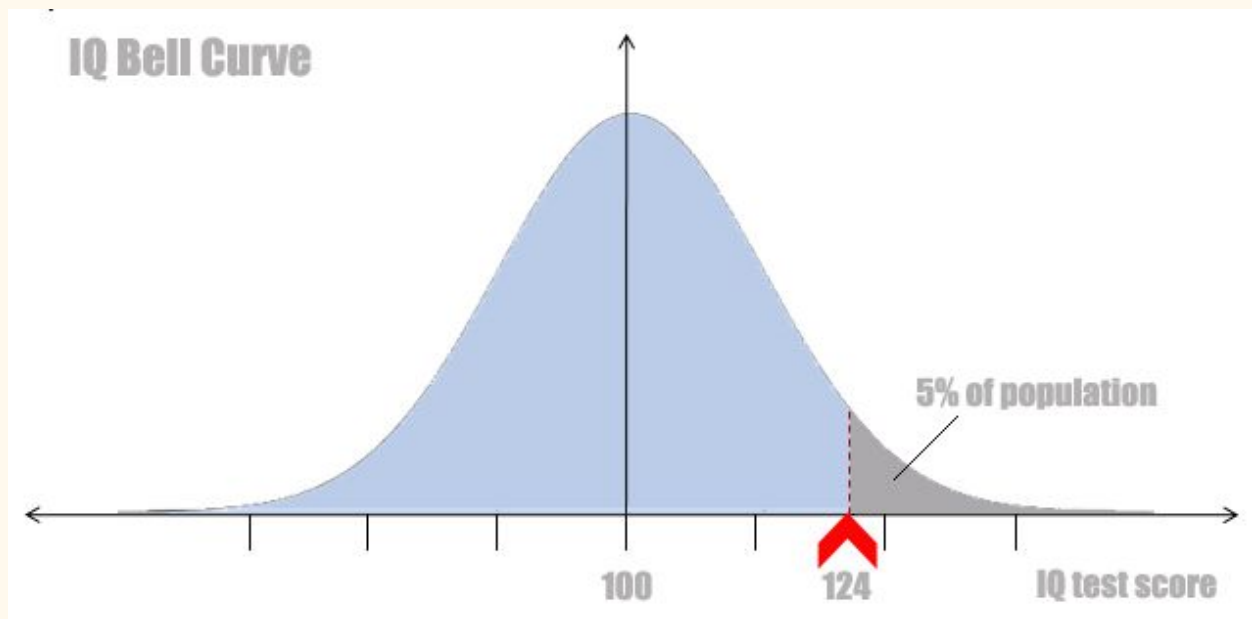


HRP Lab 2018  
CAMBRIDGE, UK

# PSYCHOMETRIC IQ AUGMENTATION 5



Mark Ashton Smith, Ph.D.

Cambridge, UK

# TABLE OF CONTENTS

<b>Central Hub of Intelligence</b>	<b>3</b>
<b>IQ &amp; Cognitive Capital</b>	<b>5</b>
<b>IQ &amp; The Attention Economy</b>	<b>6</b>
<b>IQ &amp; Self-Regulation</b>	<b>7</b>

# APPLICATIONS OF IQ

Your general intelligence (**g**) as measured by psychometric IQ tests and other aspects of cognitive performance can be improved by a number of neuroplasticity strategies, including working memory and timing brain training, learning new thinking skills and strategies ('mindware'), nootropics (phytochemicals, supplements and smart drugs), exercise, intermittent fasting, meditation, and transcranial direct current stimulation (tDCS).

Before we review some of these interventions in the next eBook I want to briefly review the 'Central Hub of Intelligence' model and some applications of this hub in our day to day lives.

