

***g*CODE**  
*g* Training  
Programs

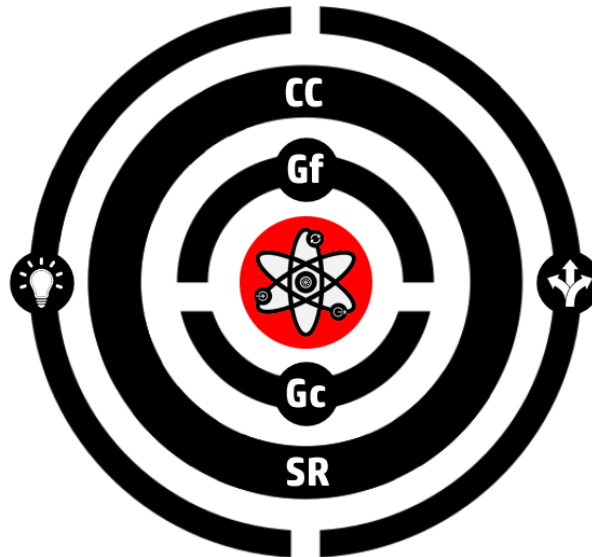
Dr Mark Ashton Smith



Cambridge Mindware Lab

# *g* Functions

Effective 'far transfer' brain training for intelligence can target any of the 5 kinds of 'real world' cognitive function shown in this model:



## i. Fluid Intelligence (Gf)

- Comprehending & understanding
- Problem solving & reasoning
- Learning efficiency
- Strategic planning & decision-making

## ii. Crystallized Intelligence & Skilfulness (Gc)

- Knowledge recall & application
- Skills
- Strategies / mindware

## iii. Cognitive Control (CC) & Self-Regulation (SR)

- Attention focus & flexibility
- Will power
- Control and regulation of emotions
- Ability to conduct sustained practice & training
- Ability to establish new habits or break old ones
- Goal pursuit, choice-making and autonomy

## iv. Creativity

- Divergent thinking
- Creative problem solving

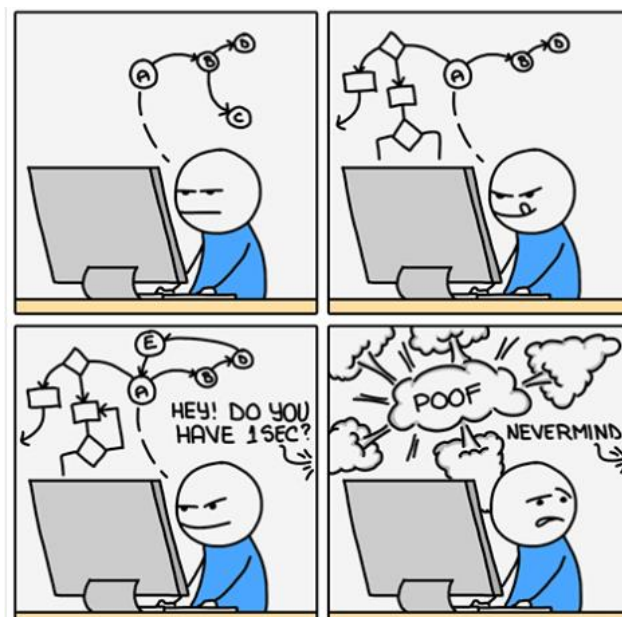
- Creative strategizing / decision-making
- Inventiveness / entrepreneurship

## v. Flexibility, Adaptiveness & Situational Awareness

- Attentional & cognitive flexibility
- Situational awareness
- Ability to disengage from goals, set switch and adapt to new environments
- Ability to adapt strategies to face new and unexpected conditions.

Supporting each of these functions is:

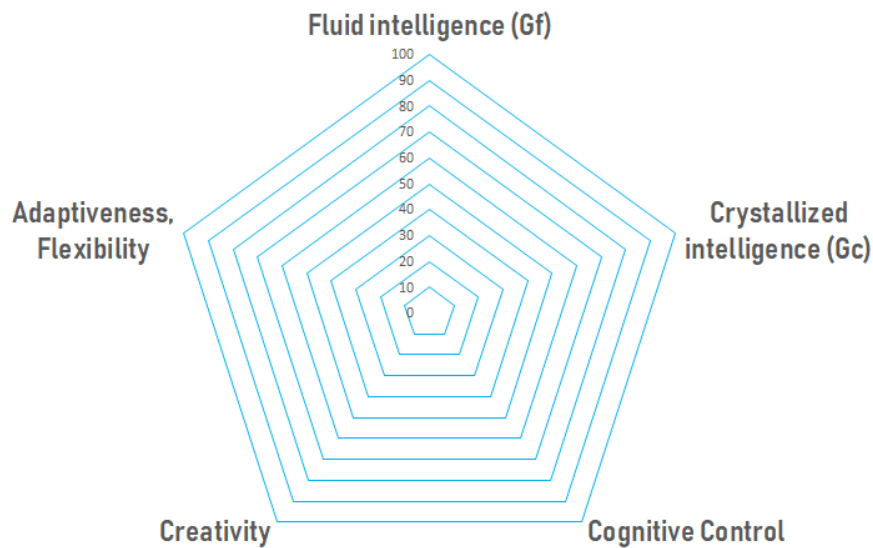
- **Working memory:** This is your ‘mental workspace’ that maintains the information you need for the current context and cognitive task – whether you are comprehending, reasoning, problem solving, learning or planning – while not losing track from distractions. Working memory is required to mentally relate, integrate, and recombine information. Following a conversation in a foreign language puts high demands on working memory, as does difficult mental arithmetic or planning the optimal route through a city during rush hour traffic. **WM capacity** (or span) is the ‘bandwidth’ of this workspace – like how much RAM a computer has.



- **Strategic Cognition:** This is your ability to manage your own ‘cognitive resources flexibly and adaptively to multi-task efficiently, to strategically change responses based on priorities, and make use of speed-accuracy and cost-benefit trade-offs. It depends in part on your own self-awareness of your own cognition – called meta-cognition.
- **Cognitive Resilience:** This is your ability to maintain optimal working memory, attention focus and intelligent cognition in the face of fatigue, stress or other emotional pressures.

## Action Step

The first thing you need to do is review the cognitive functions above, and decide which of them you may want to target with your brain training.



*Rate yourself from 0-100 on each cognitive function above*

In addition, rate each of the supporting cognitive capabilities here from 1-10:

### Working memory



### Strategic Cognition / Metacognition



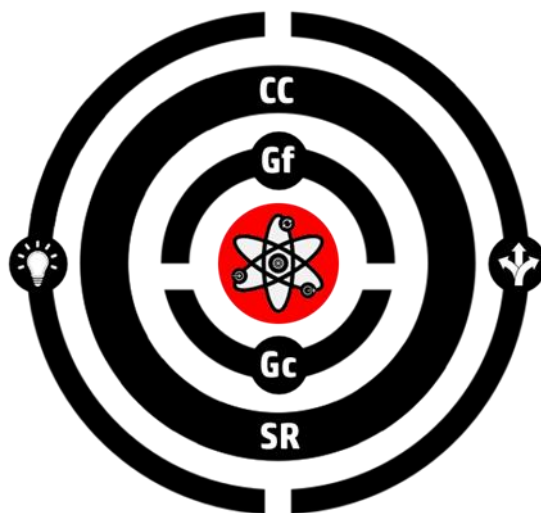
### Cognitive Resilience



# COGNITIVE TRAINING CHALLENGE

Working Memory: Foundation Training

The DNB Foundation Challenge



## Theory

The dual n-back (DNB) is the most well-known evidence-based brain training game out there. The dual n-back 'craze' finds its origins in a seminal article published by Dr Susanne Jaeggi (Assoc. Professor at the Center for the Neurobiology of Learning and Memory, University of Bern) and her colleagues back in 2008:

### Improving fluid intelligence with training on working memory



Susanne M. Jaeggi, Martin Buschkuhl, John Jonides, and Walter J. Perrig

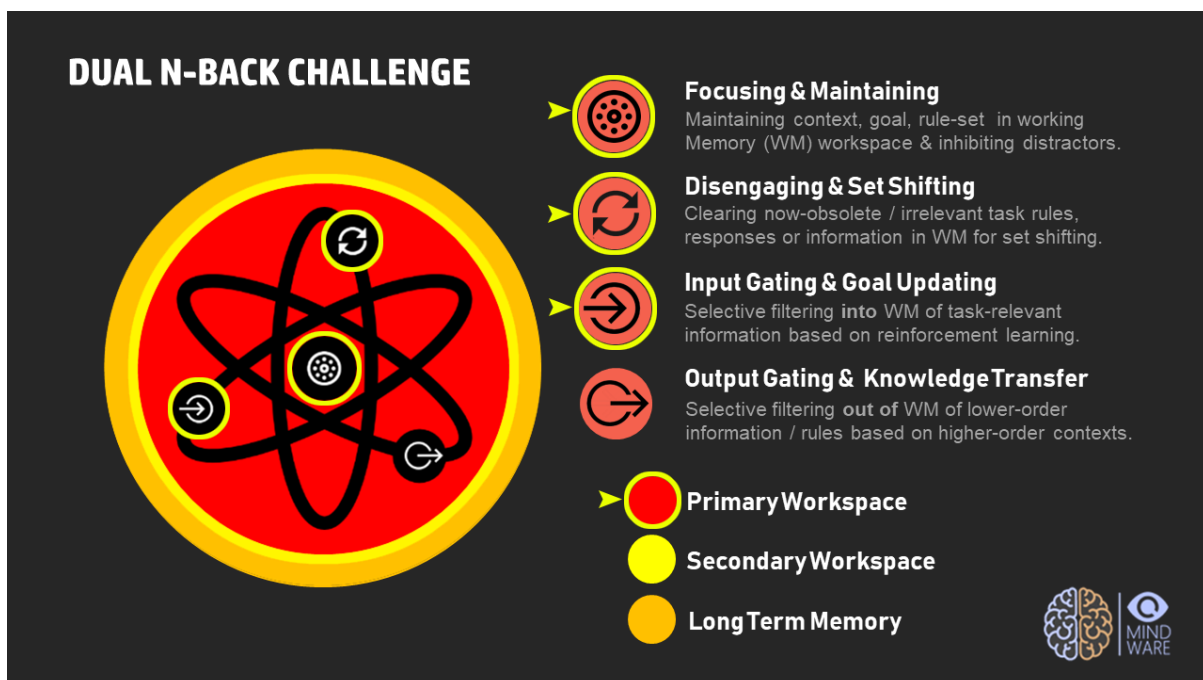
PNAS May 13, 2008 105 (19) 6829-6833; <https://doi.org/10.1073/pnas.0801268105>

Edited by Edward E. Smith, Columbia University, New York, NY, and approved March 18, 2008 (received for review February 7, 2008)

[Click for the full article](#)

There are many versions of the DNB available online, and various related discussion groups. Dual n-back training is an all-round type of training that can benefit working memory, cognitive resilience, attention control, self-regulation, and fluid intelligence.

In terms of the **gCODE** (see *gCODE Theory* eBook), dual n-back training can target the executive functions highlighted.



DNB training improves the networks underlying the:

(1) **Maintenance** of an incoming stream of information in working memory & **inhibition** of distractions in the **primary workspace**.

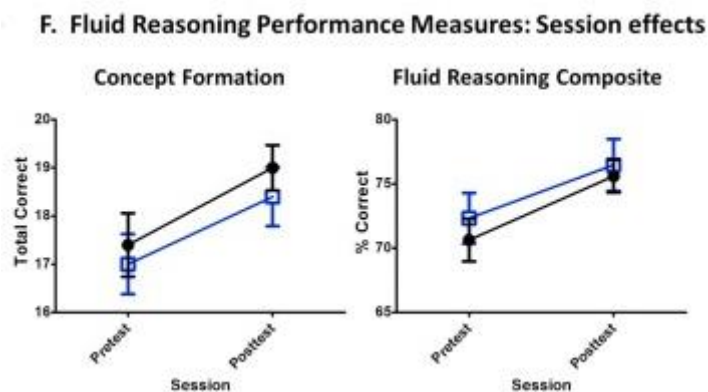
(2) **Input gating** of different streams of information into working memory.

(3) **Disengaging** & **shifting** from one kind of task (e.g. 2-back) to another (e.g. 3-back) - this function is augmented in IQ Mindware's DNB relative to other versions through what is called *interference control* training.

## Development of Classic (Jaeggi) DNB training

### Interference Control

There are numerous studies showing that combining **interference control** with dual n-back training is more effective than dual n-back training alone (3, 4). These results support the brain imaging studies showing that interference control is an important link between **fluid intelligence** and **working memory** - our mental bandwidth (5). Here are 2019 results from training interference control on two measures of fluid intelligence - concept formation and fluid reasoning (6):



IQ Mindware apps incorporate more interference and the need for interference control by default. i3 Mindware and HighIQPro have additional interference control settings to ramp up this parameter.

## Cross-Modal Training



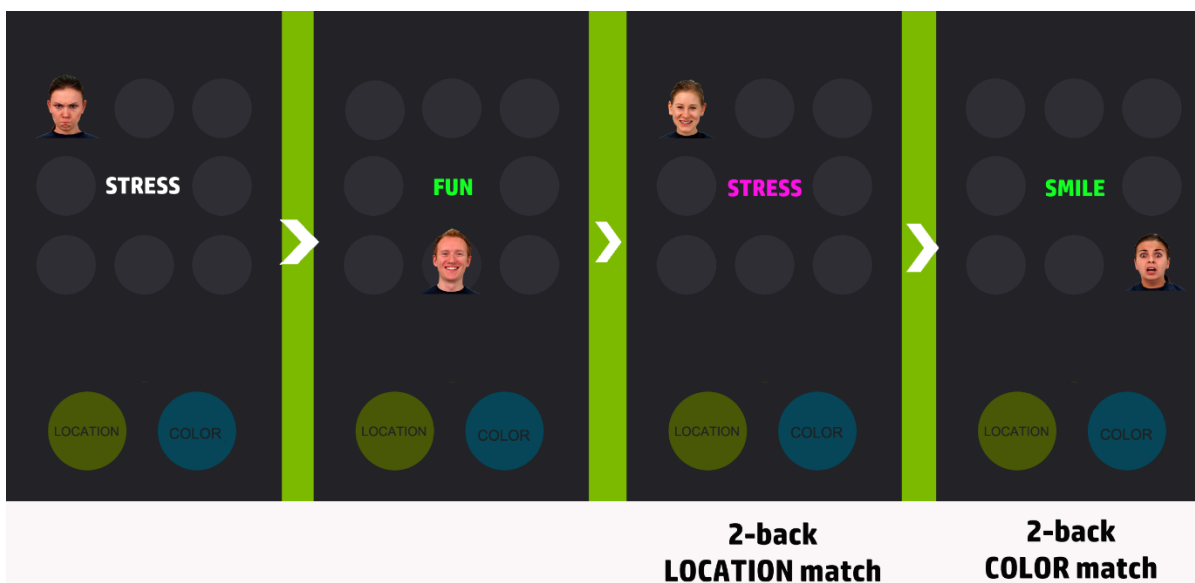
Classic dual n-back trains only one DNB game at a given presentation rate. Cross-modal training trains **multiple DNB games** that triangulate on the underlying executive functions, thereby enhancing **far-transfer** brain training gains.

3 DNB games in IQ Mindware apps (including the classic DNB) are shown in the figure here, each triangulating on the underlying *g*CODE executive functions.

Alternating **speeds** can also potentially improve attention flexibility.

