WORKING MEMORY IN TEACHING ENGLISH

Bolormaa Ayurzana
Foreign Language Department
Computer Science and Management School
Mongolian University of Science and Technology
a.bolormaa@csms.edu.mn

ABSTRACT

This article is aimed to describe memory, in particular, working memory as a key factor of achieving one's academic goals for studying English. First of all, the author is trying to find best definition of memory based on recent findings of intelligence researchers. At the same time the writer includes an interesting discovery on neurogenesis made by some scientists narrating that the creation of new neurons leads to the gradual loss of memory traces from the hippocampus due to fact that those memories are moved to elsewhere in the brain for constant save, and confirming that there is an evident consequence from this finding that neurogenesis will not occur due to full storage of working memory in the brain. As studying any foreign language is firmly dependent on retaining information or vocabulary as one of foundations for academic successes in learning the foreign language, the writer provides some facts from her students' memorization performance in classes for the fall semester, 2013. After that the article mentions a few ways to sharpen the brain abilities to process information quickly and make reasoning logically because of the fact that working memory is just one of functions of a complex device called the magical brain. Based on comparing controversial ideas about memory training online programs, the author discusses her thoughts and presents some figures on for and against these training methods. At the end of this article the research-instructor summarizes viewpoints on working memory as an inevitable part of making her job entertaining and fruitful for learners.

Field of Research: hippocampus, novelty, brain sharpeners, care of brain

1. Introduction

Memory is that mental process of bringing the past back into the present, according to some researchers from US. Memories underlay our uniquely human abilities to experience our environment and then, from those experiences, remember, learn, and create. The ability to remember is not just to glimpse into the past; a sharp memory can help with creativity, productivity and even the ability to imagine the future, according to several psychologists. Children and adolescents can remember past events with in a detailed way. According to German researchers, process of remembering the origin of memories lasts longer until it develops fully into adulthood. The study at Saarland University has found that during childhood and adolescence the brain area that plays a key role in recalling memory sources constantly improves and gets matured with age. This idea has proved by the work of other American neuroscientist, Eric R. Braverman. The brain’s life cycle displays that there are five unique electrical stages. The fetus gains its electrical activity just 7 weeks after fertilization. In the first stage there is just a spark of life. Although the baby develops new cells and begins to learn the second period is called "high-voltage dementia", in which brain voltage is four to five times greater than that adults but the baby can't properly retain all the information. Infants and toddlers can't organize their thoughts or recall information quickly. Memory retention begins in the third stage, around the age of 5, and increases exponentially during the ages of 13 to 20. In this stage called "blastoff adolescence" teenagers are under rain of 21
different hormones that make them adults from children. These hormones assist memory but make thinking, particularly decision making scattered. In the fourth stage, the "consolidation of adulthood" takes place between the ages of 20 and 40, when brain chemicals levels begin to stabilize. The fifth stage is a slow but steady functional decline. Brain cells are no longer repairing themselves, memory retention is destroyed, and processing speed undergoes a very slow death. All cognitive functions - your creativity, intelligence, and ability to remember, communicate, concentrate, or recall are reflected by the anatomy and chemistry of the brain. These functions naturally decline with age as brain cell die off, neuronal connections become short-circuited, and cerebrospinal fluid decreases.

2. New neurons are built

However, newly formed neurons have a great impact on working memory to diminish older connections, says in a report in the November 13th issue of the journal Cell. "Cell Press publication, that provides some of the first evidence in mice and rats that new neurons sprouted in the hippocampus cause the decay of short-term fear memories in that brain region, without an overall memory loss"[1]. The discovery of the researchers led by Kaoru Inokuchi of The University of Toyama in Japan suggests that the creation of new neurons leads to the gradual loss of memory traces from the hippocampus due to the fact that those memories are moved to elsewhere in the brain for constant save. "Although they examined this process only in the context of fear memory, Inokuchi says he "thinks all memories that are initially stored in the hippocampus are influenced by this process."[2] There is an evident consequence from this finding that neurogenesis will not occur due to full storage of working memory in the brain. In other words, there is a difficulty in accepting new information as the storage capacity of the hippocampus is "occupied by un-erased old memories", says Inokuchi.