## Central Hub of Intelligence

General intelligence (**g**) can be defined as:

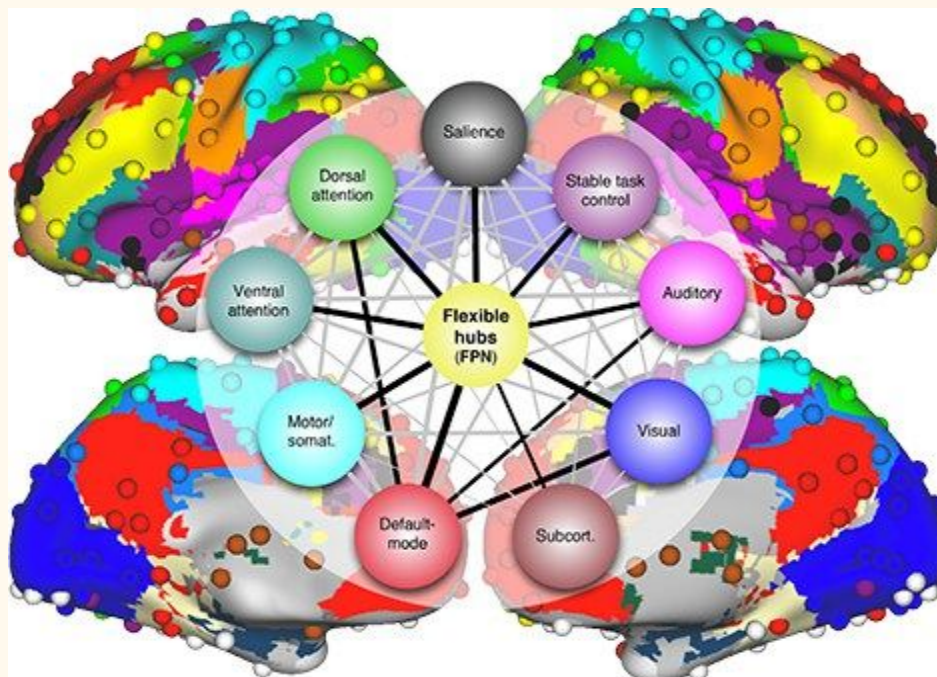
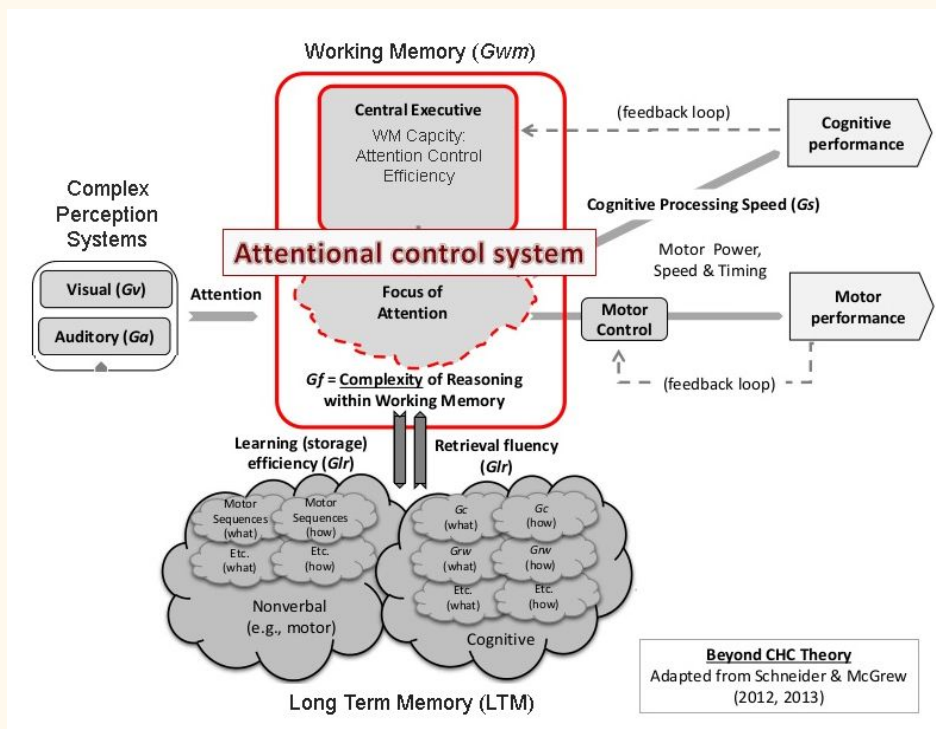
*the capacity to think, to solve novel problems, to reason and to have knowledge of the world. M. Anderson*

More specifically we can define **g** in terms of the 9 CHC broad ability factors reviewed in *Psychometric IQ Augmentation 1*: Fluid reasoning/intelligence (**Gf**), Comprehension Knowledge (**Gc**), Visuospatial processing (**Gv**), Working memory (**Gwm**), Long-term storage & Retrieval (**Glr**), Processing speed (**Gs**), Auditory processing (**Ga**), Reading & Writing (**Grw**), and Quantitative knowledge (**Gq**) ([ref](#)).

