G CODE

Dr Mark Ashton Smith
IQ Mindware
www.iqmindware.com
Cambridge, England

Brain Training User Guide

10 Mill Street
Cambridge
England
CB1 2HP

admin@iqmindware.com
www.iqmindware.com
IQ Mindware
2020

G CODE

BRAIN TRAINING for General Intelligence (G)

IQ MINDWARE: G BRAIN TRAINING

AUTHORED BY:

Dr Mark Ashton Smith

IQ Mindware
HRP Lab Ltd
Cambridge,

Online

Website:s iqmindware.com
hrplab.com

Email

Email 1: mark@iqmindware.com
Email 2: ma18183@essex.ac.uk

OCT, 2020

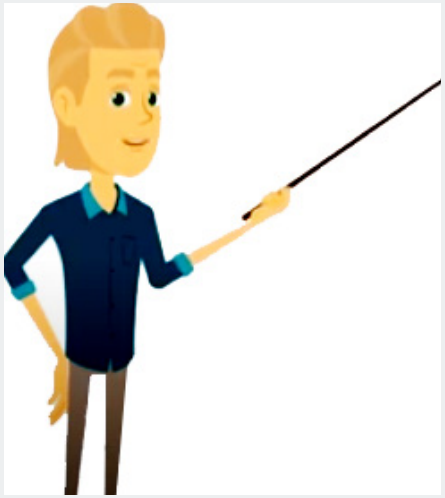
Evidence-based cognitive & brain bioenergetics training for intelligence (G) & metabolic health

Table of contents

G CODE

Brain Training Guide

Hello!



I'm Dr. Mark Ashton Smith, applied cognitive neuroscientist and founder and director of IQ Mindware – an evidence- based cognitive training provider.

I earned my joint neuroscience and cognitive psychology PhD at the Carnegie Mellon & University of Pittsburgh's Center for the Neural Basis of Cognition (CNBC) program.

I worked as a Lecturer (Assist. Professor) and researcher in the Department of Psychology at Cambridge University for a number of years and went on to help build and direct psychology programs around the world.

I now use my scientific training to develop evidence-based apps and programs to help people augment their intelligence, build resilience and improve their metabolic health and resilience.

MARK ASHTON SMITH, PHD
Director,
Health, Resilience & Performance Lab
Founder, IQ Mindware

G CODE training increases your capacity to problem solve, reason, learn, comprehend and make decisions to be more adaptive & self-optimizing

00.1

G Code Training

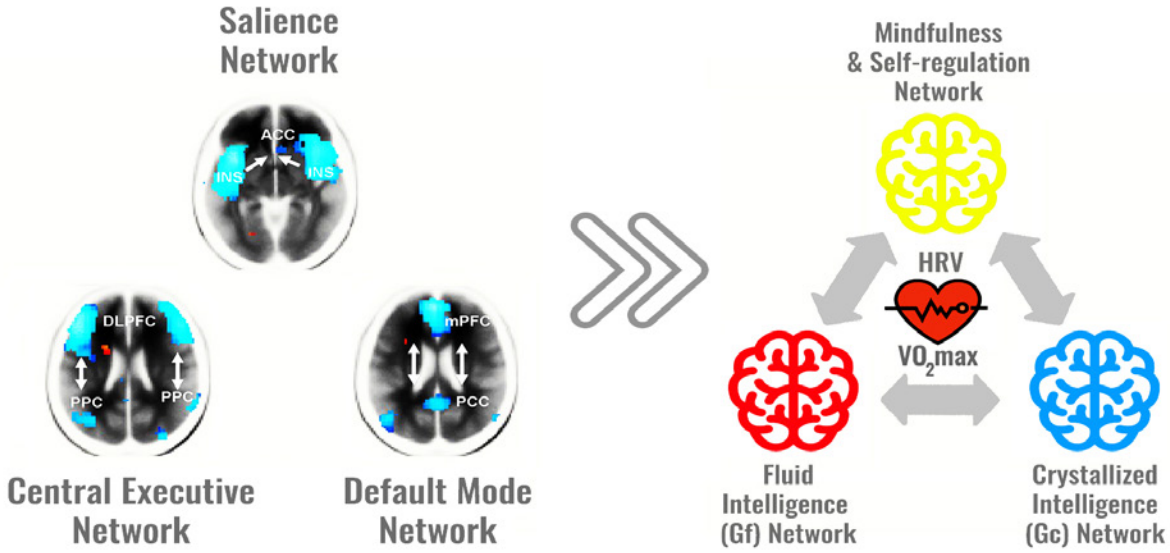
G CODE brain training is based on (1) enhancing core baseline ('set-point') capacities, such as fluid and crystallized intelligence, and (2) working with fast-acting training synergies, such as combining fluid intelligence capacity training with HRV training, to augment training gains.