## Cognitive Resilience Training: The Emotional Dual N-Back

Classic DNB training contains no emotional content – all the information that needs to be processed is neutral. IQ Mindware apps incorporate emotional content that signals ‘potential threats’ which need to be overridden to perform the task. This helps develop cognitive resilience and attention control.





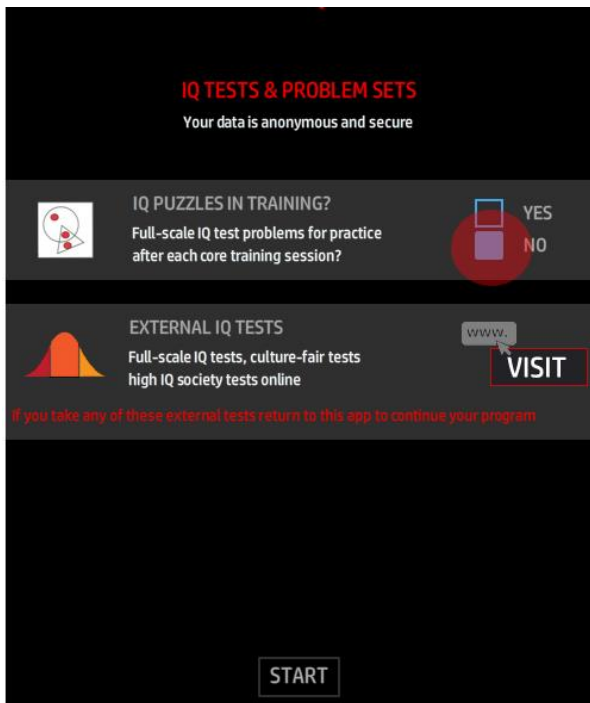
# Instructions

## Tracking Your Progress

Before and after your DNB Foundation Challenge you can take a number of valid cognitive tests (attention, working memory, cognitive resilience, etc) using your HRP Track app, including IQ tests.

You can also access the IQ tests from within the brain training app itself (see below). The link opens a web page in your browser where you can click on either the Danish Mensa or Mensa Norway test. You can take one of these before training and one after training.

For the DNB Foundation Challenge, you should deselect 'IQ Puzzles Training'.



### Danish Mensa IQ test

This non-verbal IQ test is based on the well-known Raven's Progressive Matrices and measures your fluid intelligence directly. It also provides a good measure of your general intelligence. The IQ test is **culture fair** - eliminating the effect of cultural factors such as vocabulary, mathematics and general knowledge. The calculation of IQ is based on answers from more than 250,000 people. The test is based on seeing relationships in abstract geometrical shapes. It is an excellent measure of fluid intelligence.

- **Time required:** 40 minutes time limit
- **Components of intelligence measured:** fluid intelligence
- **Culture fair IQ test?** Yes
- **Repeat testing?** No
- **Fee:** No charge

[Click to take the IQ test](#)

**Note:** The timer starts when you click the button, so be prepared!

### Mensa Norway IQ Test

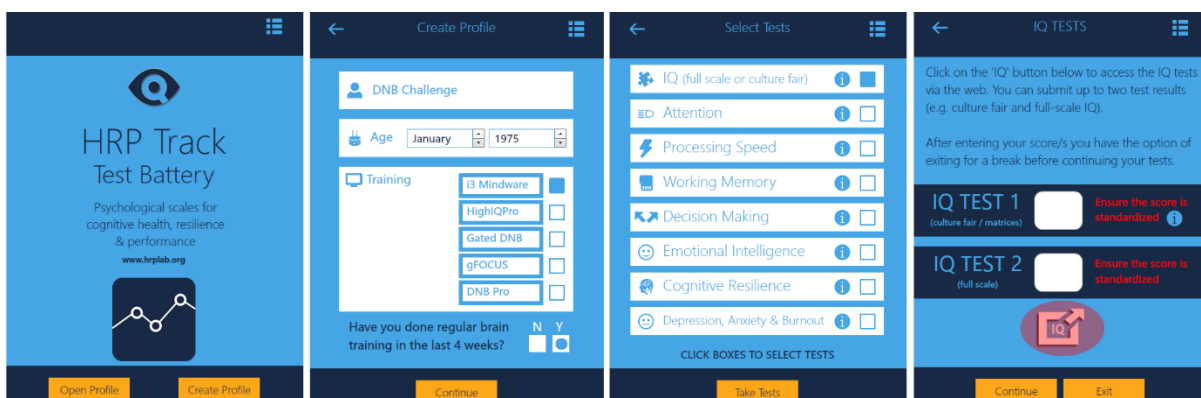
This non-verbal IQ test assesses your fluid intelligence and general intelligence through **culture fair** nonverbal questions. In this test you must click the alternative that is most logical. Have a look at the example before beginning.

If you don't know the answer, please note that you don't lose points for wrong answers. Therefore, it can be a good idea to guess.

Don't start the test before you are ready and have 25 minutes available.

- **Time required:** 25 minutes.
- **Components of intelligence measured:** fluid intelligence
- **Culture fair IQ test?** Yes
- **Repeat testing?** No
- **Fee:** No charge
- **Special information:** To get your test and IQ scores you need to click on the link at the bottom of the test.

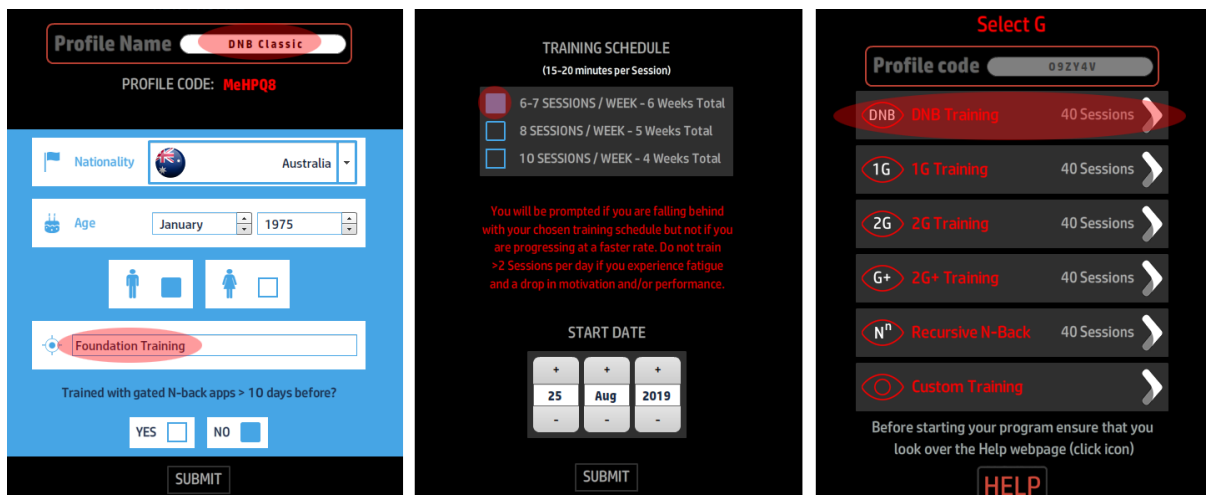
[Click to take the IQ test](#)



For the DNB Foundation Challenge, you will train with 3 different n-back games. You can set up unlimited Profiles in your brain training app, and you will need to set up 3 separate Profiles for each of these games, as shown below.

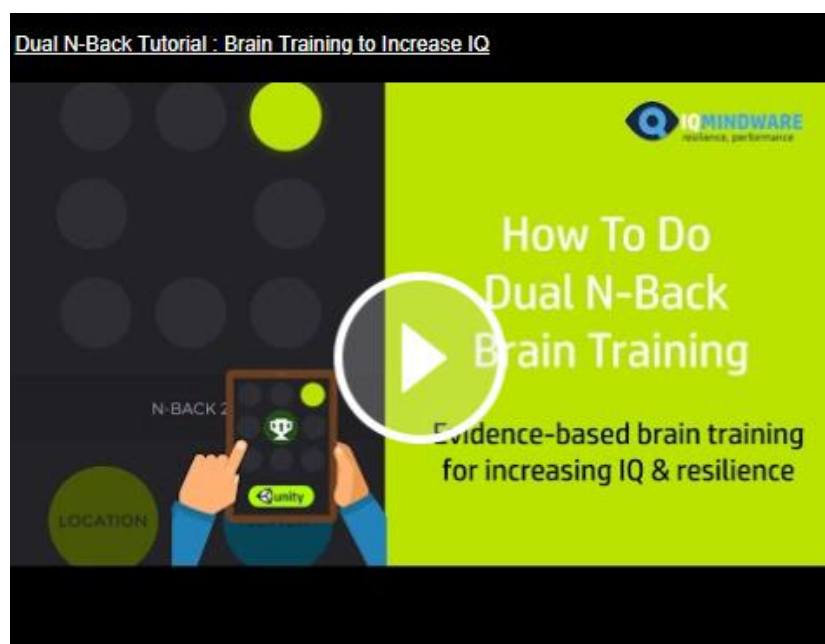
## Classic DNB Game

For the DNB Foundation Challenge, you first need to set up a Profile with the name 'DNB Classic'. For your Training Schedule, select 6-7 Sessions/week. Remember to deselect the IQ Puzzles or Tutorials. When you get to the 'Select G' screen, choose 'DNB Training'.



The normal recommendation is to train one Session per day, for six days a week. You can train more than 1 Session per day if you choose to, but there needs to be at least a 6-hour interval between training Sessions for skill consolidation to occur. If you train within an hour of going to sleep, you may find that training gains are accelerated.

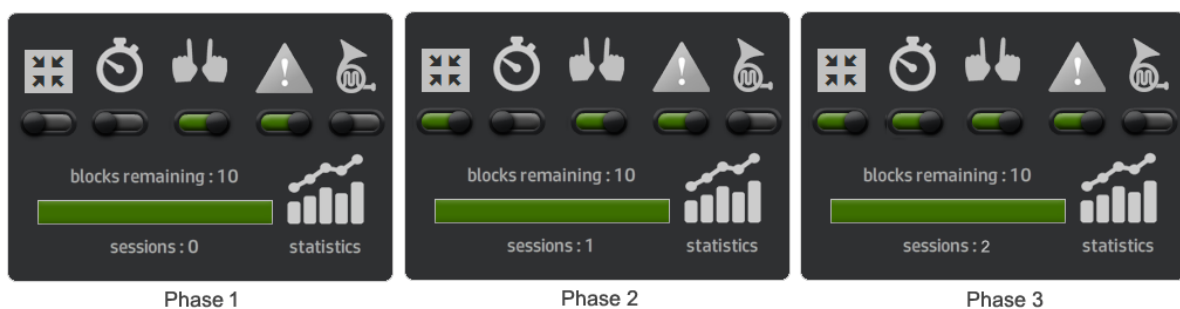
The classic dual n-back game is explained in my tutorial video at [this link here](#).



There are 10 game Blocks for you to get through for each day's Session. Each Session should last no more than 15 minutes. Your Statistics graph showing your n-back performance over time can be accessed once you have completed your first Session. The N-Back game starts at an n-back level of 2. If this is too difficult at first, after your first Block of the Session the N-back level will drop to a 1-back level.

**Phase 1:** Prior to starting your dual n-back training in Session 1, switch on the Error Feedback (triangle icon) and the Response Switching (two hands) options.

With Response Switching ON, you need to take note before each Block which key is for location matches and which key is for audio matches. Alternating your response keys makes the dual n-back more difficult initially, but significantly improves training gains.



At the end of your first Session have a look at your n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 2. If not, do another Session of Phase 1 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 1 settings.

**Phase 2:** Between each training Block of a Session switch Interference (arrows pointing in icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the target interference which improves the discrimination ability of your working memory.

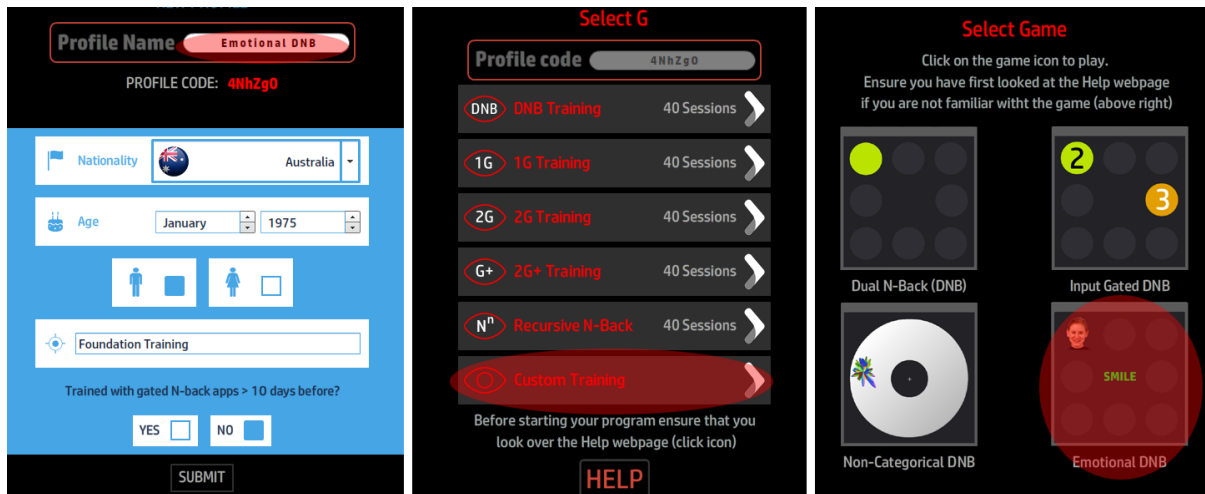
At the end of the Session have a look at your n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 3. If not, do another Session of Phase 2 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 2 settings.

**Phase 3 (Optional):** Between each training Block of a Session switch Speed (clock icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the cognitive load by increasing the speed of the task. This Phase is optional. If you opt for this Phase, ensure you get an n-back Session average of 2 before moving on to the next game.