We saw in *Psychometric IQ Augmentation 2* how we can home in on an **attention control - working memory- fluid reasoning central hub** - the work of the Fronto-Parietal Network - to locate the core of general intelligence ([review](#)). We can call this the **Central Hub of Intelligence** shown in the figures below.

The Central Hub of Intelligence is also a limited capacity **bottleneck** for information processing, depending on the capacity of our Working memory (**Gwm**). There is only a limited amount of conceptual, spatial, visuospatial or numeric data we can attend to and process at any given time when we apply our intelligence.

The more we augment IQ, the greater our attention control efficiency and the more we open this bottleneck of information processing.



The Central Hub of Intelligence ([review](#))

While Fluid reasoning(**Gf**) is the *complexity of reasoning and problem solving* in our mental workspace of working memory, the Central Hub of Intelligence as a whole can be thought of as the seat of *flexible problem solving and adaptation to new task-demands - particularly in the face of interference*.

## **IQ & Cognitive Capital**

There are many personal reasons why you might want to augment your IQ.

Here I want to touch on IQ in the context of our professional lives and the economy - a context that is fitting for the Central Hub Intelligence.

Dr Amanda Potter, a psychologist at the British Psychological Society informs us:

*“We test IQ because we want to understand to what extent [people will] have learning agility and be able to take on new information, deal with ambiguity and complexity and think on their feet”*

Dr Potter is actually expressing one view of why IQ is important: being smart is **cognitive capital** in our complex, rapidly evolving, high-tech, knowledge economy – in education, training and employment.

Central Hub Intelligence is critical to adaptive, strategic and analytic thinking in which attentional focus, planning, decision-making and problem solving unfolds in the midst of change, complexity, uncertainty and distraction. Economic demands have...

*“...increased the importance of human capital. One element of human capital is cognitive ability: quickness of mind, the ability to infer and apply patterns drawn from experience, and the ability to deal with mental complexity. Another is character and social skills: self-discipline, persistence, responsibility. And a third is actual knowledge. All of these are becoming increasingly crucial for success in the post-industrial marketplace.”* **Professor Jerry Muller, 2015, Foreign Affairs**

And on the same theme from an educational perspective:

*“Today, the most prominent source of economic growth lies in cognitive capital - the most democratic of assets. Cognitive capital cannot be mined or traded but rather must be carefully cultivated by the most forward-looking of policies.”* [Dr. Michael Samson, 2016, Director, Economic Policy Research Institute \(EPRI\).](#)

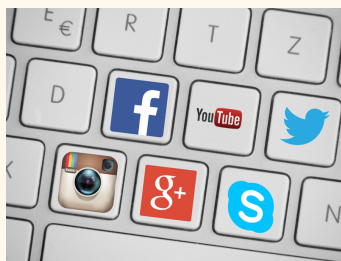
## **IQ & The Attention Economy**

*Attention as a scarce commodity.* As data and online content has grown in abundance and accessibility, attention becomes the limiting factor in the consumption of information.

Nobel Prize and Turing Award winner Herbert Simon that gets to the nub of the attention economy idea:

*"...in an information-rich world, the wealth of information means a dearth of something else: a scarcity of whatever it is that information consumes. What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention and a need to allocate that attention efficiently among the overabundance of information sources that might consume it"* **(Simon 1971).**

Simon noted that many designers of intelligent systems (AI, information systems) incorrectly represented their design problem as *information scarcity* rather than *attention scarcity*. As a result they built systems that excelled at providing more and more information, while what was actually needed were systems good at filtering out unimportant or irrelevant information [\(Simon 1996\)](#).