The core capacities G CODE training targets are:

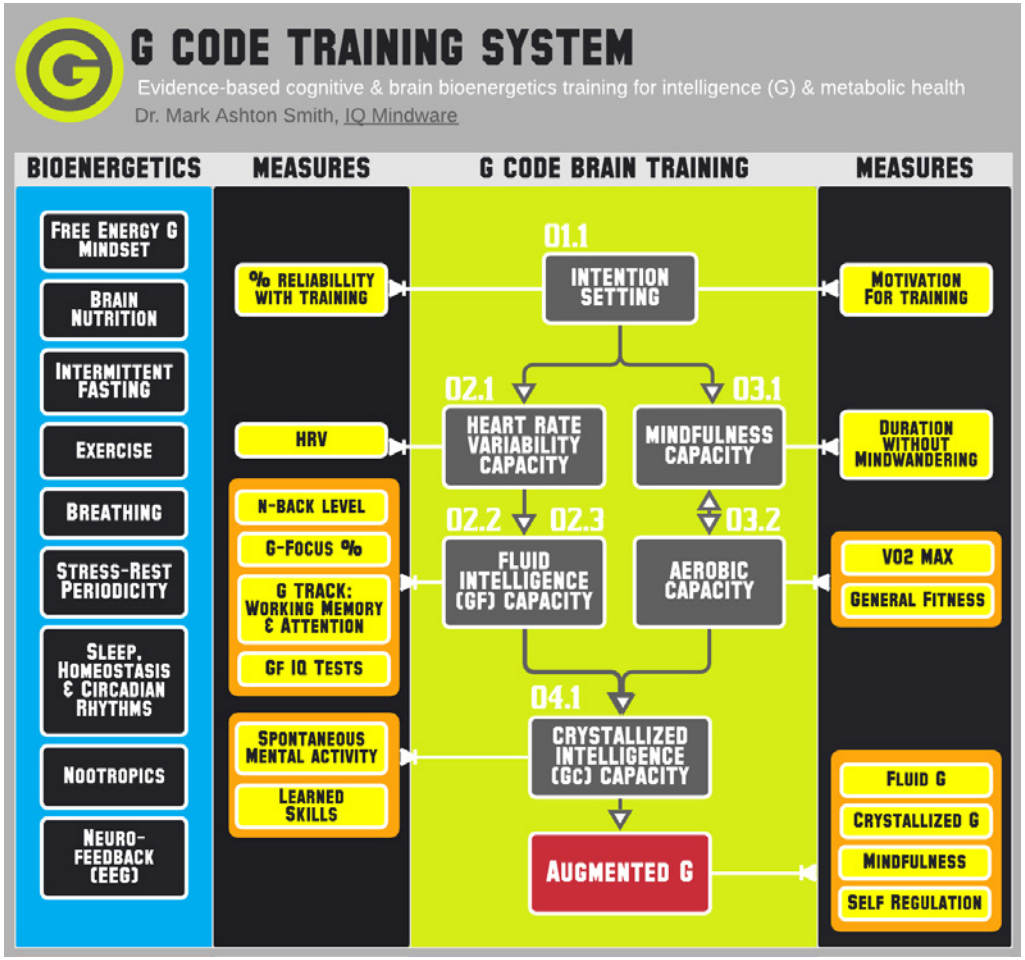
- **Mindfulness capacity** - including metacognition & self-regulation (SR).
- **Fluid intelligence (Gf) capacity** - your ability to process information, problem solve and learn in new situations.
- **Crystallized intelligence (Gc) capacity** - your knowledge and skill-set readiness.

- **Heart rate variability (HRV)** - a general measure of executive functioning and autonomic nervous system resilience and adaptability.
- **Aerobic capacity (VO2max)**- a measure of your ability to utilize oxygen and fitness.

