



Two Books on Working Memory

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Recently, many papers and books have been published on working memory and training of the working memory. However, psychiatrists seem to be somewhat reluctant to explore or apply such evidence in their clinical practices and research. In order to help readers understand the current status of research on working memory, I am introducing two short and balanced books written by two prominent working memory researchers. These veteran clinical practitioners have tried to understand and help people with working memory deficits for a long time.

The Learning Brain

By Torkel Klingberg, MD, PhD, OXFORD; 2013 [1]

The author, Torkel Klingberg, is a professor of cognitive neuroscience at the Stockholm Brain Institute, Karolinska Institute of Sweden. In 2001, Klingberg developed “Cogmed,” the working memory training program based on his breakthrough researches demonstrating that working memory capacity could be improved through training. His research focuses on how the human brain deals with attention and working memory, and how carefully designed training paradigm can be used to augment different cognitive capacities. Klingberg’s findings have been published in scientific journals, including *Science*, *Nature Neuroscience*, and the *Journal of the American Academy of Child and Adolescent Psychiatry* (<http://www.klingberglab.se/torkel-klingberg/>). In 2012, Dr. Klingberg released a book, “The Learning Brain.” The contents of the book are summarized as follows:

At first, the author introduces the working memory’s definition, model, and relations with attention. People with a

higher working memory capacity are better able to maintain focus, even during challenging activities. They can remember what they have to concentrate on and have the ability to control attention and filter out distractions, which is a great hindrance to our ability to retain relevant information. Working memory is vital for mathematics, reading comprehension, and fulfilling other children’s developmental tasks.

The second major aspect of the book is about children with low working memory capacity, including attention-deficit/hyperactivity disorder (ADHD). Working memory and ADHD are overlapping concepts. It is conceivable that children with low working memory would also display ADHD symptoms. Besides, children with lower working memory have more ADHD symptoms. Education with strategies geared specifically to help children with poor working memory may prove useful.

The author explains the relationship between genes and the brain in the third part of the book. According to twin studies, researchers have found that working memory capacity is mostly, or at least, fifty percent hereditary. However, it remains unclear which genes are precisely involved. One of the few genes identified as necessary for working memory (COMT) has the codes for an enzyme that breaks down the neurotransmitter-dopamine. Slow degradation of dopamine gives rise to more free dopamine, and thus to better functioning of the working memory. The gene that codes the information about the metabolism rate of dopamine affects the childhood brain, but it does change with age. Children who have more dopamine than adults or have too many neurotransmitters do not have a more efficient function. The “slow-degradation” gene variant is not helpful in younger children, but it leads to a better functioning of the working memory around puberty when the dopamine levels start to decrease.

The author explains the risks and rewards in terms of working memory in the next chapter. Teenagers can plan

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and assess risks better than children, but the potential rewards can invoke an uncontrollable powerful attraction. So the teenage period is not a simple stretch between childhood and adulthood. Conversely, the teenage brain is more driven by emotions than by prefrontal control due to its association with the amygdala, a collection of nerve cells that plays a crucial role in fear, anger, and stress.

To conclude, the author mentions working memory training. The training probably affects only those brain areas that are activated during the training. There is no training that improves the brain and all its functions holistically. However, if an area is responsible for many types of working memory tasks and controlling attention, it might be a crucial area. The mnemonic map in the parietal cortex seems to be a promising area. The computerized method of working memory training, “Cogmed,” which was developed to stimulate and train this area, has been tested by numerous scientific studies by independent groups around the world.

In several controlled studies, we had observed how working memory training improved the performance of subjects by 15–20% when they were tested on the tasks extraneous to the training program. Moreover, the improvement is maintained three and six months after the training period. Thus, it is never easy to measure the effects of training on daily behavior. However, in the study, we measured ADHD behaviors, such as difficulties in task completion and mind-wandering, wherein the training group showed more attention in daily life. The effects of working memory training on behaviors have also been replicated by several studies conducted in the United States. Although most studies of working memory training have included children with ADHD, the effects appear to be general.

Essentials of Working Memory Assessment and Intervention

By Milton J. Dehn, PhD, WILEY; 2015 [2]

Milton J. Dehn is an expert on cognitive processing assessment, working memory, and children’s memory impairments. He earned his bachelor’s degree in Psychology from the University of Minnesota, his master’s degree in School Psychology from Moorhead State University, and his doctor’s degree in Educational Psychology from the University of South Dakota. Dr. Dehn has practiced as a school psychologist in four Midwestern states and is currently a private practice school psychologist in Wisconsin. He has taught in the School Psy-

chology Program at the University of Wisconsin-La Crosse, where he also serves as program director.

Assessment of psychological processes began with his dissertation research. He later developed a selective, cross-battery model for psychological processing assessment, which is described in his 2006 book *Essentials of Processing Assessment*. That publication was followed by *Working Memory and Academic Learning: Assessment and Intervention*, *Long-Term Memory Problems in Children and Adolescents: Assessment, Intervention, and Effective Instruction*, and *Helping Students Remember: Exercises and Strategies to Strengthen Memory*. In 2015, Dr. Dehn published a book, “*Essentials of Working Memory Assessment and Intervention*,” which offers school psychologists, educators, and other professionals a practical guide for assessing working memory and providing appropriate interventions for children and adolescents.

Working memory deficits are the main reason why students with disabilities are unable to respond to regular education interventions successfully. Given the strong relationship between working memory and all areas of academic learning, a deeper understanding of working memory and the related assessments and interventions can facilitate more significant accomplishments.

In order to curate the study as a comprehensive resource, the text contains the theories of working memory and includes guidelines that can help organize a practical cross-battery assessment, select the right instruments, interpret the results, and formulate individualized interventions and educational programming. Further, there are illustrative case studies that explore working memory deficits in children and adolescents with disabilities. Additional assessment and intervention resources, such as checklists, forms, and detailed directions, are available in the accompanied Online Resources.

The author reviews the working memory strategies and exercises that can change the brain and includes information on various training options as well as interventions that improve cognitive processes. This step-by-step guide shows how working memory should be supported in the classroom and outlines the approaches that can help reduce frustration and enhance academic performance in students with disabilities.

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