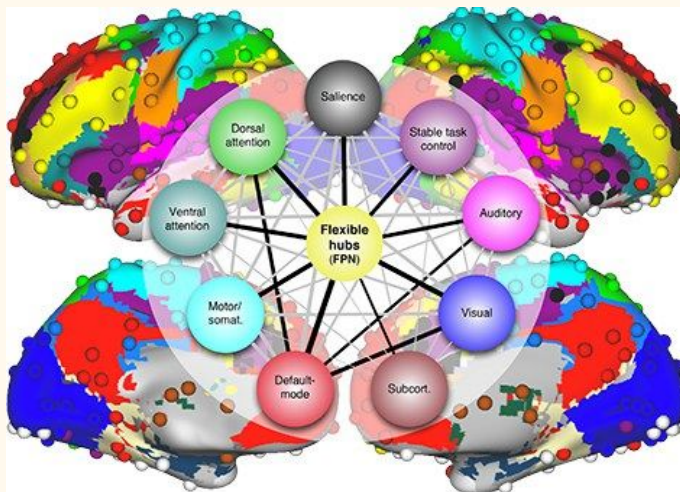


The **attention control** and **information processing bottleneck** features of the Central Hub of Intelligence are relevant here. Understanding general intelligence in terms of this model helps us see why attention filtering at the central bottleneck is critical in the Attention Economy.



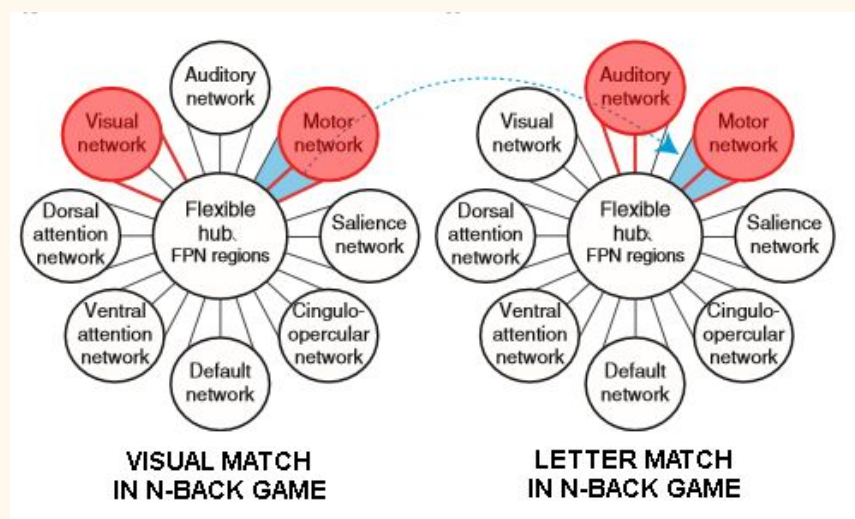
Intelligence is the seat of flexible problem solving and adaptation to new task-demands *in the face of attention-consuming interference*.

## IQ & Self-Regulation



The Central Hub of Intelligence and its underlying Fronto-Parietal Network (FPN) doesn't just act as an attention filter. It also **regulates our behavior**. The FPN is also called the **Executive Control Network**. It sends out top-down 'executive' signals for **current task goals** and exerts control by flexibly biasing information flow across a lot of other large-scale brain networks ([ref](#)).

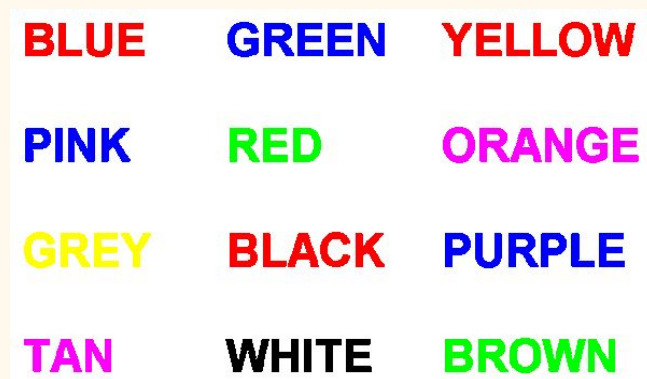
For example, if you train with the dual n-back brain training game, the better your executive control, the better your FTP switches between audio and visual brain networks (see Figure), mapping each to motor network finger presses (behavior). If your executive control is weaker, you will less flexibly switch between networks, the mappings will become inaccurate and lead to errors.