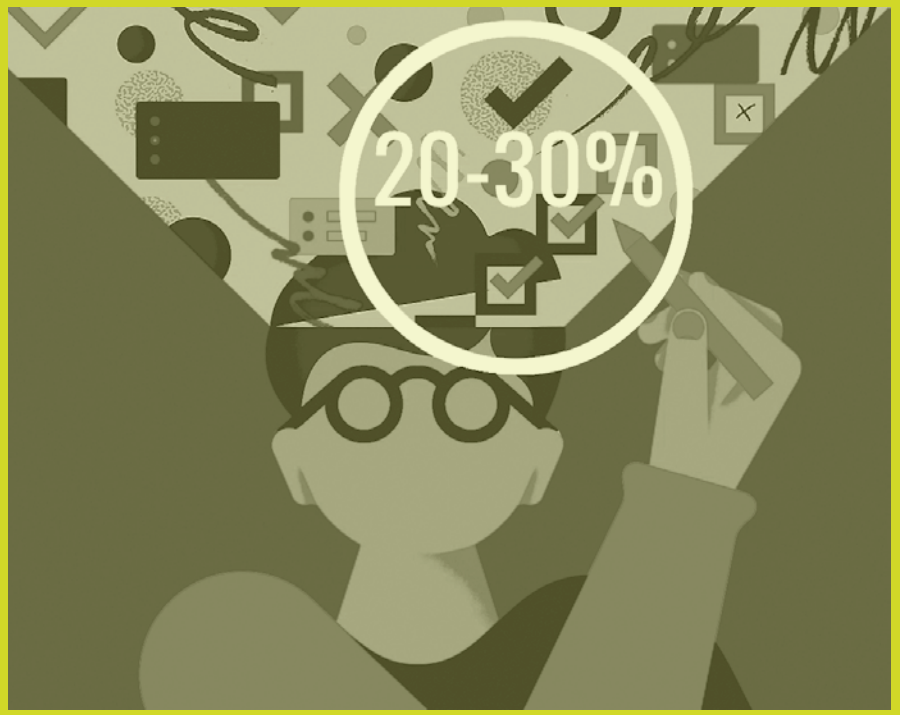
These core G capacities are associated with the three intelligence-related brain networks shown below. The G CODE brain training system targets these three networks.



G CODE BRAIN TRAINING GUIDE



20-30% efficiency in goal-setting!



01.1

Intention setting

The intention-gap problem

Since you're reading this, chances are you have the intention to do some G CODE brain training to improve your cognitive ability and intelligence.

But how often do your good intentions and goals lose momentum or get waylaid? Honestly?

The harsh truth is that in general the link between intentions and our behaviour is modest. According to research, goals and intentions only account for about 20% to 30% of what people actually end up doing! Most of what we do is based on familiar habits, day to day problem solving, external demands, and so on.

To be in effective in your G CODE training you need to set your training goals and intentions in a way that will lead to the outcomes you want. To do this you first need to familiarize yourself with the training exercises themselves.

Solution Step 1. Training practice

G CODE training involves doing five types of **capacity training**, as well as optional strategy training. The program extends for 1 to 2 months, with a total of 10 plus hours, to attain long-term neuroplasticity change. And you will need to decide on your own customized training program. Before committing to this, you need to be familiar with the G CODE training elements.

During the first week of your training, you should practice each of the training elements below to reach 'entry level' standard for your brain training program.

- HRV + Gf CAPACITY (DNB Foundation Training)
- MINDFULNESS CAPACITY + AEROBIC CAPACITY
- Gc CAPACITY

Each of these training elements is described in the sections below. Once you've practiced to 'entry standard' for each of these and obtained baseline scores in them, then you'll be able to decide on what elements you want to build into your own training program, and what will be involved in reaching your training goals.

Step 2. What‘s your motive?

Next you need to reflect on what your motive for the training is. What has motivated you to get to this point?

Is it for any of these reasons?

- You want to improve your psychometric IQ by 10-20 points. Perhaps you want to try to get into Mensa?
- Your work depends on your cognitive performance and the more cognitive ability you have the more you progress in your work.
- You experience cognitive capacity gaps or bottlenecks that prevent you from functioning at the level you want to be at in your day to day environment.
- You want to improve your general cognitive capacities, to make the most of your potential or live more optimally. Perhaps this is part of a broader program to augment health, resilience and performance for both mind and body.
- You have an aptitude exam coming up, and want to maximize the odds of doing well in it.
- You are experiencing periods of brain fog or burnout due to stress or tiredness and want more cognitive resilience and grit.
- You are getting older and want to maintain more youthful levels of cognitive ability.

your schedule and daily energy and motivation levels?