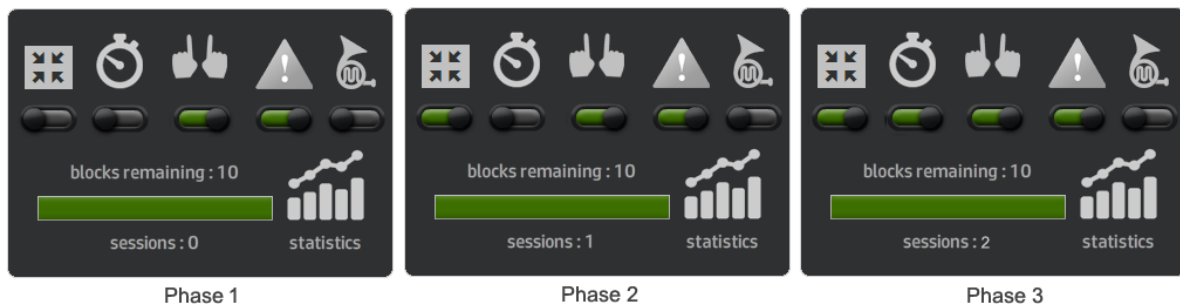
## Emotional DNB Game

You now need to set up a new Profile with the name 'Emotional DNB'. For your Training Schedule, select 6-7 Sessions/week as you did before. Remember to deselect

the IQ Puzzles or Tutorials. When you get to the ‘Select G’ screen, choose ‘Custom’, and then select the Emotional DNB game (as shown below):



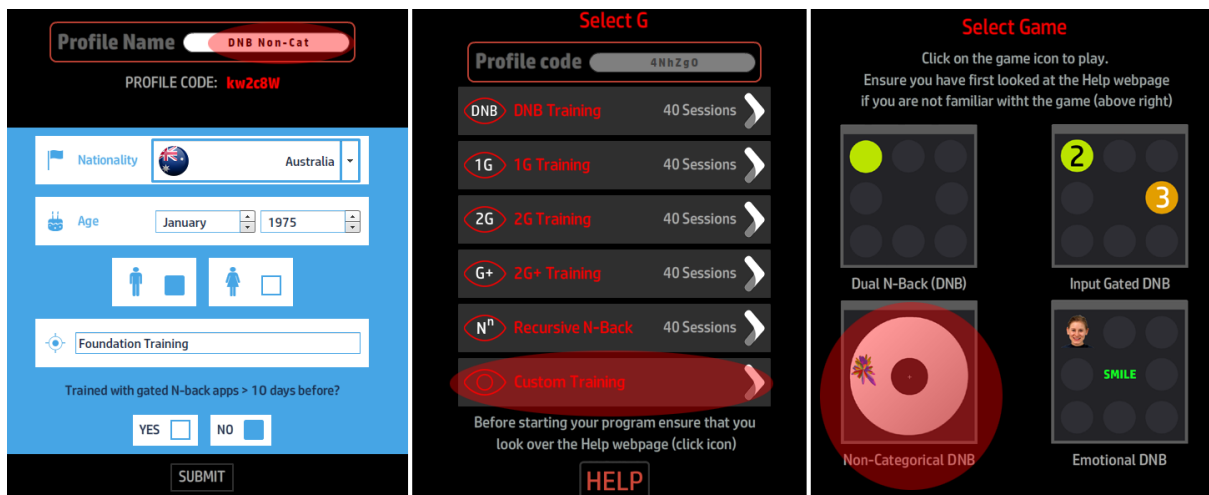
As in the classic DNB, there are 3 Phases in your training – and the Option settings you use are exactly the same as with the classic DNB game you have been playing.



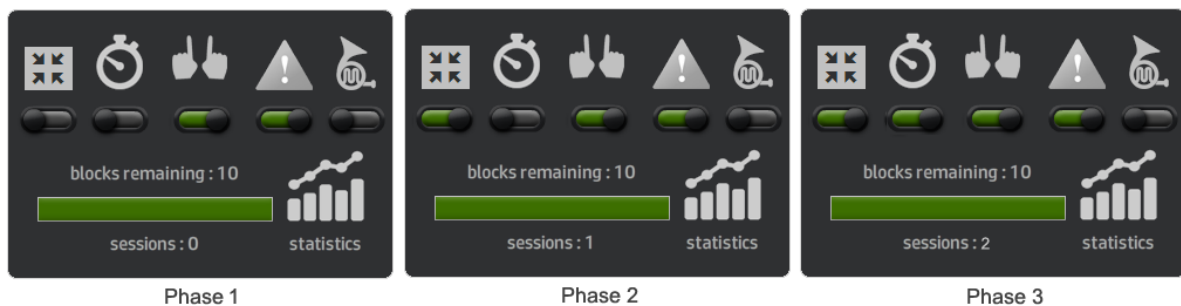
Phase 3 is **optional** as in the previous games. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to the next game.

## Non-Categorical DNB Game

You now need to set up a Profile with a name such as ‘DNB Non-Cat’. For your Training Schedule, select 6-7 Sessions/week as you did before. Remember to deselect the IQ Puzzles or Tutorials. When you get to the ‘Select G’ screen, choose ‘Custom’, and then select the Non-Categorical DNB game (as shown below):



As in the other two DNB games, there are 3 Phases in your training.



Phase 3 is **optional** as in the previous games. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to Cross-Modal Training.

## Cross-Modal DNB Training



For the remainder of your **6 weeks** of total training, you will alternate between the Classic DNB, Emotional DNB and Non-Categorical DNB each Session - either Phase 2 or Phase 3 for each. This means that between blocks you will alternate with Interference / Speed switched ON/OFF.

This should help you triangulate on the underlying **executive functions** of the *gCODE*: the underlying *gCODE* executive functions are the same, but each game has different sensory properties which are more peripheral to the *gCODE* itself.

This results in more powerful **far-transfer** effects to working memory, IQ and cognitive control.

## Target Goals of the DNB Foundation Challenge

For objective measures of improvement and success in this part of the challenge, you will look at your **average n-back performance** chart after each Session. Your target is to reach a **3-back level on each game**. You can also compare your scores with others on the Leaderboard for each game.

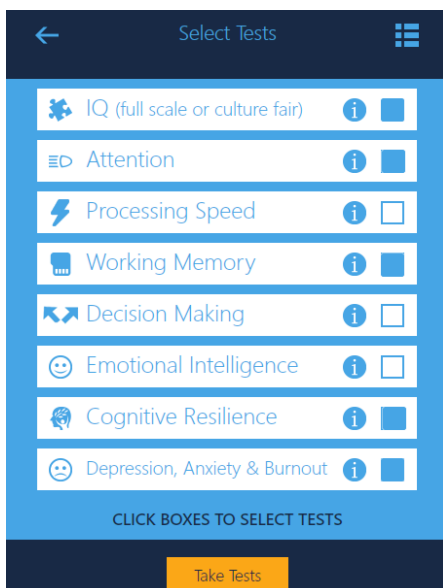
If you achieve this training goal for each game, we can be confident that your training has resulted in **long-term neuroplasticity changes in core executive functions**, augmenting your working memory, attention control and general intelligence (*g*).

Note that since you are training between different games, you will not complete all Sessions of any given game. What is critical however, is that you complete **40 Sessions in total over 6 weeks or less**. If you train more than once a day, ensure there is a 6 hour interval between Sessions.



## Cognitive Performance Gains

When you purchase the i3 Mindware or HighIQPro app, these come bundled with a psychometric testing app that gives you option valid tests for your IQ. There are two types of IQ test you can take: fluid intelligence matrices tests, and working memory tests (both assess full-scale IQ).



If you complete these 6 weeks of training and attain at the minimum a 2-back average for each of the 3 games, we offer a money-back guarantee of a 10-20 point increase on both measures of IQ (or either one you choose to take). Simply take screenshots of your fluid intelligence test scores (for the external tests linked to in the app).

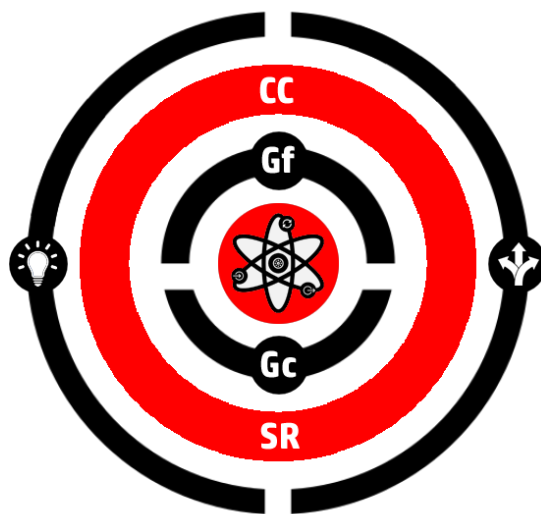
You can also expect similar increases in the other cognitive functions indicated here if you complete the DNB Foundation Challenge.



# COGNITIVE TRAINING CHALLENGE

Attention & Self-Regulation Training

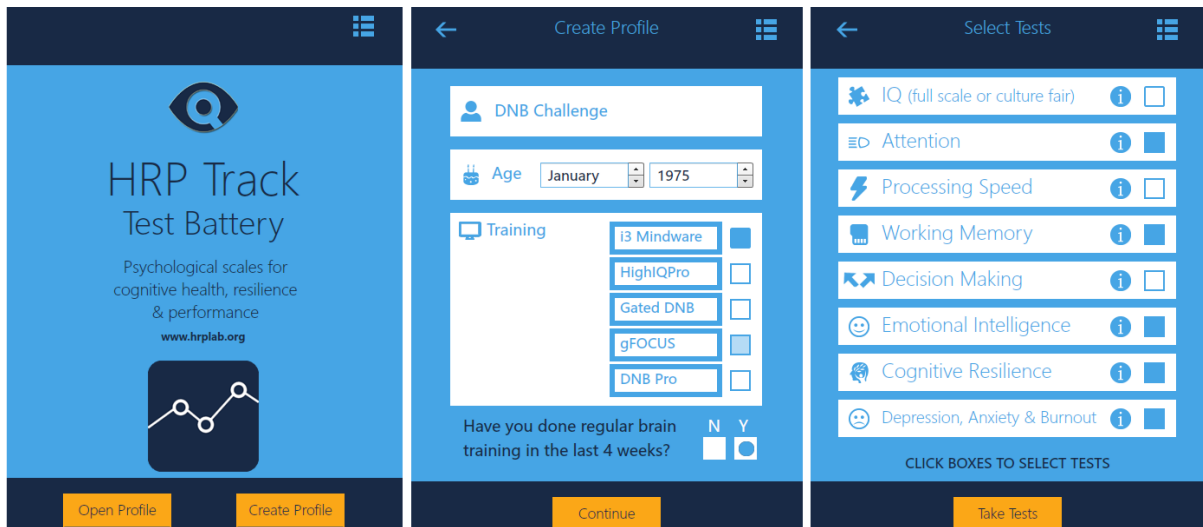
The Cognitive Control Challenge



# Instructions

## Tracking Your Progress

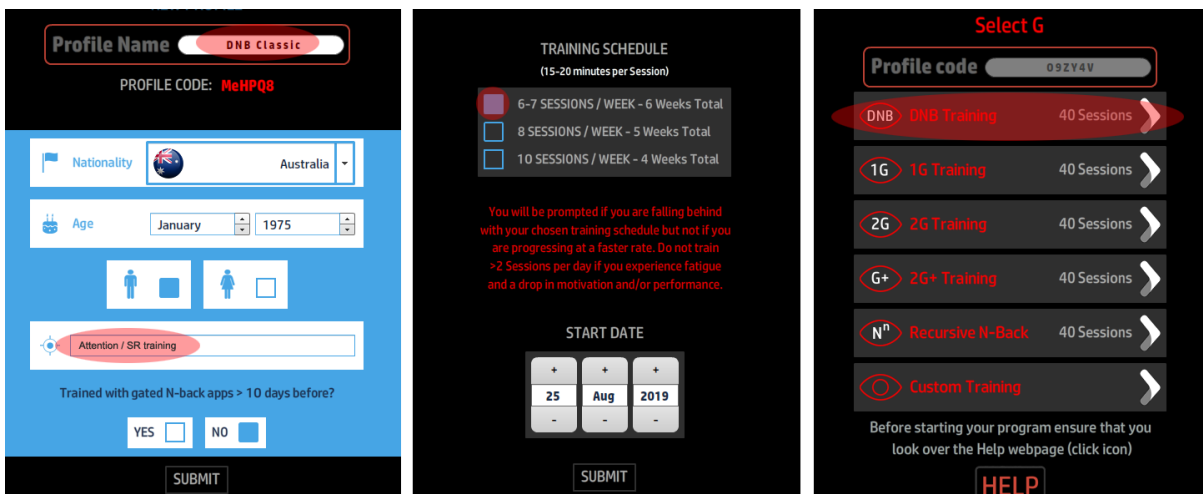
Before and after your Cognitive Control Challenge you can take any of a number of valid cognitive tests relating to attention control and self-regulation - including attention, working memory, cognitive resilience, EQ, and mental health.



For the Cognitive Control Challenge, you will train with 3 n-back games. You can set up unlimited Profiles in your brain training app, and you will need to set up 2 separate Profiles for each of these games.

## Classic DNB Game

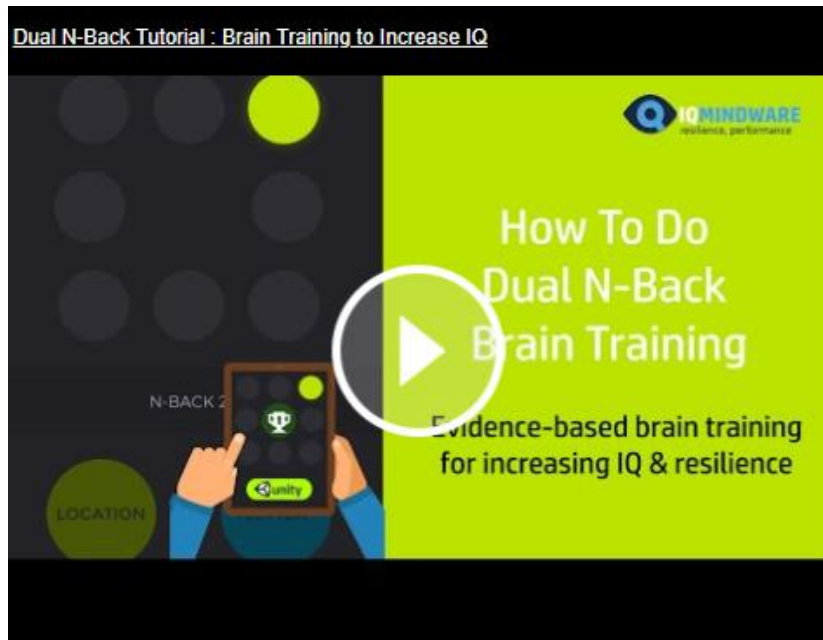
For the Cognitive Control Challenge, you first need to set up a Profile with the name 'DNB Classic'. For your Training Schedule, select 6-7 Sessions/week. Remember to deselect the IQ Puzzles or Tutorials when you see those options. When you get to the 'Select G' screen, choose 'DNB Training'.





The normal recommendation is to train one Session per day, for six days a week. You can train more than 1 Session per day if you choose to, but there needs to be at least a 6-hour interval between training Sessions for skill consolidation to occur. If you train within an hour of going to sleep, you may find that training gains are accelerated.

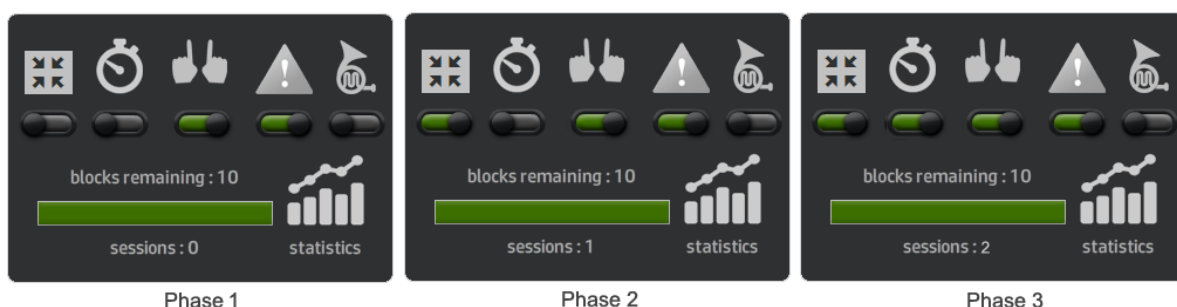
The classic dual n-back game is explained in my tutorial video at [this link here](#).



There are 10 game Blocks for you to get through for each day's Session. Each Session should last no more than 15 minutes. Your Statistics graph showing your n-back performance over time can be accessed once you have completed your first Session. The N-Back game starts at an n-back level of 2. If this is too difficult at first, after your first Block of the Session the N-back level will drop to a 1-back level.

**Phase 1:** Prior to starting your dual n-back training in Session 1, switch on the Error Feedback (triangle icon) and the Response Switching (two hands) options.