Activity of the Central Hub of Intelligence playing the Dual N-Back.

The Central Hub of Intelligence allows us to follow through with our intentions and not be on ‘automatic pilot’. It allows us to overcome habits, to resist our ‘default’ behaviors when we need to do learn to do things differently.

To demonstrate this function of the executive hub to yourself, try to quickly read the INK colors of the words below, ignoring the actual meanings (e.g. ‘red, blue, red, blue, green...’). It’s your Fronto-Parietal Network and Central Hub Intelligence that allows you to overcome your cognitive habit of processing these words for their *meaning*.

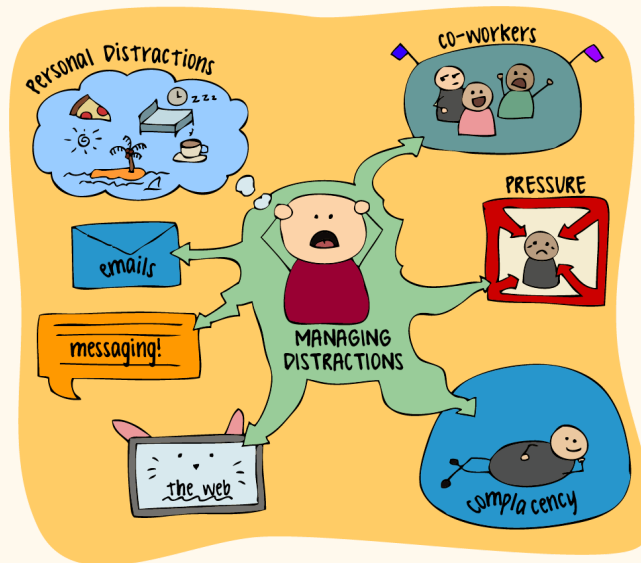


This is the well-known **Stroop Task**. Research shows a clear link between performance on this task and Fluid reasoning (*Gf*) as well as working memory capacity (*Gwm*) - all components of the Central Intelligence Hub ([review](#)).

The Central Hub of Intelligence allows us to act **rationally** when we might otherwise succumb to instant gratification. Long-term rewards are harder to motivate us than short-term rewards. It is far easier to spend \$5000 now, than spend \$10,000 in 30-50 years time. Your Future Self wants to have saved for retirement from your 20s or 30s; your Present Self wants to spend all surplus earnings on holidays. It’s tempting to regularly binge on ice cream and cakes, when increased risk of diabetes or heart failure is years away. Your Future Self wants to remain healthy; your Present Self wants sugars and fats. Our Executive Control hub allows us to act according to more strategic, long-term commitments.

And it allows us to remain disciplined in our actions in the face of distraction in our Attention Economy. You can think of what you *do* at any given time as having a tendency to be constantly pulled in different directions.





Your Central Executive hub is what prevents derailing - keeps you on track in your actions based on your goals and intentions.

The self-regulation function of Central Hub of Intelligence also extends to the **regulation of emotional reactions** that might pull at your attention and lead to unwanted behaviors. For instance, when you act 'on principle' or confront someone about an issue when you don't feel like it or fear it, your Executive Control hub is engaged. It is engaged any time you are showing grit or courage.



Odysseus and the Sirens!

Self-regulation through executive control is also needed if you are prone to distraction or rumination by threats or other negative cues. For this reason, training the Executive Control Network can be particularly helpful intervention for **anxiety** or **depression** ([review](#)).

Executive control deficits are also known to play a critical role in the development and maintenance of **drug addiction** ([review](#)), and training executive control may be an effective intervention strategy for addiction ([review](#)).

## Summary

In summary, we reviewed the cognitive neuroscience of the Central Hub of Intelligence, an Executive Control center, as well as the seat of fluid reasoning. We then looked at the concept of ‘cognitive capital’ and how this IQ hub is critical to adaptive, strategic and analytic thinking in our rapidly changing, knowledge economy. We also defined the Attention Economy, and looked at the critical filtering role of the Central Hub of Intelligence in the context of ‘attention consumption’. Finally we looked at how the Central Hub of Intelligence is the ‘executive control’ center underlying our ability to self-regulate our actions and manage emotional reactivity.