- Do you have subgoals that you will work towards to obtain your overall training goal to make the process more manageable and motivating?
- What obstacles/distractions/failures might arise and how will you respond so that you continue sticking to your training program? Do you have built-in flexibility in your plan? Do you have a 'growth mindset' so you are able to accept and learn from any obstacles? if you don't do regular exercise or meditation.

HOW MUCH DO YOU VALUE THE TRAINING?

- How compelling is your motive for training? How much do you really want the results?
- Are you convinced of the evidence for the effectiveness of the methods in G CODE training as a means to your goals? How likely are the gains from the training?
- How much do the likely gains you get from training outweigh the costs - e.g. the time and effort involved?

Having weighed up these considerations, you should be in a position to set yourself a challenging but realistic training goal that you can commit to. You can, if needed, re-evaluate your training goal every couple of weeks or so.

IQ Mindware's coaching services may be of help with here as well.

Or is your motive something else...or more specific?

In this step you need to explicitly describe your motive/s for training.

Verbalize it to yourself or write it down.

Step 3. Tracking training gains

For the above, you need to track your progress and/or success as a result of your training. It's important to keep your long-range goals in mind, and keep aware of how you are progressing in the big picture.

The first step is to measure your baseline metrics.

IN-APP TRACKING

i3/HighIQPro/DNB Pro. You can track your working memory capacity (a measure

of **Gf CAPACITY**) from your **n-back level.** Working memory is your information-processing 'bandwidth'.

gFOCUS. You can track your attention control - another component of Gf CAPACITY) using the gFOCUS app (percentage accuracy) metric.

HRP Track app. You can do before and after standardized tests of (1) culture-fair IQ, working memory, and attention (measures of fluid intelligence capacity); (2) emotional intelligence, and cognitive resilience (measures of SELF-REGULATION capacity).

EXTERNAL TRACKING

You can objectively assess whether you:

- Performed well in a test you prepared for.
- Performed better in work evaluations.
- You have been more effectively learning, problem solving, comprehending and decision-making in day to day life based on fewer mistakes, less inefficiency and more successful outcomes..

Heart rate variability (HRV). For HRV I recommend HRV4Training phone app. You simply wake up each morning and take a recording - either using the phone camera sensor, or an external compatible heart rate monitor. After getting your baseline HRV after 4 days of data, you can start to see how your HRV varies from day to day, compares to others

and can improve with training over time.

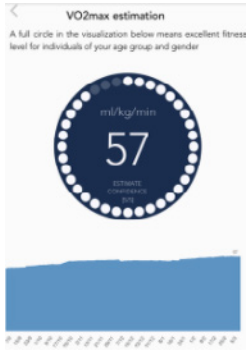
All of the following are recommended HRV devices:

Brand	Battery Life	iOS & Android App	Sensor Placement
Polar H10	400 hours	Yes	Chest strap
Polar H7	200 hours	Yes	Chest strap
Garmin Premium Heart Rate Monitor Strap	4.5 years (1 hour per day)	Yes	Chest strap
4iiii Viiiiva Heart Rate Monitor	160 hours	Yes	Chest strap
Suunto Smart Sensor	500 hours	iOS only	Chest Strap

An option preferred by many is to download Elite HRV combined with a heart rate monitor such as

- CorSense HRV finger monitor
- Polar H7 or H10
- Wahoo TICKR – Only Bluetooth is HRV accurate, ANT+ is just HR accurate
- BlueLeza HRM Blue – Only available in Europe
- 4iiii Viiiiva
- Zephyr HxM (make sure it's Bluetooth 4.0, not 2.0!)
- Cardiosport TP3
- Suunto Smart Belt
- Garmin Premium (for ANT+ compatible Android phones/tablets only)
- Garmin HRM Tri (for ANT+ compatible Android phones/tablets only)

Aerobic capacity. For aerobic capacity, you can also use HRV4training if you run or cycle, using the Strava integration and training with a HR monitor. Strava is compatible with a number of GPS devices that record heart rate data, including Garmin, Fitbit, Apple Watch, Wahoo, Polar, and Suunto, and TomTom.



Watches that independently measure VO2max are listed in this table below.