With Response Switching ON, you need to take note before each Block which key is for location matches and which key is for audio matches. Alternating your response keys makes the dual n-back more difficult initially, but significantly improves training gains.



At the end of your first Session have a look at your n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 2. If not, do another Session of Phase 1 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 1 settings.

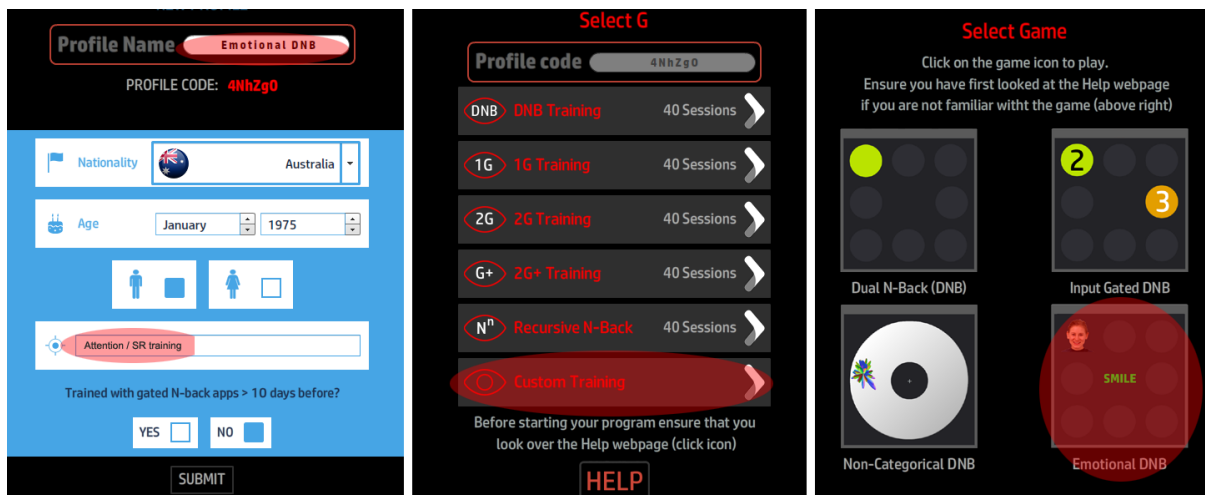
**Phase 2:** Between each training Block of a Session switch Interference (arrows pointing in icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the target interference which improves the discrimination ability of your working memory.

At the end of the Session have a look at your n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 3. If not, do another Session of Phase 2 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 2 settings.

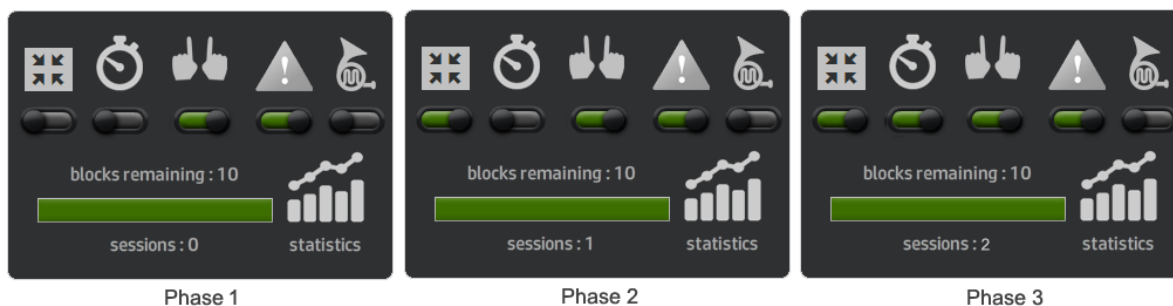
**Phase 3 (Optional):** Between each training Block of a Session switch Speed (clock icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the cognitive load by increasing the speed of the task. This Phase is optional. If you opt for this Phase, ensure you get an n-back Session average of 2 before moving on to the next game.

## Emotional DNB Game

You now need to set up a new Profile with the name 'Emotional DNB'. For your Training Schedule, select 6-7 Sessions/week as you did before. Remember to deselect the IQ Puzzles or Tutorials. When you get to the 'Select G' screen, choose 'Custom', and then select the Emotional DNB game (as shown below):



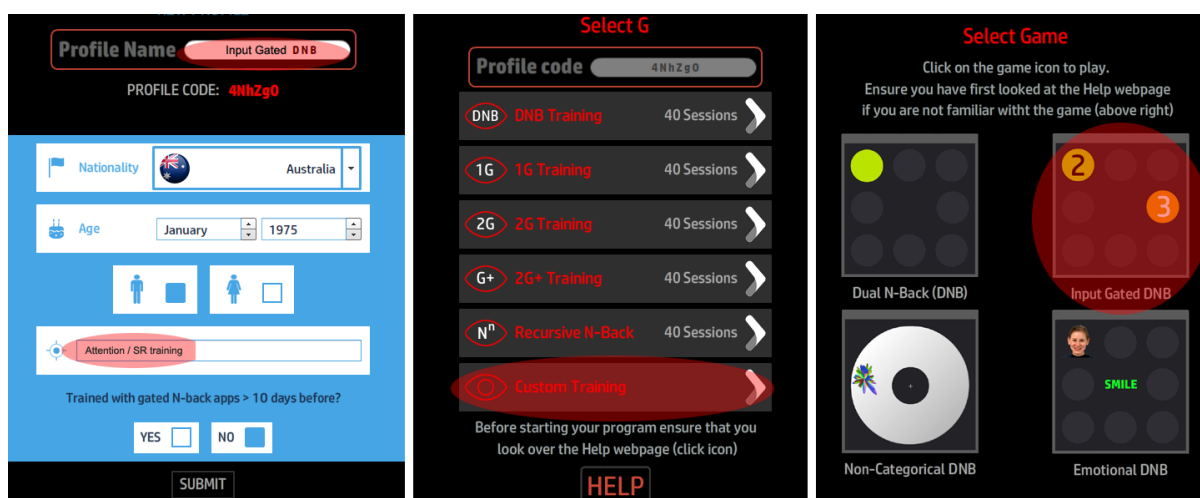
As in the classic DNB, there are 3 Phases in your training – and the Option settings you use are exactly the same as with the classic DNB game you have been playing.



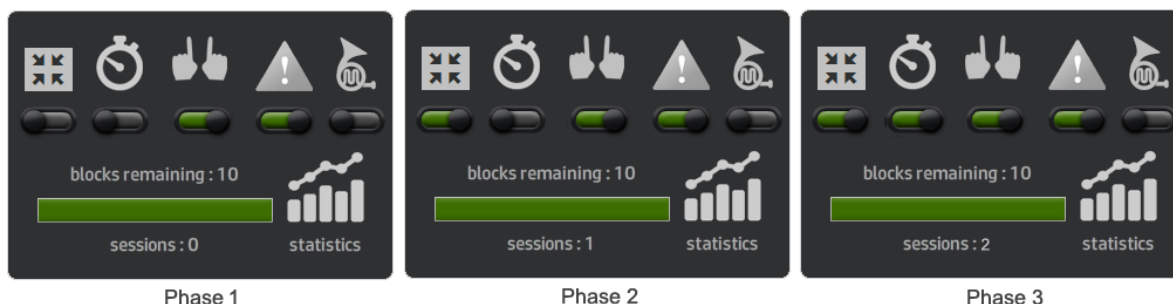
Phase 3 is **optional** as in the previous game. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to the next game.

## Input Gated DNB Game

You now need to set up a Profile with the name 'Input Gated DNB'. For your Training Schedule, select 6-7 Sessions/week as you did before. Remember to deselect the IQ Puzzles or Tutorials. When you get to the 'Select G' screen, choose 'Custom', and then select the Input Gated DNB game (as shown below):



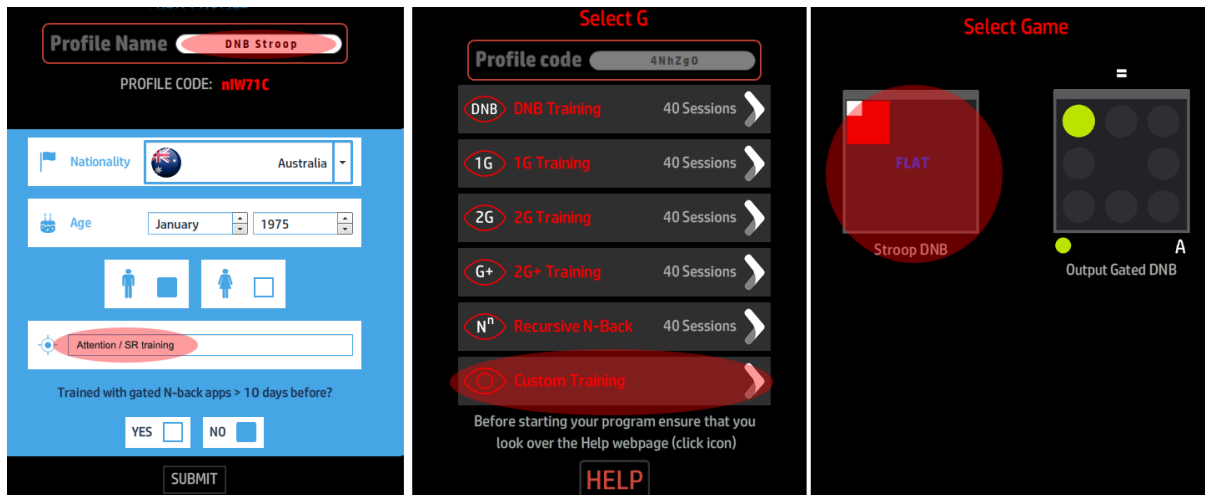
As in the previous games, there are 3 Phases in your training and the Option settings you use are exactly the same as in those games.



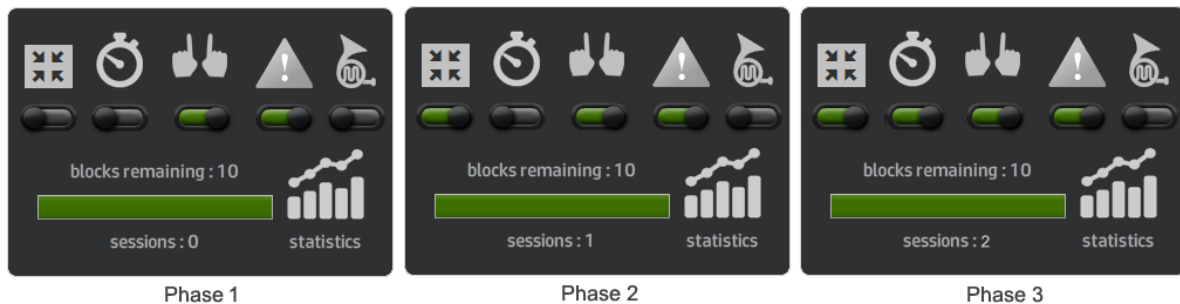
Phase 3 is **optional** as in the previous game. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to the next game.

## Stroop DNB Game

You now need to set up a Profile with the name 'DNB Stroop'. For your Training Schedule, select 6-7 Sessions/week as you did before. Remember to deselect the IQ Puzzles or Tutorials. When you get to the 'Select G' screen, choose 'Custom', and then select the Non-Categorical DNB game (as shown below):



As in the other two DNB games, there are 3 Phases in your training.



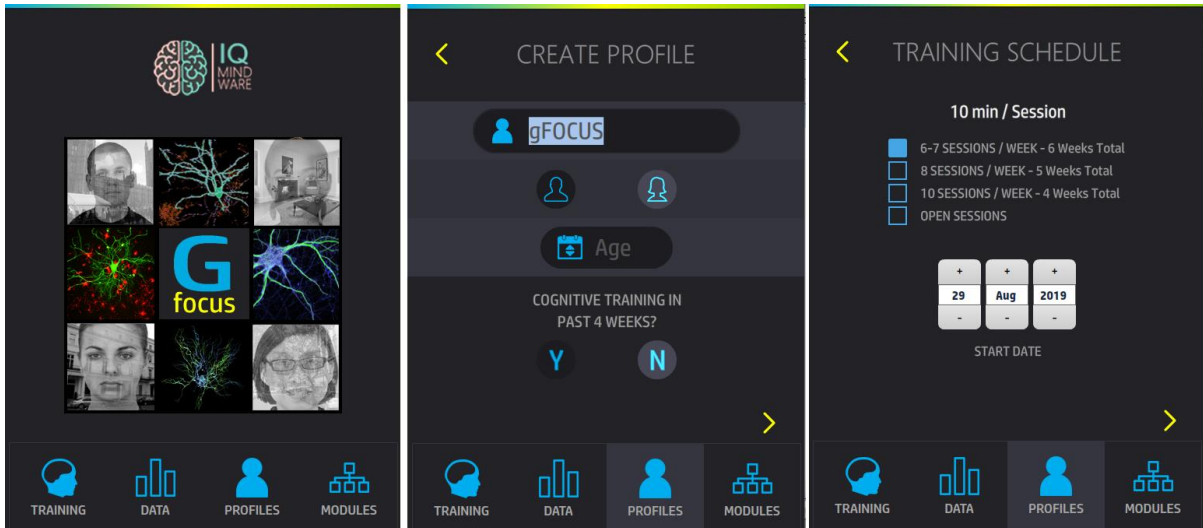
Phase 3 is **optional** as in the previous games. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to gFOCUS training.

## gFOCUS game

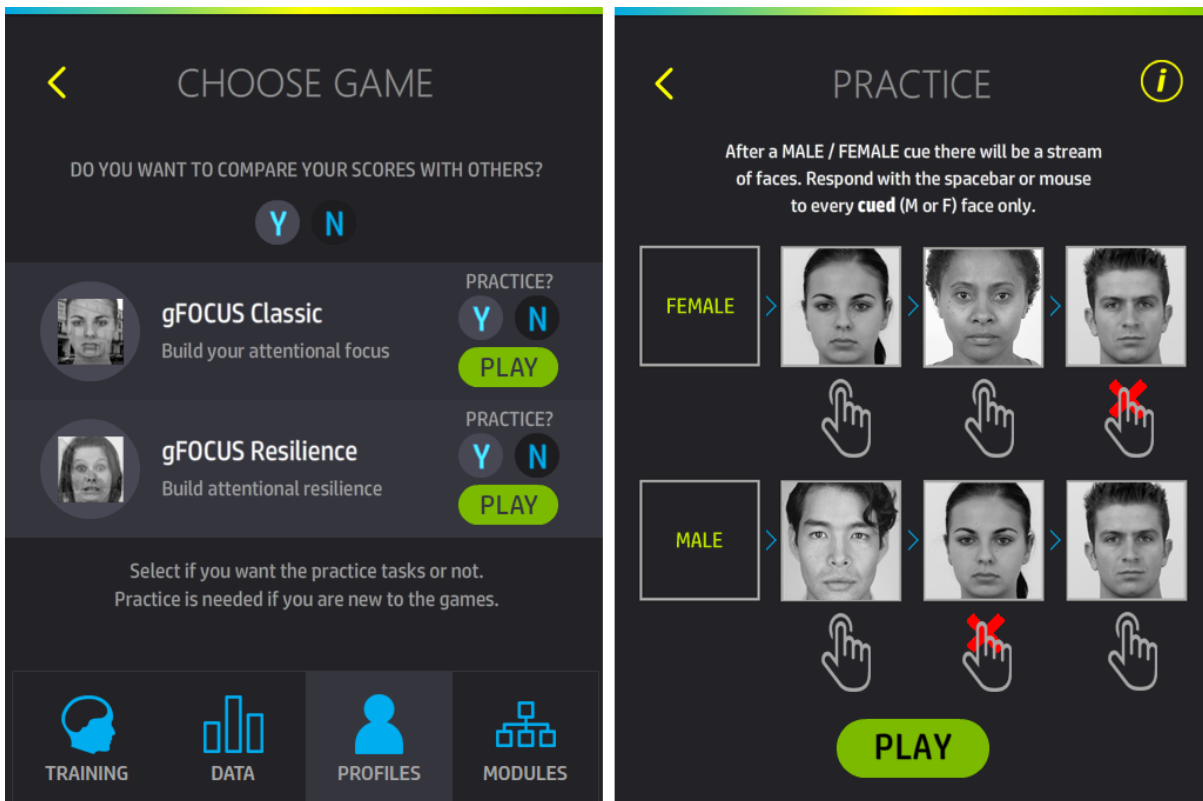
For the Cognitive Control Challenge, we strongly recommend that you also train with the gFOCUS app which is designed to train sustained attention focus, attention shifting and goal updating in terms of the gCODE executive functions.