In accordance with earlier studies retaining new facts depends on the hippocampus. This dominance rapidly faded away over time because events in working memory storage are relayed to other areas of the brain referred as the neo-cortex. Meanwhile, the strength of connections between neurons of the hippocampus is weakened, revealed observation of scientists. New neurons continuously grow in the hippocampuses of adults, even though they get older, confirm scientists. However it is still unrevealed the functions of newly appeared brain cells. Inokuchi's team had a suspense that newborn cells not only play a crucial role in keeping neural networks but they can do controversial to the previous function. Integration of freshly created brain cells might lead to destruction of formation of former gathered information that is almost revealed by the latest discoveries.

On the other hand, voluntary exercise, which causes a rise in the birth of new neurons, sped up the decay rate of hippocampus-dependency of memory, without any memory loss. "Enhanced neurogenesis caused by exercise may accelerate memory decay from the hippocampus and at the same time it may facilitate memory transfer to neocortex," Inokuchi said. "Hippocampal capacity of memory storage is limited, but in this way exercise could increase the [brain's overall] capacity."

The study sets the stage for further examination of the connections between neurogenesis and learning capacity, the researchers say. They also plan to examine how the gradual decay of memory dependence on the hippocampus relates to the transformation of memory over time from a detailed and contextually-rich form to a more generic one.
3. Definition of working memory

By analyzing the facts on working memory, this term can be defined as an operator that connects signals coming to the right point to the relevant place and gives an alert to do something in a short period like parents remind their children to do something on time. The main function of working memory is to keep and process information in one's brain meanwhile it has to ignore non-essential signals and make up clear thoughts/decisions. Many research works revealed that non-controlling one's stream of thought results in serious pitfalls, from poor reading comprehension to learning disability. There is an emerging consensus among intelligence researchers that general cognitive ability is comprised of multiple interacting cognitive functions, and working memory is one of those crucial intellectual functions, explains Scott Barry Kaufman. In fact, our brain is a complex machine, and multiple parts of it must work together to accomplish even the simplest task. That's why it's important to get a complete training program that exercises multiple core brain functions. Imagine watching an action movie. You need to process information quickly to understand how the plot evolves. You need to pay sharp attention or you'll miss key details and dialogue. You need to store and retain information in your working memory throughout the movie to understand how all of it ties together to make sense.

4. Novelty forces your brain to change

New tasks present unexpected obstacles, forcing your brain to work in different ways. When faced with new challenges, your brain can no longer recall old habits — it must redesign its existing network and build new pathways for information processing. That's because the brain assigns special neural pathways or each type of task. Just as you use different muscle groups for running and swimming, so you use different neural circuitry for reading and watching a movie. Familiar tasks simply reactivate existing circuitry — which can keep your brain active, but won't fundamentally change or improve it. You have a unique set of cognitive strengths and weaknesses. A task that's easy for someone else may be a challenge to you, and vice versa. In order to improve, you need tasks appropriate for your brain's ever-changing ability levels. As your brain becomes stronger, it's able to handle tougher challenges. This response to challenges is a key part of neural growth, and you need challenges that adapt quickly enough to push you. In any learning process, strong core cognitive abilities provide students of all ages with the mental scaffolding to support more complex activities such as formulating an argument, writing a creative story, and navigating social situations. Researchers have found that core cognitive abilities such as working memory and processing speed are factors for educational achievement in math, science, and reading. To make students learn the foreign language efficiently and improve their grades I am focusing on how memorizing impacted student performance. The target learners were students studying English for 5 to 6 years.

5. Experiment with students

Students who participated in the survey were divided into two groups: one group supplemented classroom activities with limited time, while the other group followed a normal curriculum. Both groups took a cognitive assessment before and after the lesson in order to measure their individual improvement. Time to complete retain conversations given students varies beginning with a range of 20 minutes to 10 minutes.

After analyzing data from 35 students, it was found that students who trained with tips for retaining and brain power for a semester showed significant improvements in assessment scores compared to students who kept to a standard academic schedule. In fact, those who invested more than 2-3 hours per week into memory improved almost twice as much as those who didn't practice.
6. How to harness your brain’s abilities

You, too, could achieve amazing improvements. But not every experience can rewire your brain for the better: in order to fully harness the power of neuroplasticity, you need to challenge your brain with training that’s novel, adaptive, and complete.