Brand	Device
Garmin	Vivosmart 3; Vivosmart 4; Vívoactive 3, 4 and Venu; Vivomove HR and 3; Vivosport; Forerunner 35; Forerunner 45/45S; Forerunner 230; Forerunner 235; Forerunner 245/245M; Forerunner 620; Forerunner 630; Forerunner 645 Music; Forerunner 735; Forerunner 935 and 945; Forerunner 920 XT; MARQ collection; Fenix 2, 3, 3HR, 5, 5 Plus and 6; Tactix collection; Quatix 3; Quatix 5 Series; Fenix Chronos; Edge 130; Edge 530; Edge 820; Edge 830; Edge 1000; Edge 1030.
Suunto	Suunto 3 Fitness; Suunto 5; Suunto Ambit 3 series.
Huawei	Fit, Band 2 Pro; Band 3; Band 3 Pro; Band 4 Pro; Honor Dream; Honor Magic range; Watch GT range; Talkband B5
TomTom	TomTom Runner 3; TomTom Spark 3; Tom Tom Adventurer.
Others	Montblanc Summit 2; Actxa Spur+; Withings Steel HR Sport; Huami Amazfit Stratos range; MiTac Run 350; Fjuul Premium; Jabra Elite Sport; Jabra Sport Pulse Special Edition; Pear Sports; PulseOn; Casio G-Shock GBD-H1000; Xiaomi Mi Watch range

Try to keep track of your progress at this level of what is motivating you in the first place. After each week or two of training, reflect on (and perhaps measure) how the training is helping you progress towards your valued goals for the training.

Don't lose sight of the big-picture even if on a day to day basis progress may not be obvious, and there may be occasional setbacks.

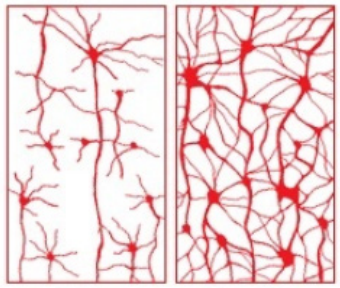
In this step, decide on what you want to keep track of, and get some baseline measures.

If you are going to use HRP Track, open this up, create a Profile and select the tests you want to take prior to your training, so you can take them again after the training.

Step 4. Goal & intention setting

Now you need to decide on your 4-8 week training program and set your training goals. Without a long-term training commitment you will not get the long term neuroplasticity effects you need.

Here are a couple of training schedule benchmarks to help you decide on your program, from the higher-demand ultra training, to lower-demand regular training.



ULTRA TRAINING BENCHMARK

For a period of 6-8 weeks.

At least:

- x3 sessions per week of **[MINDFULNESS CAPACITY + AEROBIC CAPACITY training]** - minimum 20 min/per session.

Alternating (on separate days) with:

- x3 sessions per week **[HRV + Gf CAPACITY training]** (i3/HighIQPro/DNBPro/gFOCUS)

Followed by (within 4 hours of the Gf CAPACITY training or any other learning or focused problem solving episode):

- x3 sessions of **Gc CAPACITY training.**

REGULAR TRAINING BENCHMARK

For a period of 6-8 weeks.

At least 5 sessions per week of either:

- **[MINDFULNESS CAPACITY training + AEROBIC CAPACITY training]** - minimum 20 min/per session.

Or

- **[HRV + Gf CAPACITY training]**

With optional sessions of

- **Gc CAPACITY training**

YOUR CUSTOMIZED TRAINING PROGRAM

Using the above benchmarks, you can decide on your own customized training program goals before you start your training.

EXPECTED TRAINING GAINS

Based on the metrics you want to track, after a few days training you can decide on how much you want to improve from your starting baseline.

Generally speaking, increasing your baseline by 15-20% is a very challenging but realistic objective for most. For example, increasing IQ from 100 to 115, or a **VO2max of 42 mL/kg/min to 50 mL/kg/min.**

If your baseline is already high, then the increase is likely to be a less - such as 10%.

A 10-20% gain across multiple core capacities results in a tremendous increase in overall capacity.