You can purchase gFOCUS for just \$15 as an existing IQ Mindware customer by e-mailing [admin@iqmindware.com](mailto:admin@iqmindware.com) (ask for the existing customer discount).

As with the i3 Mindware and HighIQPro apps, you can set up multiple Profiles in gFOCUS. Here are screenshots of the Profile setup screens.



For the Cognitive Control Challenge select the gFOCUS Classic game shown below – with practice. If you wanted to vary your training when using gFOCUS at a later stage, you could also train with gFOCUS Resilience which is excellent training for cognitive resilience, as well as anxiety.

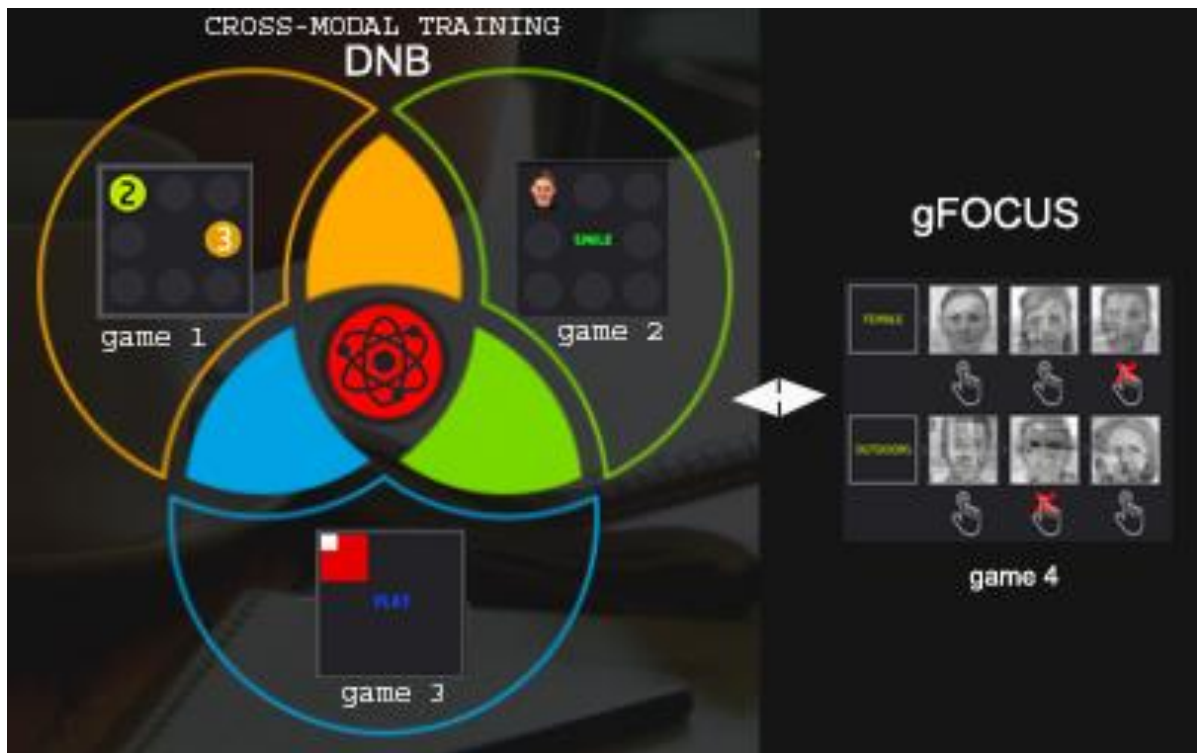


Do one session of gFOCUS training before continuing with cross-modal training for the remainder of the Cognitive Control Challenge.

## Cross-Modal Training

For the remainder of your **6 weeks** of total training, you will alternate between the Input Gated DNB, Emotional DNB, Stroop DNB and gFOCUS each Session - either

Phase 2 or Phase 3 for each. This means that between blocks you will alternate with Interference / Speed switched ON/OFF.



This should help you triangulate on the underlying **executive functions** of the *gCODE* for cognitive control and self-regulation: the underlying *gCODE* executive functions are the same, but each game has different sensory properties which are more peripheral to the *gCODE* itself. This results in more powerful **far-transfer** effects.

### Target Goals of the Cognitive Control Challenge

For objective measures of improvement and success in this part of the challenge, you will look at your **average n-back performance** chart after each Session. Your target is to reach a **3-back level on each game**. You can also compare your scores with others on the Leaderboard for each game.

If you achieve this training goal for each game, we can be confident that your training has resulted in **long-term neuroplasticity changes in core executive functions**.

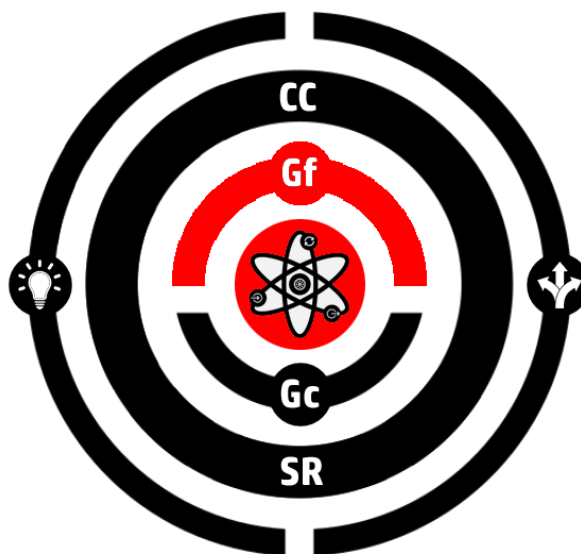
Note that since you are training between different games, you will not complete all Sessions of any given game. What is critical however, is that you complete **40 Sessions in total over 6 weeks or less**. If you train more than once a day, ensure there is a 6 hour interval between Sessions.



# COGNITIVE TRAINING CHALLENGE

Fluid Intelligence (Gf): IQ Training

The Gf Challenge

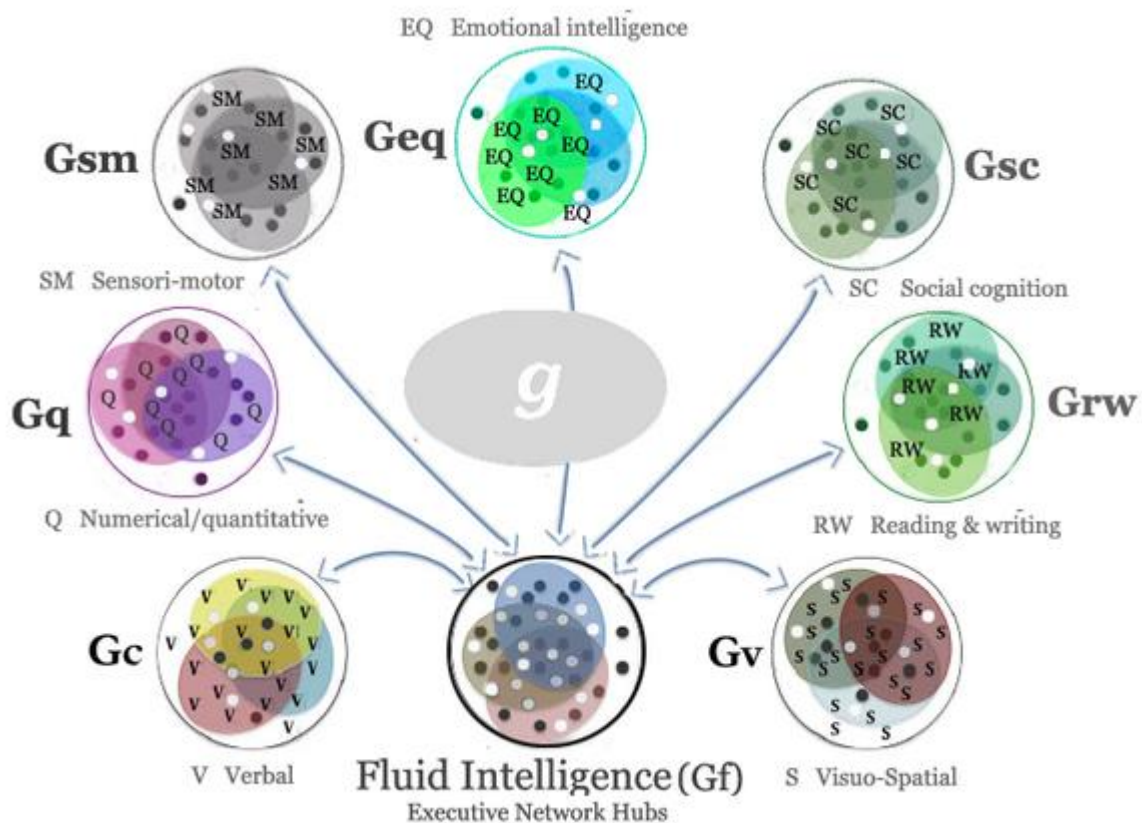


# Theory

## Fluid Intelligence (Gf) Definition:

*Fluid intelligence (Gf):* Fluid intelligence is the ability to reason, problem solve, and to see patterns or relations among items (Ferrer et al. 2009). It includes both inductive and deductive logical reasoning. It involves being able to figure out the abstract relations underlying analogies.

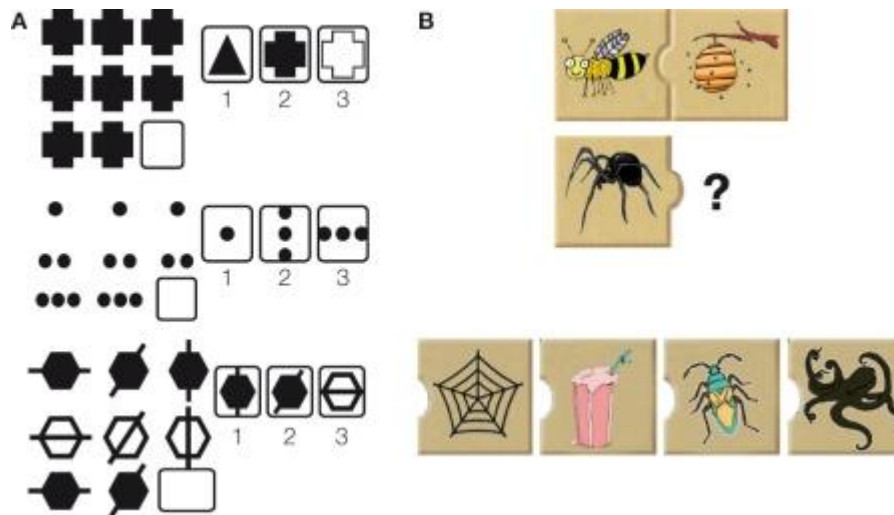
**Fluid intelligence** is the 'hub' of the different 'broad abilities' of intelligence measured by IQ tests and other types of cognitive performance test - as shown here.



Fluid intelligence processes overlap with all the other types of 'multiple intelligence'. If your training results in neuroplasticity changes in fluid intelligence (Gf) you are training the core network of your overall intelligence.

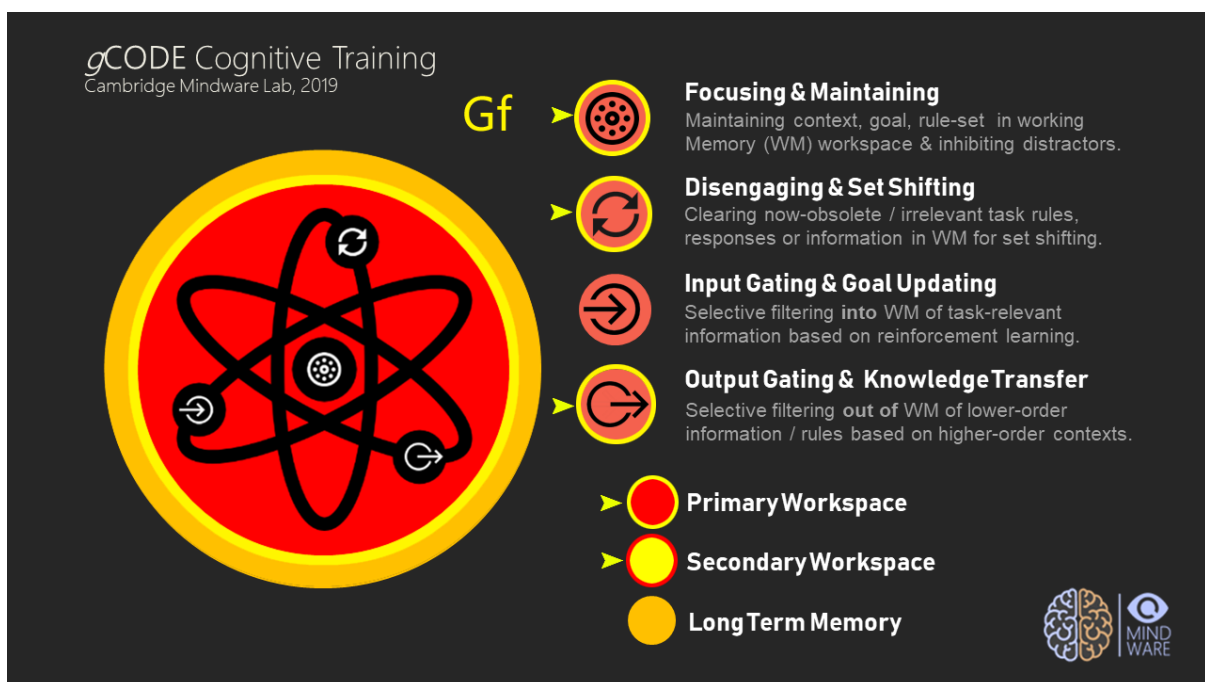
IQ tests that measure fluid intelligence (e.g., Raven's Matrices) are highly correlated with independent measures of EFs ([1](#), [2](#)).





Process Overlap Theory (3) claims that combinations of executive processes are in fact *the same as* fluid intelligence (*Gf*) when they are applied to solving complex and novel cognitive challenges.

In the *gCODE*, the executive functions subserving *Gf* are **maintaining** (and multi-workspace WM capacity), **disengaging** and **output gating**. Also working memory **capacity** is critical for *Gf*.

