

## Can you really make your brain BIGGER: Using cognitive science to increase your study efficiency and retention

*How are we as clinicians going to keep up with the ever-expanding fund of medical knowledge?*

The rapid expanse of medical knowledge is a well-recognized reality creating a daunting circumstance for us as clinicians- trying to keep up with what we need to know.<sup>1</sup> There are several strategies to help the practicing physician keep up. These include:

1. “Peripheral brains” such as smartphone apps and pocket cards
2. Secondary journals- which were discussed in our [November Monthly Tips](#)
3. Efficient study techniques

*Wouldn't it be great if you could improve the efficiency with which you study and learn?*

Enter cognitive science. While this is a vast field of research covering a range of topics, one area of study has been in the production and retention of memories. A summation of this field's findings can be found in the book *Make It Stick: the Science of Successful Learning*.<sup>2</sup> Cognitive scientists Henry Roediger and Mark McDaniel teamed up with story teller Peter Brown to outline how we can improve our efficiency in learning and memory retention. In its simplified form, this involves four processes:

- **Retrieval Practice (R)** - As a medical student you cannot spend 3 grueling hours on acid-base analysis, put the book down and expect to nail an ABG interpretation 4 months later. To solidify a memory into our long-term bank we must practice using it. Quite simply, this is the act of pulling information (a memory) from our memory back. This is retrieval practice.
- **Spacing (S)** - The idea of spacing is linked to retrieval practice but gives greater detail about *when* we should be retrieving memories. It is fine to practice retrieving a memory 30 minutes after it is created (ie shortly after you read a new article), but it is more powerful and efficient in creating memory retention when some time has passed. Allowing for a bit of forgetting to occur and making the retrieval *effortful* leads to greater retention.
- **Interleaving (I)** - Interestingly, cognitive science has found that when we mix our study of different subject matter we often gain a greater understanding of each. This is thought to be related to pattern recognition across topics, rule generation, and the linking of memories in our brains. By mixing our review of several articles, therefore, we can improve our retention of the take-home from each.
- **Generation (G)** - The concept of generation is akin to an active rather than passive learner. It explains that in *creating* from our memory we again reinforce the content and

improve retention. Activities such as recollective summaries or content application are much more retention-producing than passive actions such as rereading.

So, after reading an article use these steps to “Make it Stick”:

1. Take a moment to write out the key points of the paper and how they may affect your practice (**R, G**).
2. Create an alert 1 week later (via smartphone, calendar, post it notes, whichever structure works for you) to remind yourself to do a recollection exercise where you spend two minutes writing all you can remember on the article, then review and correct (**R, S, G**).
3. Create a notecard with the article title on one side and short summation on the other (**S, G**).
4. Whenever you sit to read a new article, review the notecard and simply speak aloud the major summative points (**R, S, I, G**). Once the article and its content become second nature, the notecard can be filed or discarded.

While more effortful than our inherent learning strategies, this method of study based on cognitive science is more time efficient. For most of us, our typical pattern involves reading an article, putting it down, forgetting it, and rereading it months to years later when we realize the content is lost. In the proposed study construct, after the first active reading session the subsequent retrieval activities are quite short, collectively require less time, and are higher yield for actually remembering the topic.

To learn more on the topic of memory retention, please read *Make it Stick* or use these links to my podcast website for my [summary](#) and [interview](#) with the author.

References:

1. Densen P. *Challenges and opportunities facing medical education*. Trans Am Clin Climatol Assoc. 2011;122:48-58.
2. Brown P, Roediger H, McDaniel M. *Make It Stick : the Science of Successful Learning*. Cambridge, Massachusetts :The Belknap Press of Harvard University Press, 2014.