In considering goals you can actually commit to and attain, you need to consider the following:

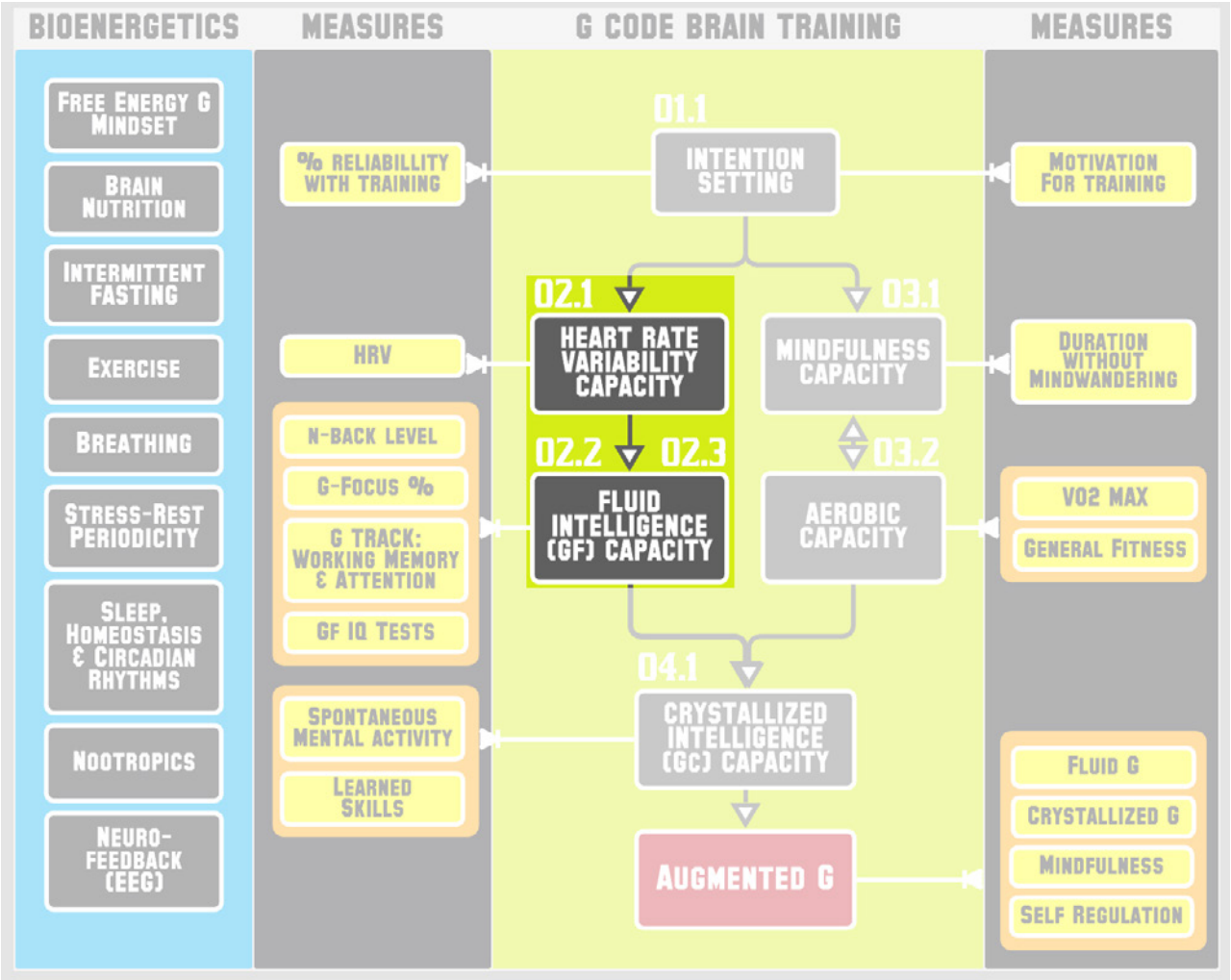
YOUR EXPECTATION OF SUCCESS?

How much do you really believe you will attain your training goal/s? Do you have a strong expectation of success? The improvements you see when training should help with your motivation, but sometimes there will be periods where you feel like you are not improving. Can you deal with that and be persistent in your training? You may have time this week to train, but what about next week - or subsequent weeks?

Consider the following, before committing to your training goals. If you feel like there is good reason not to expect full success, scale back on your training goals.

