, they can recall 9-11 images out of 12, which is above average and at a sufficient level (M-3.99). This also appears to be higher than the average for regular school students (M-2.66).

Results of a study examining the short-term auditory memory of bilingual school students are as follows.

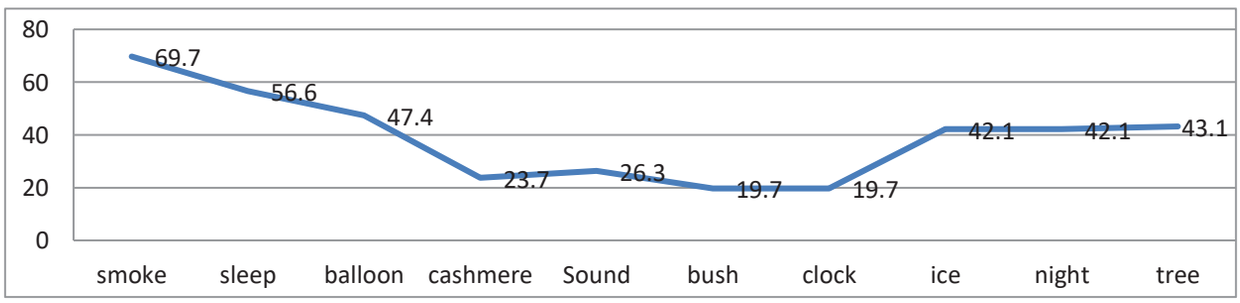

Figure 3. Performance on short-term auditory memory tasks (percentage)

Regarding task performance, the first word was recalled by 69.7 percent, and the last three words were recalled by over 40 percent. The order in which words are spoken affects recall. Also, it is observed that the first and last words are well remembered. And when comparing this with visual memory indicators, it appears that visual memory is dominant over auditory memory for 9-year-old children.

Table 3. Average performance on short-term auditory memory tasks

Tasks	N	Range	Minimun	Maximun	Mean	Std.Deviation
Semantic memory	76	2	2	4	2.92	0.37

The ability to recall information after hearing the information of students with bilingual education was at the average level (M-2.92).

Results of a study examining the semantic skills of students in bilingual schools are as follows.

The semantic memory of students in bilingual schools curriculum was studied by asking them to recall a 24-item story immediately after listening to it. The results of the study show that the verbal memory of students in bilingual schools was above average (M-3.7), which is higher than that of students in regular schools as measured by the Institute of Education (M-3.06).

Table 4. Average performance on semantic memory tasks

Tasks	N	Range	Minimun	Maximun	Mean	Std.Deviation
Semantic memory	76	3	2	5	3,7	0.1

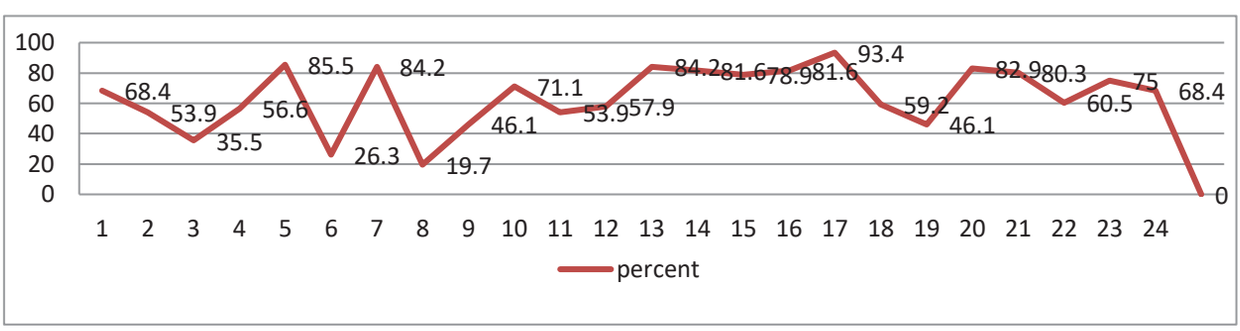

Figure 4. Performance indicators on semantic memory tasks

And their performance on the tasks was basically the same as that of regular school students. Specifically, many of the students remembered the 17th meaning unit (..find that old woman..) that determines the continuation of the story. And they were able to recall better the parts that were related to each other. For example, "A king of a dynasty went hunting. (1) The king got lost (2) and went to a hut. (5) They cooked millet (7) and it was a delicious meal. (10) But it was not as tasty as the

food cooked by the old woman. (13) "The king got angry... (14) You can't cook as well as that old woman (15). (16) He said, "Find the old woman." (17) "Therefore, O king, do not eat for three days (20)." (21)" etc., and fewer people recalled units that were part of the meaning. Жишээ нь, "He has never eaten a human being like the king," "that woman in the water," etc., are recalled with a low percentage.

4. Conclusion

For students with bilingual education, the ability to concentrate and work speed was at a normal average level (M-3.04). For 9-year-old students in a bilingual school, they can recall 9-11 images out of 12, which is above average and at a sufficient level (M-3.99). The ability to recall information after listening to it in bilingual students was at an average level (M-2.92), and when compared to visual memory indicators, visual memory appears to be dominant in 9-year-old children. The semantic memory of students in bilingual schools was above average (M-3.7). When comparing the results of the study with the results of 9-year-old children in regular schools published by the Institute of Education, the results of the tasks were all higher for students in bilingual schools, which may indicate that Chinese language has an impact on students' memory.

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