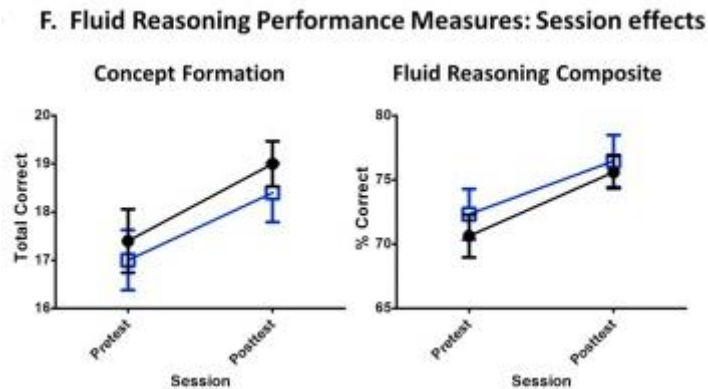


The two functions below are of particular relevance to *Gf*.

### Disengaging/Set Shifting

There are numerous studies showing that combining **interference control** with dual n-back training is more effective than dual n-back training alone (4, 5). These

results support the brain imaging studies showing that interference control is an important link between **fluid intelligence** and **working memory** - our mental bandwidth (6). Here are 2019 results from training interference control on two measures of fluid intelligence - concept formation and fluid reasoning (7):



Applying fluid intelligence can be thought of as ‘offline’ reasoning and hypothesis testing – such as when you solve matrices IQ tests, and you try to figure out the underlying rules in the patterns.

“In the realm of problem solving (Gf), high working memory capacity allows a person to represent and maintain a problem accurately and stably, so that ‘hypothesis testing’ can be conducted. However, as hypotheses are disproven or become untenable, **disengaging** from outdated problem solving attempts becomes important so that new hypotheses can be generated and tested.” (8)

### Output Gating

Output gating mechanisms that depend on striatal-prefrontal working memory circuits are critical for learning and applying complex, context-dependent rules – processes that are central to Gf.

"output gating is specifically at the root of the developmental change in higher order rule use...training-induced increase in cognitive flexibility is... mediated by more efficient output gating of abstract rule representations that support generalization, learning and fluid reasoning." (Unger et al, 2016)

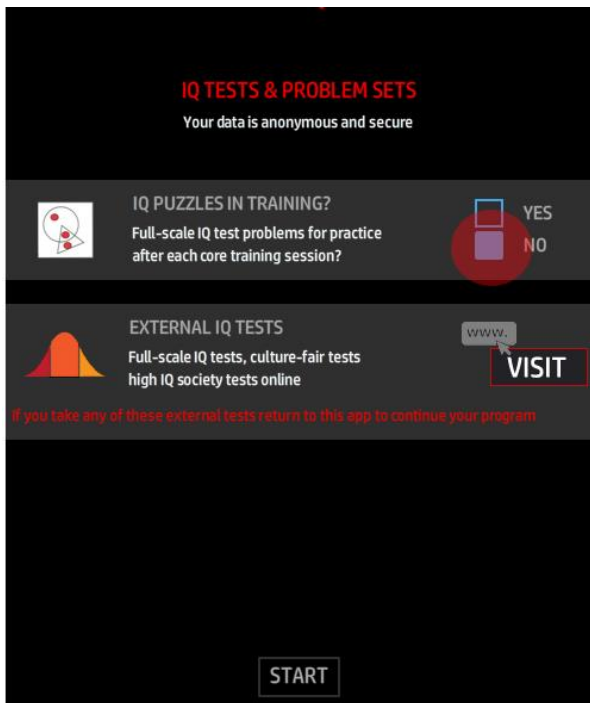
# Instructions

## Tracking Your Progress

Before and after your Gf Challenge you can take a number of valid cognitive tests. using your HRP Track app, including IQ tests. The relevant ones for IQ are IQ, processing speed, working memory, decision-making and cognitive resilience.

You can also access the IQ tests from within the brain training app itself (see below). The link opens a web page in your browser where you can click on either the Danish Mensa or Mensa Norway fluid intelligence (Gf) test. You can take one of these before training and one after training.

For the DNB Foundation Challenge, you should deselect 'IQ Puzzles Training'.



### Danish Mensa IQ test

This non-verbal IQ test is based on the well-known Raven's Progressive Matrices and measures your fluid intelligence directly. It also provides a good measure of your general intelligence. The IQ test is **culture fair** - eliminating the effect of cultural factors such as vocabulary, mathematics and general knowledge. The calculation of IQ is based on answers from more than 250,000 people. The test is based on seeing relationships in abstract geometrical shapes. It is an excellent measure of fluid intelligence.

- **Time required:** 40 minutes time limit
- **Components of intelligence measured:** fluid intelligence
- **Culture fair IQ test?** Yes
- **Repeat testing?** No
- **Fee:** No charge

[Click to take the IQ test](#)

**Note:** The timer starts when you click the button, so be prepared!

### Mensa Norway IQ Test

This non-verbal IQ test assesses your fluid intelligence and general intelligence through **culture fair** nonverbal questions.

In this test you must click the alternative that is most logical. Have a look at the example before beginning.

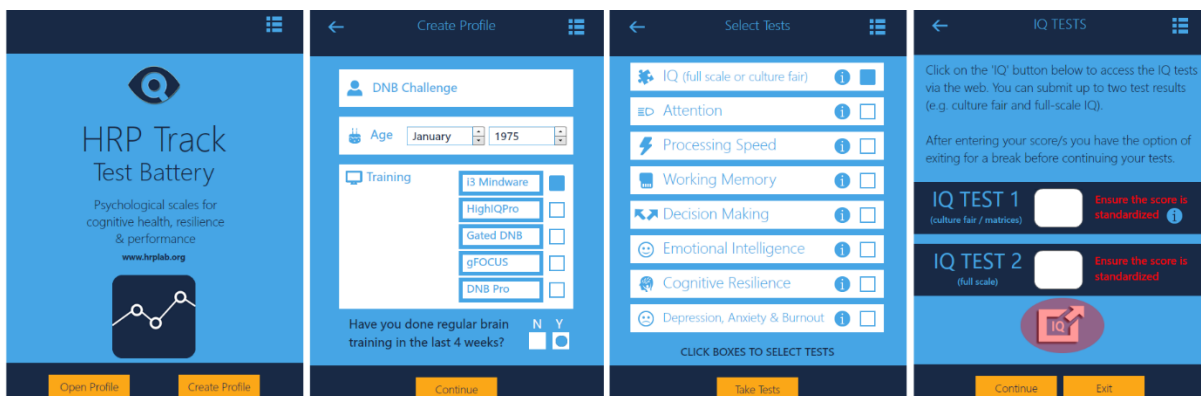
If you don't know the answer, please note that you don't lose points for wrong answers. Therefore, it can be a good idea to guess.

Don't start the test before you are ready and have 25 minutes available.

- **Time required:** 25 minutes.
- **Components of intelligence measured:** fluid intelligence
- **Culture fair IQ test?** Yes
- **Repeat testing?** No
- **Fee:** No charge

• **Special information:** To get your test and IQ scores you need to click on the link at the bottom of the test.

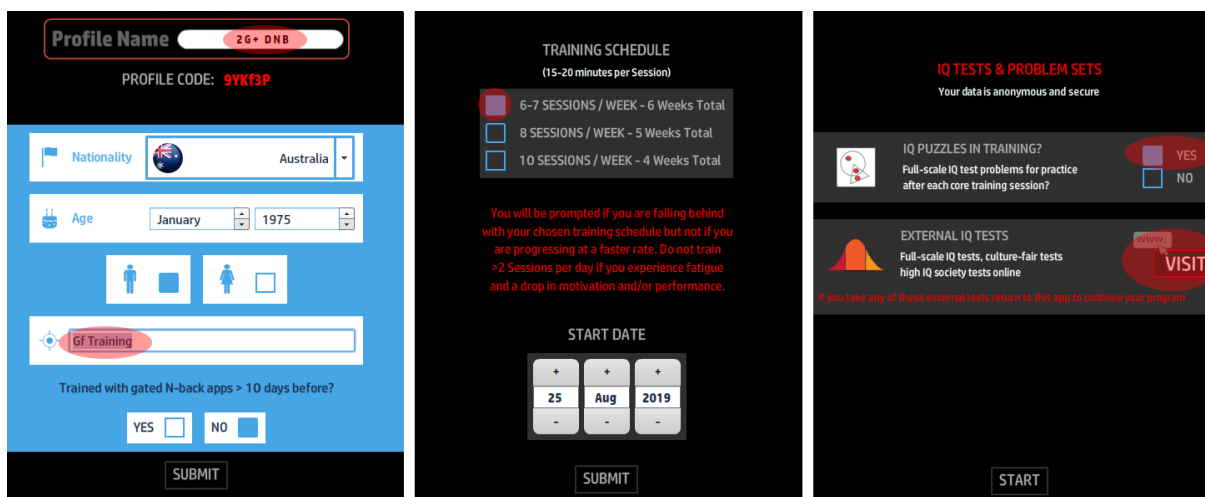
[Click to take the IQ test](#)



For the Gf Challenge, you will set up 2 training games if you are an i3 Mindware user: 2G+ and You can set up unlimited Profiles in your brain training app, and you will need to set up 3 separate Profiles for each of these games, as shown below.

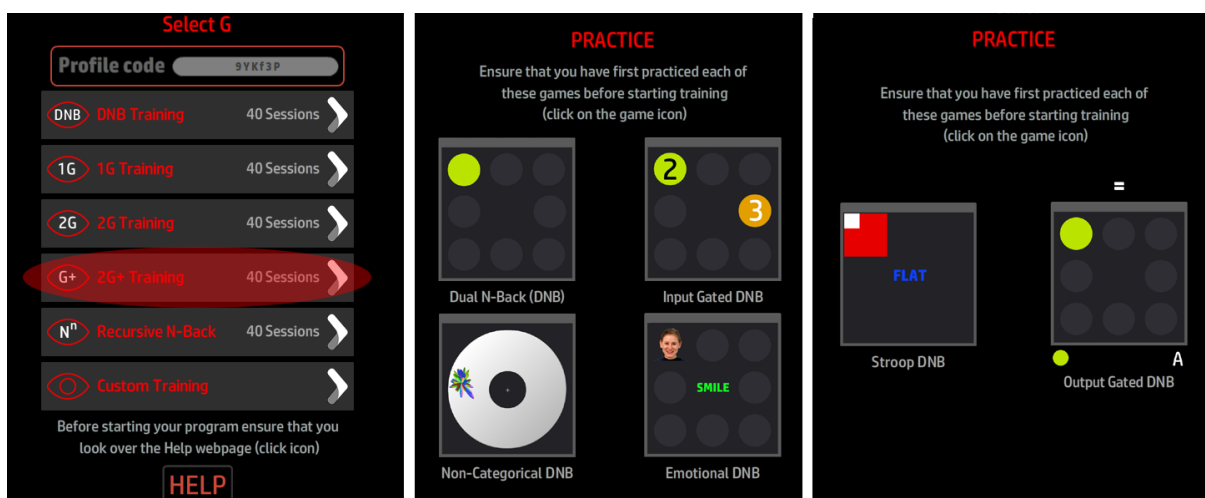
## 2G+ DNB Game

For the Gf Challenge you first need to set up a Profile with the name '2G+ DNB. For your Training Schedule, select 6-7 Sessions/week. Also, select Puzzles (in i3) or Tutorials (in HighIQPro). Selecting this provides access to full scale IQ test practice problems in i3 and 'mindware' tutorials in HighIQPro for applied intelligence.



The normal recommendation is to train one Session per day, for six days a week. You can train more than 1 Session per day if you choose to, but there needs to be at least a 6-hour interval between training Sessions for skill consolidation to occur. If you train within an hour of going to sleep, you may find that training gains are accelerated.

Next you need to select the 2G+ game as shown below.

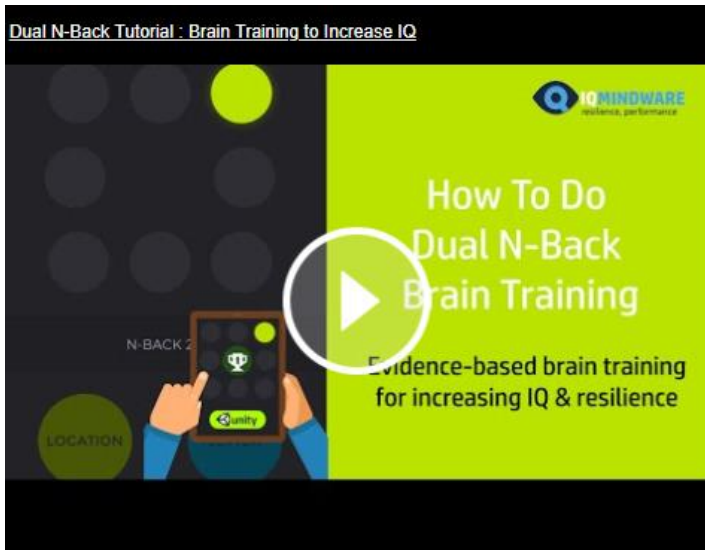


The Gf Challenge requires competence in a number of component games first. The first part of your training involves working through each of the 6 **practice** games shown above, starting with the Dual N-back and then progressing to Input Gated

DNB, Non-Categorical DNB, Emotional DNB, Stroop DNB and Output Gated DNB. Once you have reached a basic level of mastery with each of these games, you can progress to the actual 2G+ game that pulls them all together into one powerful Gf training program based on the Gf CODE.

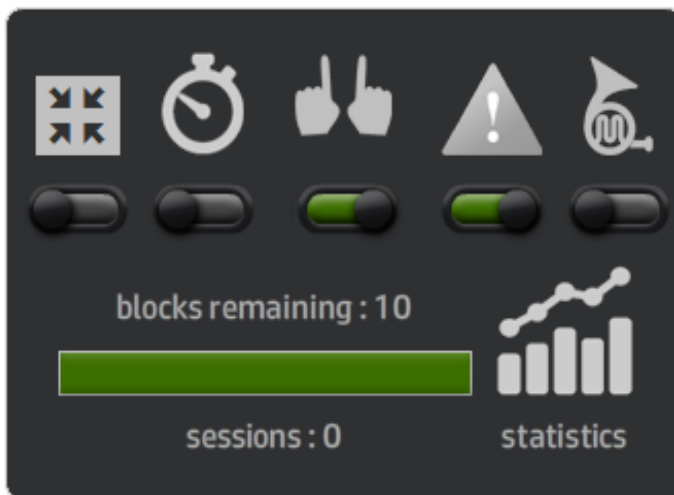
### Practice Game 1. Classic Dual N-Back (DNB)

You can skip this phase if you are already familiar with the DNB and have maintained a 2-back level.



The classic dual n-back game is explained in my tutorial video at [this link here](#).

While practicing this game, there are 10 game Blocks for you to get through for each day's Session. Each Session should last no more than 15 minutes. The N-Back game starts at an n-back level of 2. If this is too difficult at first, after your first Block of the Session the N-back level will drop to a 1-back level.



Prior to starting your dual n-back practice training in Session 1, switch on the Error Feedback (triangle icon) and the Response Switching (two hands) options.

With Response Switching ON, you need to take note before each Block which key is for location matches and which key is for audio matches. Alternating your response keys makes the dual n-back more difficult initially, but significantly improves training gains.

**If you have achieved a 2-back average** after your first 10 Block Session, then you should move to Practice Game 2. If not, continue with your training for another Session. of DNB, and continue from Session to Session until you have reached a 2-back.

### **Practice Game 2. Input Gated DNB**

You can skip this phase if you are already familiar with the Input Gated DNB game and have maintained a 2-back level. As in Practice Game 1, Response Switching and Error Feedback should be ON, and your objective is to attain a 2-back average before moving on to the next practice game.

