

## Working Memory – What is it and what’s the problem

**Dr Jared Horvath** (Neuroscientist) describes working memory as “the ‘workbench’ of the mind. It’s distinct from our long-term memories. It’s the space where we temporarily hold information for manipulating and processing. We use it to bring in new information to tie our memories and what we know”.

Working Memory is essential for daily life, especially for tasks that involve attention and problem solving. A strong working memory is critical to making progress in learning. Working memory is limited for everyone but some individuals are particularly constrained, including those students with developmental disorders and learning difficulties.

## Proposed Solution / Intervention

Cogmed Working Memory Training is an online cognitive intervention program designed to strengthen the User’s working memory with specific and intensive working memory exercises. Cogmed Working Memory Training provides an evidence-based program for helping children, adolescents, and adults sustainably improve attention by training their working memory. Cognitive neuroscience, combined with innovative computer game design and close professional support, enables Cogmed to deliver substantial and lasting benefits to clients.

## The Theoretical Rationale – How does it work?

- A minimum of 25 training sessions, between 25-50 minutes each, done over a minimum of 5 weeks (an individualised protocol will be selected to suit the user).
- Users (students) who complete the program are supported by a Coach for the duration of the program. Each Cogmed coach is required to complete comprehensive training.
- The difficulty level will automatically adjust based on the performance of the user so that he/she will always train to the limits of their working memory capacity. This creates the required intensity for neural change.

## What does the Research Say? What is the Evidence for Efficacy?

Cogmed has a strong evidence-base, with over 80 independently research published studies and more than 90 ongoing studies.

Around 93% of student successfully complete the program at the level of intensity that is needed to achieve change. Around 80% of students improve on behavioural measures on attention. This figure comes from a wide variety of research studies. There are a number of studies that suggest that improvements to working memory have a flow-on effect to improvements in reading comprehension and mathematics.

Working memory training is not a replacement for knowledge and skill building in literacy and numeracy, but the explicit development of working memory capacity allows students to focus more and take better advantage of the learning opportunities available in the classroom. Parents commonly report that their children are noticeably more organised at home.

Clinical trials and clinical audits from registered Cogmed practices report that the successful completion of Cogmed before implementing a scholastic intervention, such as a literacy recovery program, results in a better outcome in a shorter period of time.

## **Claims that Cogmed does not make**

Since the usability and evidence base for Cogmed is often misstated in media and even in some academic research papers, it is also important to clarify some common misconceptions about the effects or intended use of Cogmed. Below are some examples:

- Cogmed is not a treatment for ADHD, but can help reduce some of the symptoms commonly present in ADHD that are related to poor WM function.
- Cogmed does not replace formal education, but should rather be seen as an add on that can potentially aid learning in an educational setting. Therefore, if Cogmed is used within a school setting it is important to plan the implementation to interfere as little as possible with formal teaching.
- Cogmed is not a magic pill and assigning someone to a Cogmed training does not automatically improve his or her WM. Compare this with physical exercise for which it is not sufficient to just go to the gym, but in order to gain strength you have to put in effort and hard work. The same is true for Cogmed and although this is acknowledged in practice and reflected in the elaborate coaching system that is a crucial part of Cogmed, this is unfortunately rarely acknowledged in the research literature. An important aspect for future research to investigate is the predictors and relations between what is observed in training performance (what is put in) and effects resulting from training (what comes out).
- Cogmed is not a cure for dementia, cognitive decline related to aging, or Alzheimer's disease but can potentially help with working memory related problems commonly seen in these cases.
- Cogmed does not help everyone with everything, but does seem to help individuals who are hindered by their poor WM and for those individuals the benefits are more noticeable to themselves and sometimes even objectively measurable.

## Conclusions

- The number of research studies investigating the effects seen after completion of the CWMT program are growing each year, with more than 80 peer-reviewed publications as of March 2016. The findings that are repeatedly reported include sustained improvements on WM and attention in both children and adults. Training effects have been reported in children and adults with ADHD, children with learning difficulties, hearing impairments, low language abilities, born prematurely, with intellectual disability, in adults with acquired brain injury and in typical samples ranging from preschoolers to older adults.
- Because formal learning is dependent on information processing in WM, it would seem obvious that better WM would lead to better learning. However, that is for empirical research studies to investigate. Such evidence is starting to emerge, even though this type of research faces many challenges. Assessing learning requires longitudinal approaches, sensitive measures and flawless research. These types of studies are both expensive and cumbersome to undertake. While CWMT is the most researched WM program to date (both commercially and non-commercially), more studies are needed to further address more specific effects in daily life, further optimization of the method and further individualization of the training.

Key references can be found at:

<http://www.cogmed.com/research>

Cogmed Claim and Evidence Document