- Based on the practice sessions you've done, can you realistically imagine doing x sessions repeatedly over 6-8 weeks?
- How good are you generally at establishing new habits? How persistent are you when conditions are not ideal for sticking to your plans?
- How many new habits are involved in your training plan? If you already do regular exercise and meditation, and it's only coherence breathing and brain training to add for the 'ultra' program, then this is more likely to happen then if you don't do regular exercise or meditation.
- Where will you do your training, and when? Envisage the situation and how you'll make it happen in your daily routine. How will your training fit in with

Free energy =
‘Reality gaps’ between
your expectations
and what you experience
- informational entropy


BIOENERGETICS
MEASURES
G CODE BRAIN TRAINING
MEASURES
FREE ENERGY G MINDSET
BRAIN NUTRITION
INTERMITTENT FASTING
EXERCISE
BREATHING
STRESS-REST PERIODICITY
SLEEP, HOMEOSTASIS & CIRCADIAN RHYTHMS
NOOTROPICS
NEURO-FEEDBACK (EEG)
% RELIABILLITY WITH TRAINING
HRV
N-BACK LEVEL
G-FOCUS %
G TRACK: WORKING MEMORY & ATTENTION
GF IQ TESTS
SPONTANEOUS MENTAL ACTIVITY
LEARNED SKILLS
01.1
INTENTION SETTING
02.1
HEART RATE VARIABILITY CAPACITY
02.2 02.3
FLUID INTELLIGENCE (GF) CAPACITY
03.1
MINDFULNESS CAPACITY
03.2
AEROBIC CAPACITY
04.1
CRYSTALLIZED INTELLIGENCE (GC) CAPACITY
AUGMENTED G
MOTIVATION FOR TRAINING
DURATION WITHOUT MINDWANDERING
VO2 MAX
GENERAL FITNESS
FLUID G
CRYSTALLIZED G
MINDFULNESS
SELF REGULATION

02

HRV + Fluid Intelligence (Gf) Capacy Training Synergy

02.1

HRV Training

The i3 & HighIQPro apps train your **fluid intelligence (Gf) capacity**.

An increase in Gf capacity can be utilized for better reasoning, problem solving, comprehension, decision-making and learning - and can greatly augment your IQ.

But prior to doing Gf training you need to **prime your brain to be in an optimal state for far-transfer** - the transfer of the learning you do in playing the app games to G-demanding cognition in the real world. Increasing any of the following helps with far transfer based on the research:

1. Increase your brain's **network modularity**.
2. Increase your brain's pre-training **dopamine levels**.
3. Increase your resting **heart rate variability** (HRV).

Prior to every brain training session you do, ensure you have had a good night's sleep and try to train when you are feeling relaxed and attentive.

These prerequisites help with both your brain network modularity and dopamine levels, allowing for more effective learning and far-transfer.

Mindful Coherence Breathing

To optimize your **heart rate variability (HRV)** - a biomarker of higher-level cogn-tive functining and adaptability - you should do 10 minutes **coherence breathing** prior to your app-based Gf capacity training using i3 Mindware or HighIQPro. Coherence breathing is attained when your heart rate speeds up and slows down in a way that is synched with your breath cycle.

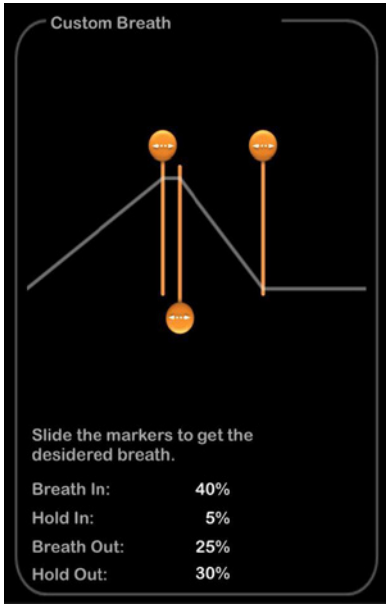
This exercise has been demonstrated to increase your heart rate variability - and to prove this you can compare your HRV prior to and after the breathing exercise.

HOW TO DO IT?

Sit comfortably and do a coherence breathing exercise, staying aware of the breathing process, while counting breaths internally.

Your overall breath cycle should be around 9-11 seconds, and a recommended breath cycle based on recent evidence for this kind of diaphragmatic breathing practice is a 4 second in-breath, a 2 second out-breath and a 4 secibd breath-hold after the out-breath. Thiss builds up blood carbon dioxide prior to the next in-breath. This so-called 'Bahya' (out-breath holding) version of coherence breathing appears to get more consistent HRV-improving results than standard 5 second in-breath, 5 second out-breath cycles.

You could experiment with the time intervals for out-breath and breath holding - perhaps preferring a 4-3-3 cycles rather than the 4-2-4 cycle. This will have the same HRV improving effect.



For guided breathing you could use an app such as HeartRate+ Coherence Pro.