### **Practice Game 3. Non-Categorical DNB**

You can skip this phase if you are already familiar with the Non-Categorical DNB game and have maintained a 2-back level. As in Practice Game 2, Response Switching and Error Feedback should be ON, and your objective is to attain a 2-back average before moving on to the next practice game

### **Practice Game 4. Emotional DNB**

You can skip this phase if you are already familiar with the Emotional DNB game and have maintained a 2-back level. As in Practice Game 3, Response Switching and Error Feedback should be ON, and your objective is to attain a 2-back average before moving on to the next practice game.

### **Practice Game 5. Stroop DNB Practice**

As in Practice Game 4, Response Switching and Error Feedback should be ON, and your objective is to attain a 2-back average before moving on to the next practice game.

### **Practice Game 6. Output Gated DNB**

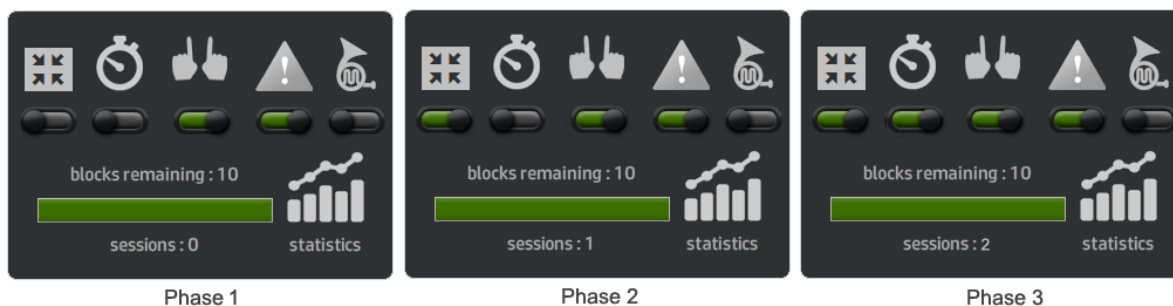
As in Practice Game 5, Response Switching and Error Feedback should be ON, and your objective is to attain a 2-back average before moving on to the actual 2G+ DNB game

## **2G+ DNB Game**

This cross-modal game targets **disengaging** and **output gating** in the gCODE – precisely what is needed for fluid intelligence far transfer gains.

There are 3 Phases in this game:

**Phase 1:** Prior to starting your 2G+ training, switch on the Error Feedback (triangle icon) and the Response Switching options (as in the Practice Games)



At the end of your first Session have a look at your 2G+ n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 2. If not, do another Session of Phase 1 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 3 settings.

**Phase 2:** Between each training Block of a Session switch Interference (arrows pointing in icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the target interference which improves the discrimination ability of your working memory.

At the end of the Session have a look at your 2G+ n-back performance graph. **If you have achieved a 2-back average**, then you should move to Phase 3. If not, do another Session of Phase 2 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with Phase 3 settings.

**Phase 3 (Optional):** Between each training Block of a Session switch Speed (clock icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the cognitive load by increasing the speed of the task. This Phase is optional. If you opt for this Phase, ensure you get an n-back Session average of 2 before moving on.

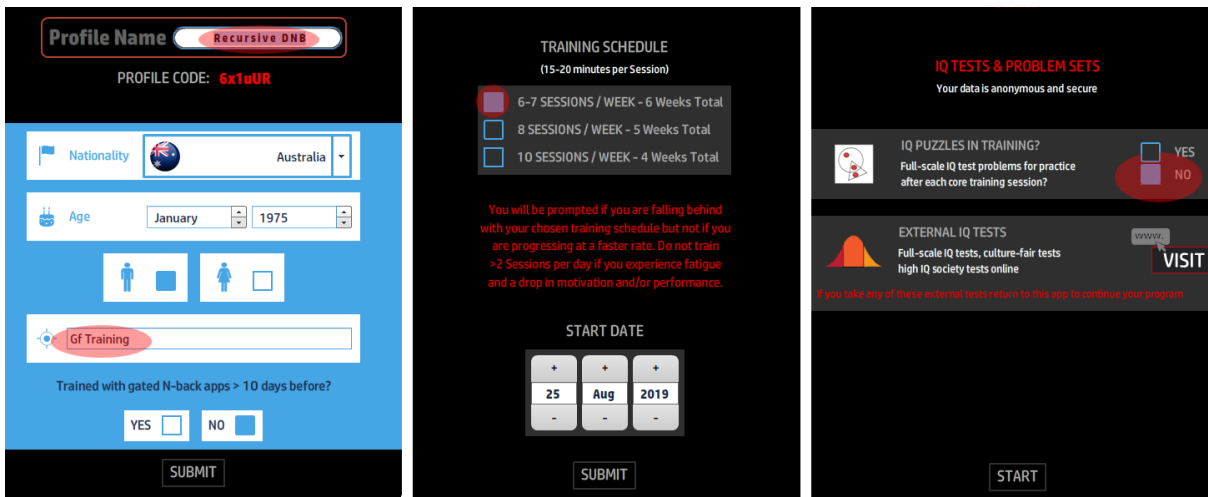
For the remainder of your **6 weeks** of total training, you will continue to alternate from Block to Block with Interference (and Speed if you opt to) switched ON and then OFF. You can vary the combinations of ON or OFF for both options semi-randomly. The variety here enhances the IQ far-transfer from your training.

## Recursive DNB Game for i3 Mindware Users

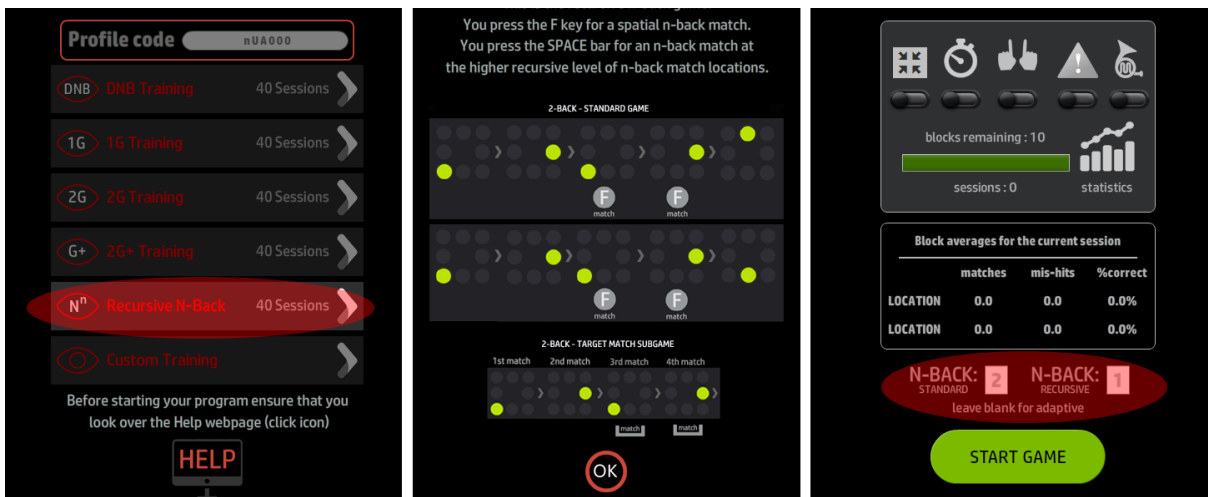
This is a training option for i3 Mindware users (you can upgrade from HighIQPro for \$10 by contacting us at [admin@iqmindware.com](mailto:admin@iqmindware.com))

You now need to set up a Profile with the name 'Recursive DNB'. For your Training Schedule, select 6-7 Sessions/week as you did with 2G+. For this Profile deselect the IQ Puzzles or Tutorials (choose 'NO').

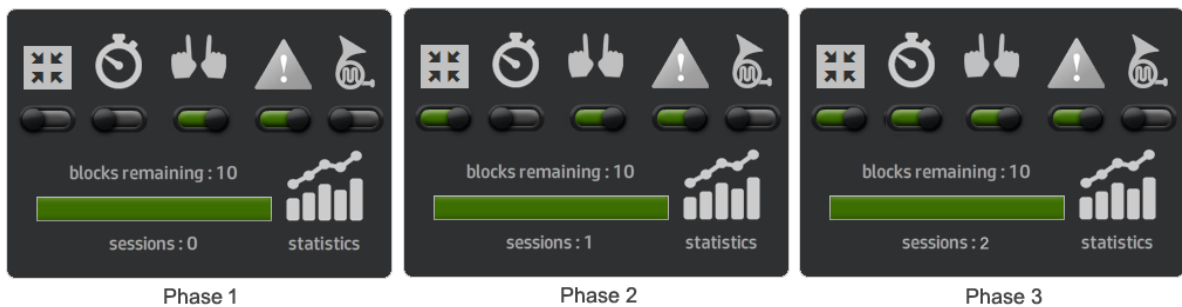




When you get to the ‘Select G’ screen, choose ‘Recursive DNB’, as shown here. Ensure you have an understanding through the help resources before playing the game.



As in the 2G+ DNB, there are 3 Phases in your training – and the Option settings you use are exactly the same as with the classic DNB game you have been playing.



Phase 3 is **optional** as in the previous games. Make sure you reach an n-back level of 2 in Phase 2 however before moving on to the next game.



## Alternating 2G+ and Recursive DNB Training

For the remainder of your **6 weeks** of total training if you are an i3 Mindware user, you will continue to alternate from Block to Block with Interference (and Speed if you opt to) switched ON and then OFF. You can vary the combinations of ON or OFF for both options semi-randomly. The variety here enhances the IQ far-transfer from your training.

## Target Goals of the Gf Challenge

For objective measures of improvement and success in this part of the challenge, you will look at your **average n-back performance** chart after each Session. Your target is to reach a **3-back level on each game**. You can also compare your scores with others on the Leaderboard for each game.

If you achieve this training goal for each game, we can be confident that your training has resulted in **long-term neuroplasticity changes in core executive functions related to fluid intelligence (Gf)**, augmenting your working memory, and general intelligence (*g*) – as well as cognitive resilience.

Note that since you are training between different games, you will not complete all Sessions of any given game. What is critical however, is that you complete **40 Sessions in total over 6 weeks or less**. If you train more than once a day, ensure there is a 6 hour interval between Sessions.



## Cognitive Performance Gains



When you purchase the i3 Mindware or HighIQPro app, these come bundled with a psychometric testing app that gives you option valid tests for your IQ. There are two types of IQ test you can take: fluid intelligence matrices tests, and working memory tests (both assess full-scale IQ).

If you complete these 6 weeks of training and attain at the minimum a 2-back average for each of the 3 games, we offer a money-back guarantee of a 10-20 point increase on both measures of IQ (or either one you choose to take). Simply take screenshots of your fluid intelligence test scores (for the external tests linked to in the app).

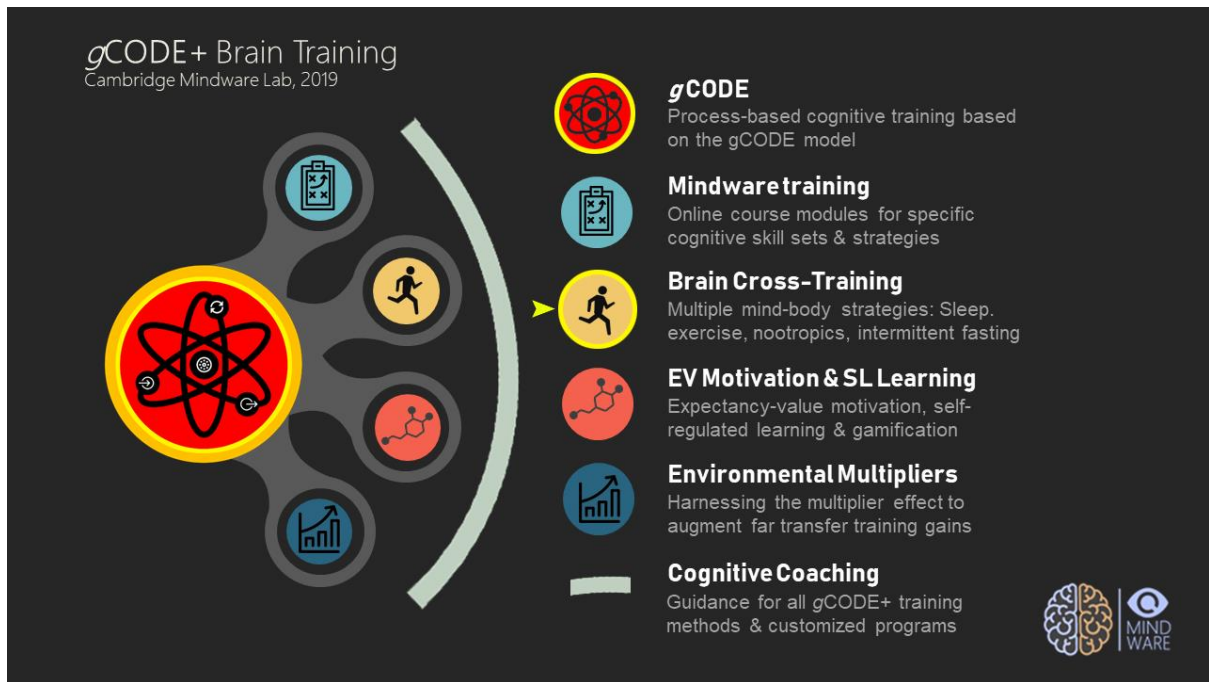


**gCODE+**  
Brain Training  
Programs

Dr Mark Ashton Smith

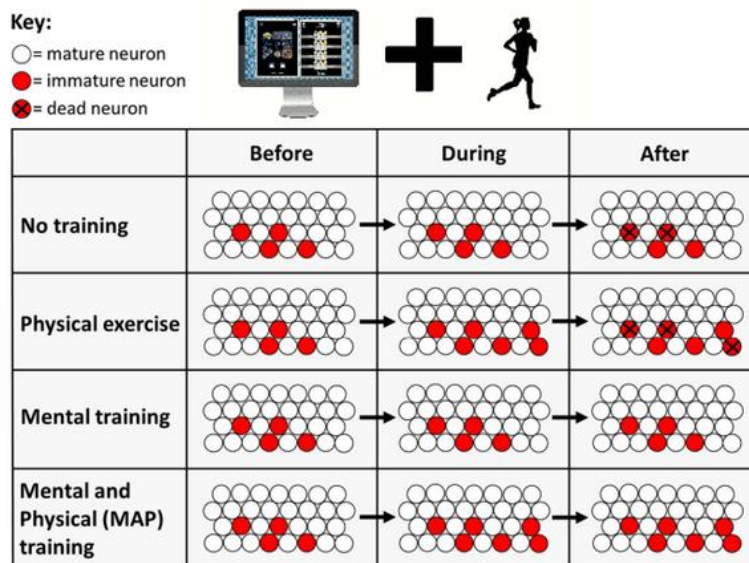


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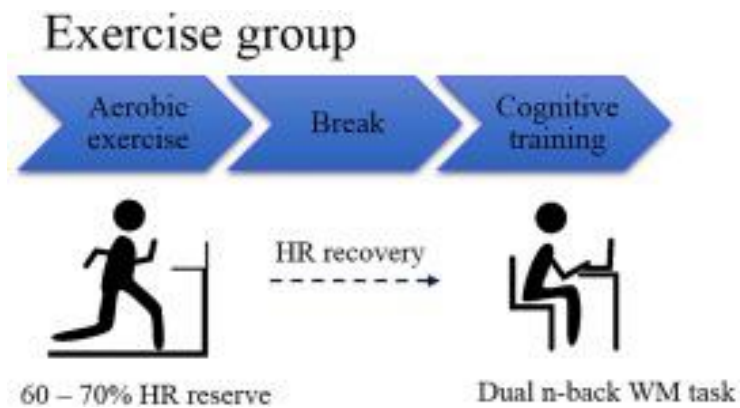


## Neurogenesis & Multimodal Training

Work by Dr Tracey Shors at Rutgers (1) and others has shown that **exercise** can greatly increase the number of new neurons produced in adult brains each day - a process called **neurogenesis**. These will mostly die through programmed cell death. However, combining exercise with brain training prevents the programmed cell death and integrates the new brain cells into functional circuits that can enhance cognitive performance (2). The effect of this **multimodal** (mental and physical) training has been found to work synergistically - the effect on IQ is greater than either exercise or brain training alone.