This complex formula explains why some popular games such as Sudoku and crosswords don’t increase intelligence — the more you play these games, the more you retrace overlearned pathways in your brain. Carefully elaborate challenges are needed to really strengthen your brain.

6.1. A brain -healthy lifestyle: Physical exercise grows the brain

Positive relationship between physical exercise and overall health and longevity has been touted for more than two thousand years. Simple walking—does it sound crazy? No, it doesn’t. Because walking for at least 30 minutes three or more times a week, increases blood flow to the brain, enlarges your frontal lobes, and adds new memory-recording neurons in your hippocampus.

6.2. The brain needs high-grade natural fuel

The closer our diet is to what nature provides in an unadulterated state, the better it is for our overall health and for our brain. Let’s take a look at some of the evidence in support of this claim. Two studies from 2002, both published in the Journal of the American Medical Association, looked at the eating habits of healthy aging adults in Chicago and the Netherlands, respectively. Both studies came to the conclusion: health aging individuals who consumed diets rich in natural vitamin E had a markedly reduced risk of Alzheimer’s disease. In another study, published in the Annals of Neurology, doctors at Harvard Medical School found that total vegetable intake was associated with less cognitive decline in aging women.

6.3. What you eat affects how you think and remember

Each of the billions of cells in your brain is a small factory, and like any factory, each cell requires fuel to keep it going. The brain has evolved to use nutrients found in nature as building blocks to construct and repair the cells it needs to run. As modern nutritional scientists explore the metabolic mysteries of the brain, they discover over and over that nature’s plan is best; nutrients are more effective when they come from real foods rather than as isolated supplements. No matter where you live, no matter what your genetic inheritance, if you eat a diet centered on fruits and vegetables, nuts, seeds, whole grains, fish, and healthy vegetable oils, and a diet with modest amounts of low fat dairy products and wine, your brain function optimally and you will reduce your risk of memory loss and Alzheimer’s disease.

7. Analysis of recent articles on working memory training

In his recent New Yorker paper, Pulitzer Prize winning journalist Gareth Cook concluded that working memory training will not make you smarter. According to Gareth, “Playing the games makes you better at the game, in other words, but not at anything anyone might care about in real life.” But is this really the most informative conclusion we can draw from the data? Cook based his conclusion on a recent review by Monica Melby-Lervag and Charles Hulme. Partly consistent with Cook’s statement, the researchers saw little evidence for the generalization of working memory training to other mental skills such as reading comprehension, word decoding, and arithmetic. But that’s not all they found. The researchers also found that working memory training programs do produce reliable short-term improvements in both verbal and visuospatial working memory skills. On average, the effect sizes were moderate, but in some cases the effects were actually quite large and rather...
impressive for brief training regimes which only lasted 12 hours (on average). In fact, the largest effects were found for Cogmed working memory training programs. So while Cook is quite right to criticize Cogmed for claiming too much in their promotional materials, I believe he is too quick to dismiss large and reliable short-term improvements in working memory as meaningless in the real world. A telling finding of the Melby-Lerfag and Hulme review is that age was a significant moderating variable on strength of training. Younger children (below the age of 10 years) showed significantly larger benefits from verbal working memory training than older children (11-18 years of age). This suggests that lumping people together who are at different stages in their cognitive development can obscure some truly meaningful effects. I imagine if the researchers also included elderly individuals in their analysis (e.g., those above the age of 60), they would have found effect sizes resembling what they found for the youngest age groups.

8. Conclusion

While I believe multiple factors are important when considering the effectiveness of working memory training, I want to be clear that I am not saying that the kind of brain games that were included in Melby-Lerfag and Hulme’s review (and were the focus of Cook’s article) is the best method to improve working memory. The evidence suggests that the activities that show the strongest and most widespread effects on cognitive functioning are those that target the “whole person” such as traditional martial arts training and enriched school curricula. I think we often underestimate the extent to which multiple aspects of development—cognitive, physical, social, and emotional—all feed off each other. There is no magic bullet to optimize memory and other brain functions or to prevent Alzheimer’s disease, and there is certainly no effective treatment once the ravages of Alzheimer’s are manifest. So each of us must do our part— for ourselves, for our spouses, for family and friends, and especially for our children and grandchildren and future generations. By taking care of your brain and your memories, at the least you will feel better about yourself. At the most, you will benefit from and enjoy additional years-or decades- of brain-healthy living.

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References


