Tip Sheet

Support for Individuals with Working Memory Difficulties

Currently, there are no evidence-based strategies for directly improving working memory. However, there is plenty that can be done to enhance learning in individuals with working memory difficulties. The approach that we recommend involves managing working memory loads, with the aim of alleviating the disruptive learning consequences of excessive working memory loads. The following recommendations should be used to guide both the development of lessons or work environments for individuals with working memory impairments, and the monitoring of the individual's performance. In each case, the aim is to minimise the chance that the individual will incorrectly complete the required task due to working memory failures.

1. Recognise working memory failures

Working memory failures typically manifest themselves in frequent errors of the following kinds:

- Incomplete recall, such as forgetting some or all of the words in a sentence, or of a sequence of words
- Failing to follow instructions, including remembering only part of a sequence of instructions, or forgetting the content of an instruction (for example, a child correctly remembers to go to Mrs Smith's classroom as instructed by a teacher, but once there cannot remember the content of the message to be given)
- Place-keeping errors – for example, repeating and/or skipping letters and words during sentence writing, missing out large chunks of a task
- Task abandonment – the individual gives up a task completely.

If these types of activity failure are observed, it is recommended that the working memory demands of the task are considered (see point 2) and if believed to be excessive, the activity should be repeated with reduced working memory loads (see point 3).

2. Monitor the individual

It is important to monitor the individual's working memory regularly in the course of demanding activities. This will include:

- Looking for warning signs of memory overload (see point 1);
- Ask the individual directly – for example, ask for details of what s/he is doing and intends to do next.

In cases when the individual has forgotten crucial information:

- Repeat information as required;
- Break down tasks and instructions into smaller components to minimise memory load;
- Encourage the individual to request information when required.

3. Evaluate the working memory demands of tasks

Activities that impose heavy storage demands typically involve significant amounts of verbal material with relatively arbitrary content. Some examples of activities with working memory demands that are likely to exceed the capacities of an individual with working memory difficulties include:

- Remembering sequences of three or more numbers or unrelated words (e.g. 5, 9, 2, 6 or cat, lion, kangaroo)
- Remembering and successfully following lengthy instructions (e.g. Put your sheets on the green table, arrow cards in the packet, put your pencil away, and come and sit on the carpet)
- Remembering lengthy sentences containing some arbitrary content to be written down (e.g. To blow up parliament, Guy Fawkes had 36 barrels of gunpowder)
- Keeping track of the place reached in the course of multi-level tasks (e.g. writing a sentence down either from memory or from the white board)

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4. Reduce working memory loads if necessary

In order to avoid working-memory-related failures (see point 1), working memory loads in structured activities should be decreased. This can be achieved in a number of ways, including:

• Reducing the overall amount of material to be stored (e.g. shortening sentences to be written or number of items to be remembered)

• Increasing the meaningfulness and degree of familiarity of the material to be remembered

• Simplifying the linguistic structures of verbal material (e.g. using simple active constructions rather than passive forms with embedded clauses in activities involving remembering sentences, and in instructions)

• Reducing processing demands (see point 5)

• Re-structuring multi-step tasks into separate independent steps, supported by memory aids if possible

• Making available and encouraging the use of external devices that act as memory aids for the individual; these include 'useful spellings' on white boards and cards, providing number lines, printed notes, and voice recording technology to store information that needs to be remembered.

5. Be aware that processing demands increase working memory loads

Although individuals may be capable of storing a particular amount of information in one situation, a demanding concurrent processing task will increase working memory demands and may lead to memory failure, as illustrated in the two examples below.

Example 1

The children in Horatio's class were asked to identify the rhyming words in a text read aloud by the teacher. They had to wait until all four lines had been read before telling the teacher the two words that rhymed: tie and fly. This task involves matching the sound structures of a pair of words, and storing them. Horatio was unable to do this, although he was able to remember two words under conditions where no concurrent processing was required.

Example 2

An activity in Delilah's class involved the teacher writing number sequences on the white board with some numbers missing. She counted the numbers aloud as she wrote them, and asked the class what numbers she had missed out. In each case, there was more than one number missing (e.g. 0, 1, 2, 4, 5, 7, 8). In this activity, the child has to use his/her number knowledge to identify each missing number, and store them. On all occasions, Delilah was unable to identify the missing numbers. In such cases, steps should be taken to modify the learning activity in order to reduce working memory loads (see point 3).

6. Frequently repeat important information

It is good practice to regularly repeat information that is crucial to ongoing tasks when working with individuals who have working memory deficits.

• general classroom management instructions

• task-specific instructions (what the whole activity consists of, broken down into simple steps)

• detailed content intrinsic to an activity (e.g. the particular sentence to be written).

Individuals should also be encouraged to request repetition of information in cases of forgetting.

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7. Encourage the use of memory aids

A variety of tools that support working memory may already be commonly used in educational and work environments – these include number lines, counting devices, cards, voice-to-text and text-to-speech software, personalised dictionaries, notes and wall charts. These tools can help in several different ways to reduce working memory loads – they may reduce the processing demands of the activity and they may also reduce the storage load of the task, helping the individual to keep their place.

However, many individuals with working memory difficulties often struggle to use such tools, possibly because of the initial cost of mastering the new skill. Therefore, it is recommended that the individual practises the use of memory aids in situations with minimal working memory demands in order to establish mastery of the basic skill, before their use in more complex activities with higher working memory loads.

8. Develop use of memory-relieving strategies

Individuals with working memory difficulties are typically aware when they have forgotten crucial information, but often do not know what to do in such situations. It is important that the individual develops strategies for overcoming memory problems, including:

• Use of rehearsal to maintain important information

• Use of memory aids (see point 7)

• Organisational strategies – breaking tasks down into component parts where possible

• Asking for help when important information has been forgotten.

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