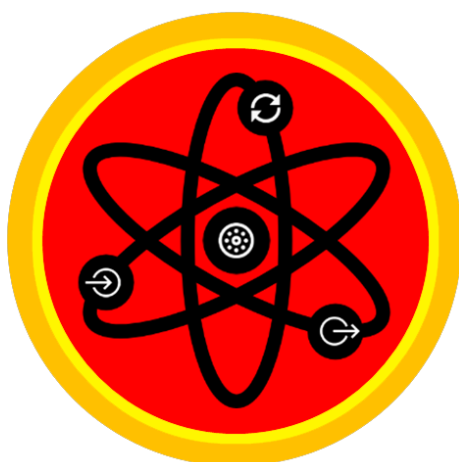


We recommend the following type of training program published in the journal *Biological Psychology* (3) that resulted in impressive gains in general cognitive ability.



Do **3-5 workouts per week**. You do not have to stick this particular regime shown in the figure above. Choose a training regime for the workout and brain training that fits your schedule. They do not even need to be on the same day.

You can do either **aerobic fitness** for 20 minutes or more - e.g. running, swimming, cycling, fast walking (70-80% of max heart rate, 133–152 bpm, Zone 2) **OR** 10 minute **high intensity interval training** (HIIT) sessions - (80-95% max heart rate alternating with rest intervals). Both modes of exercise can result in increased neurogenesis (8, 9, 10). A good introduction to HIITs can be found [here](#).



## 123 Sigma Rule

Dr Mark Ashton Smith



Cambridge Mindware Lab

If you want to improve in anything through training and practice, there are two things you can do from the get-go to accelerate your training gains.

## Feedback

One of these is to **use continual feedback.**

Elite performers will measure, quantify, and track their progress in various ways. Each little measurement provides feedback - a signal of whether they are making progress or need to change course.



“Feedback is the breakfast of champions.”

– Ken Blanchard

The use of feedback by teachers in educational settings accelerates learning by 50-100% over a 1 year period (1). In sports, feedback is an exceptional tool for coaches to use with their athletes. It allows coaches to tell athletes how they are performing in relation to their expectations. Coaches can then direct or teach athletes how to reach these expectations and perform better, accelerating the learning process (2, 3). Feedback helps us turn disappointments and failures into opportunities for learning; it helps motivate, challenge, direct and support us on our quest to improve our skills and performance.

When brain training you should be actively seeking feedback and using it to increase effort, address weaknesses or build on your strengths.

## Benchmarks

The other thing you can do to improve in anything through training and practice is **set yourself clear benchmark targets.**

Measuring yourself against clear benchmarks answers questions such as: ‘How good am I?’ And ‘What standard can I aim for?’ and ‘How much am I improving?’

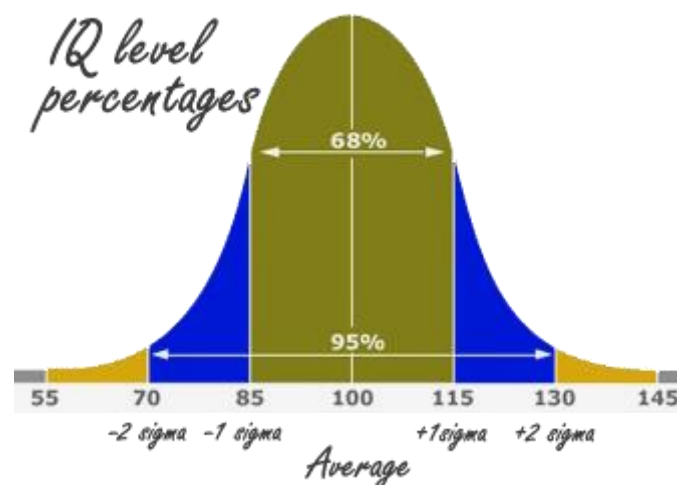
## The 123 Sigma Rule

At IQ Mindware we use the **123 Sigma Rule** to set benchmarks. Applying this rule helps you set up your expectations for training. The 123 Sigma rule extends the well-known **68-95-99.7 rule** which can be explained as follows:

### 1 sigma is 1 standard deviation.

The sigma metric is a measure of the spread of a ‘normal’ (bell shaped) distribution of some ability or property in a population - such as reaction time, income or IQ. The actual value of 1 sigma will depend on the test being used. For IQ tests, 1 sigma = 15 points.

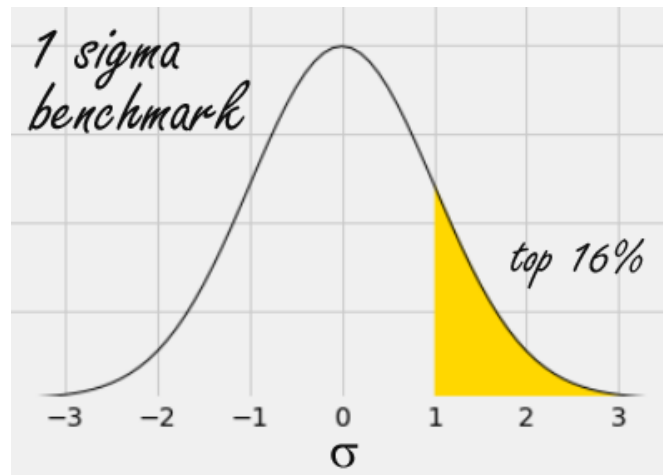
The 68-95-99.7 rule tells us that 68% of the population is between -1 and +1 sigma from the average; 95% is between -2 and +2 sigma from the average; and 99.7% is between -3 and +3 sigma from the average. For the example of IQ, 68% of the population has an IQ between 85 and 115, and 95% of the population is between an IQ of 70 and 130.



The **123 Sigma Rule** provides 3 benchmarks we can work with, each of which has an intuitive, easy to use interpretation in real life.

### Exceptional. 1 Sigma: The Top 16%

If you are more than 1 sigma from the average in the population this puts you above 84% of the population in the top 16%.



If you have an IQ of 115 (1 sigma) or above you are capable of the cognitive demands of almost any profession, and can attain the highest levels of education and training. An IQ above 115 is considered to be a **high IQ** – a level up from ‘above average IQ’.

In other areas, if you are in the top 16% of earners, you have a **high income**. If you are in the top 16% of those in your sports league, you are a **good player**. This is the 1 sigma definition of being exceptional.

**The Smart Fraction.** The Smart Fraction Theory (4) tells us that national wealth is determined by the fraction of workers with an IQ equal to or greater than some **minimum threshold**. General intelligence (*g*) is a robust predictor of economic growth and productivity across a large sample of countries.

“IQ is relevant for technological progress, for innovation, for leading a nation, for leading organizations, as entrepreneurs, and so on...I think in the modern economy, human capital and cognitive ability are more important than economic freedom.” Dr Rinderman

The cognitive ability of the **smart fraction** of any country makes by far the biggest contribution to the strength of that country’s economy, and predicts the quality of economic and political institutions. Others have argued for the impact of the smart fraction on media, music, literature, art, philosophy and world-views (4).

So what is this smart fraction threshold?

According to the data, a 1 sigma **IQ level of 115** places someone just above the threshold (5).

### IQ Mindware brain training recommendation

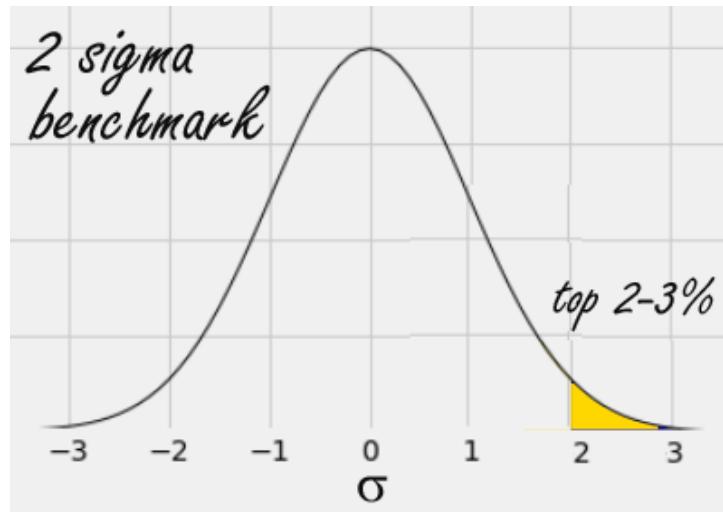
If you have a pre-training IQ below 115, the 1 sigma level of 115 (Smart Fraction level) is an ideal target to train for.



## Excellent. 2 Sigma: The Top 2-3%

This is a benchmark for becoming really exceptional. This puts you in the state / county level for sport. For any kind of performance-based skill, this a level of ability that is associated with having a strong reputation.

For IQ, this is a level of **130 or more**. This is Mensa standard. To become a Mensan, you need to demonstrate you have an IQ in the top two per cent - the 98th percentile. There is no other criteria (6). This is like a **1 in 50 level** of cognitive ability: if there are 50 students in a class, 1 of them may be at this 'top of the class' level.



In terms of the Smart Fraction Theory, 130 is the asymptote level: If the average IQ of a society was 130, per capita GDPs will level off, allowing GDPs of less bright nations to catch up (5).

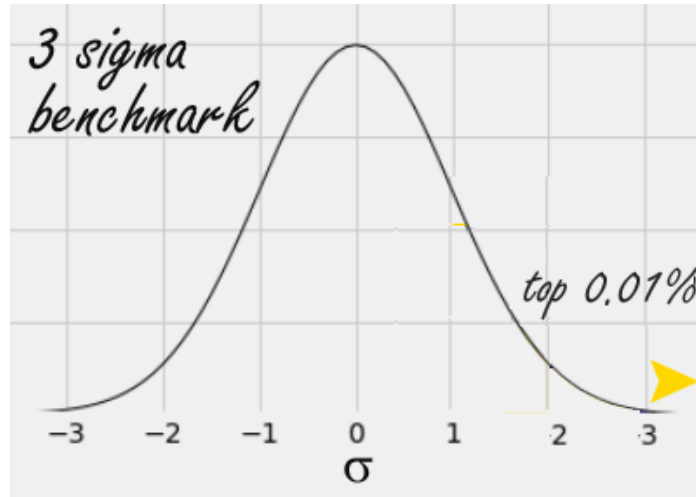
### IQ Mindware brain training recommendation

If you have a pre-training IQ of between 115 and 125, the 2 sigma level of 130 (Mensa level) is an ideal target to train for.

## Elite. 3 Sigma: Top 0.1%

This level of performance puts you at a national and international level of competitiveness.

For intelligence ( $g$ ), this is an IQ of 145 or higher. In a high school of 1000 students, only 1 student may have IQs of this level.

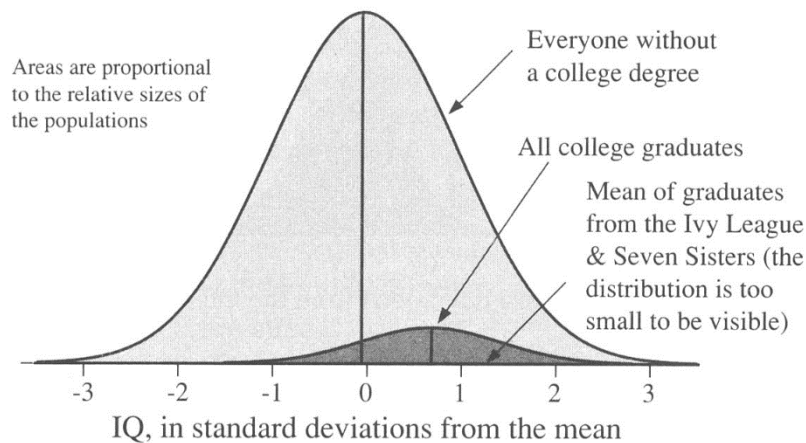


This is the level of Ivy League cognitive elites. Take a look at this data on college students based on SAT scores. First, going back to 1930 (translating back from standard deviations to IQ scores!) you can see that the average IQ of all college graduates was 111. The average IQ of Ivy League colleges was 120. That's not that different.

Americans with and without a college degree as of 1930

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Three Populations of 23-Year-Olds in 1930



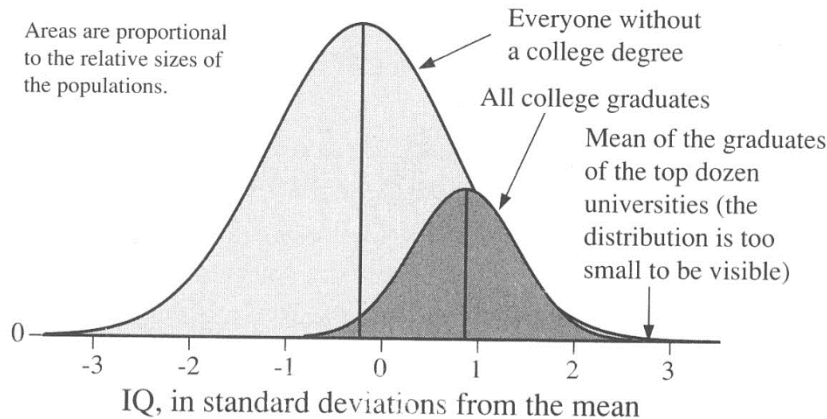
Sources: Brigham, 1932; Learned and Wood, 1938.

But if we wind forward to 1990 you see a very different picture.

## Americans with and without a college degree as of 1990

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### Three Populations of 23-Year-Olds in 1990



While the average IQ of all college graduates in the country has barely changed (from 111 to 113), the average IQ of Ivy League college graduates has increased from 120 to 142 - close to the **3 sigma level**. That's an extraordinary gain and demonstrates what is happening in the Ivy League colleges that have a disproportionate impact in many institutions.

### IQ Mindware brain training recommendation

If you have a pre-training IQ of between 130-140 the 3 sigma level of 145 (cognitive elite) is an ideal target to train for.

## 123 Sigma Rule Summary

In summary, the **123 Sigma Rule** is a rule that says that meaningful and measurable benchmarks for excellence can be segmented into 1 sigma (exceptional), 2 sigma (excellent) and 3 sigma (elite) levels - and that these levels encompass the full range of excellence.

At IQ Mindware we are not fixated on numbers and self-quantification: what's important is what you do with your precious cognitive resources. But the 123 Sigma Rule can help for setting motivating targets and providing useful feedback in the learning process.

After assessing your IQ with IQ Mindware's valid pre-training tests, you can use the 123 Sigma Rule to determine what your benchmark target can be in your quest for IQ augmentation through brain training. Alternatively, if your current capacity is just above one of these sigma thresholds, you can train to ensure that it does not drop below it through chronic stress or, in the longer term, through the aging process.