# An excerpt from 'Boost Your Memory'

**Train your digit span**
**Your digit span is a little-known aspect of memory, but train it and not only will your memory improve, but you'll increase your IQ too!**

"The span of absolute judgment and the span of immediate memory impose severe limitations on the amount of information that we are able to receive, process, and remember." Psychologist, George A Miller.

Seven bits of information seems to be the natural limit of our mental 'desktop' on which we do our thinking. Increase this memory space and reap the benefits.

Humans seem to have a predilection for the number seven, it crops up again and again through history. We talk of seven deadly sins, seas, days of the week, wonders of the world, ages of man and so on. It seems Humanity never met a number seven it didn't like. Could this be related to some in-built feature of the way we think?  In 1956, the psychologist, George Miller published what became one of the most famous psychology papers of all time: 'The magical number seven, plus or minus two'. Miller reasoned that most people can hold in their minds between five and nine 'bits' of information. This is why telephone numbers are typically seven digits long, as this about the limit of what people can remember in one go.

This limited amount of information is referred to as our digit span, or working memory. Working memory is like the desktop of the mind: it's where our brains do their conscious thinking work. Information is constantly flowing into and out of our working memory. It is also referred to as short term memory, as it rarely lasts more than about 30 seconds. In order to

make judgements and calculations we need to use our working memory. When asked to distinguish between musical tones, for example, people can distinguish between no more than about 6. This is nothing to do with our hearing abilities, it seems that we can typically only distinguish between about 7 categories of items at once due to our working memory. Equally, if you quickly flash up a number of dots on a computer screen and ask people to tell you how many there were, once you use more than around 7 dots, people start to make errors: fewer than seven dots and they accurately count them, more than seven and they will guess.

So, is this an in-built limit of our brains? It seems it might be. The explanation is technical, but it seems that its to do with the interplay of two frequency-patterns in our cortex (the uppermost part of the brain, which is more developed in Humans than animals). One frequency, called theta, is the neurons firing at around 5 times per second, another, called gamma, fires at around 35 times per second. One theory is that the number of gamma pulses you have for every theta pulse is what determines your digit span. In other words, thirty-five divided by five is seven. The theory seems to make sense, but no-one really knows at the moment if its actually true.

The implications of this is that its best to organize information — both for yourself and others — into no more than seven categories. Think of them as seven boxes which you can use to put information in. If you can pack the information tightly together, then you can get more than one thing in each box. For example, if you have two or three bits of information that are closely linked in your mind, such that the mere mention of one of them will trigger the other bits, then that one group will only use up one of your seven boxes. Therefore you can increase the amount you can hold in your working memory by making close associations between individual bits of information.

Working memory varies between individuals, and seems to

account for between about a quarter and half of the variation in intelligence between individuals. In other words: the greater your working memory capacity, the greater your intelligence is likely to be. There's also evidence that suggests by training yourself you can increase your digit span, and therefore increase your intelligence and ability to concentrate on information. To train your digit span, write out series of numbers, gradually increasing their length, read each series out once, then look away and try to recall it in reverse order. Start with around 7, and make sure you can easily handle that, before moving onto 8 and so on.

**How did it go?**

Are there any other ways to improve my working memory in everyday life?
Yes, cut out distractions. If you need to concentrate when you are working, seek out a quiet environment. You can also try making notes and talking to yourself to increase your ability to hold information in mind. Writing things down releases a bit of the pressure of holding information in mind all at once.

**How can I keep information in my working memory?**
It seems that maintaining information in working memory mainly works in terms of sound, rather than images or concepts. In other words, you imagine the sound — such as the sound of yourself speaking the information — over and over in order to hold onto it. You've probably experienced this when trying to remember a phone number you've just heard, whilst searching for something to write it down on!

**Here's an idea for you:**
Keep an eye out for games that will help you to train your digit span. There are many card games and video games which require the player to memorise a number of bits of information. Practice at these will enable you to increase the volume of information you can hold at once in your working

memory, whilst also having fun!