This app measures your heart rate coherence using a camera-based finger sensor, and you can set customized breathing cycles that guide you with an indicator - as I have done here with a 10 second cycle.

After getting used to the cycle, you can optionally practice it independently from the app, with breath counting in a kind of relaxed mindfulness practice. See how many breath cycles you can do without losing track of where you are in the cycle. (You could check with your app periodically for accuracy).

This HRV training is useful not only before Gf capacity training, but also before any learning episode involving focus and effort.

02.2

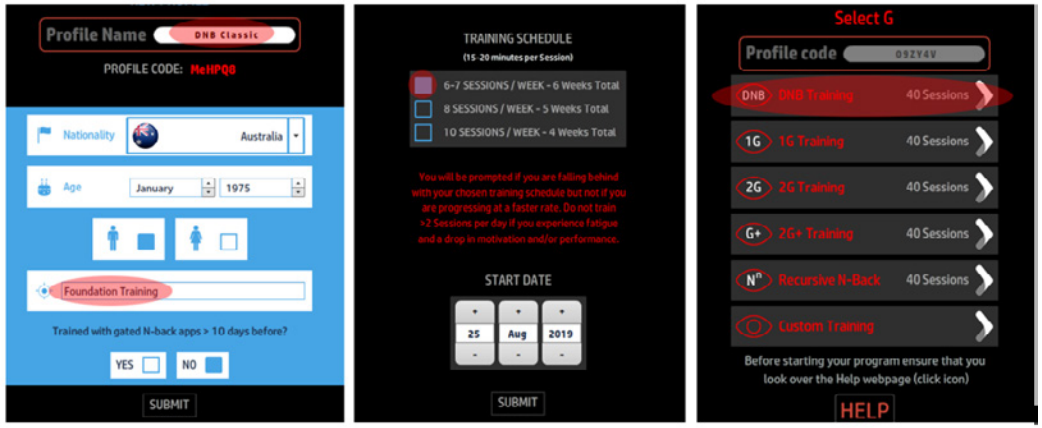
Gf Capacity Training

The i3 & HighIQPro apps training your **working memory**. Your working memory is critical for your fluid intelligence (Gf) capacity. The DNB Foundation Challenge is recommended if you are not familiar with dual n-back training. You will need to set up three different Profiles for this Challenge. You can set up unlimited Profiles in your brain training app.

DNB Foundation Challenge pt 1

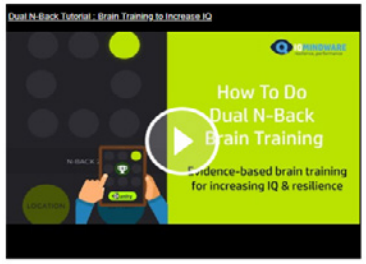
For the DNB Foundation Challenge, you first need to set up a Profile with the name 'DNB Classic'. For your Training Schedule, select 6-7 Sessions/week. You can select the IQ Puzzles or Tutorials if you want additional training materials, but this is not needed for the core Gf training gains. When you get to the Select G screen,

G CODE BRAIN TRAINING GUIDE



The normal recommendation is to train only one Session per day, for as many days as you have scheduled in your training Program. 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.

The classic dual n-back game is explained in my tutorial video at this link here.

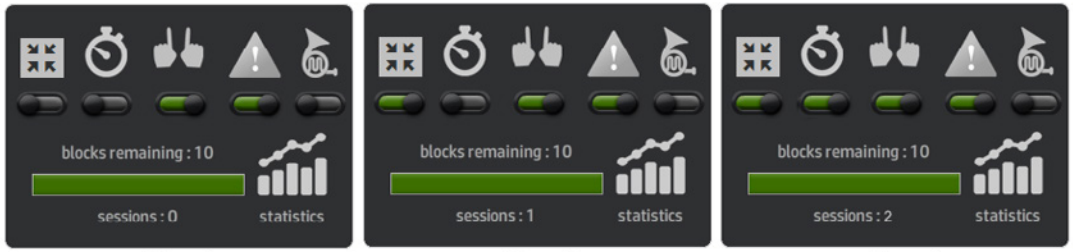


There are 10 game Blocks for you to get through for each day's Session. Each Session should last no more than 15-20 minutes and should be done after the **coherence breathing** exercise. Your Statistics graph showing your n-back performance over time can be accessed once you have completed your first 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. Error feedback can be turned off later, but is useful earlier in the learning process.



Phase 1 Phase 2 Phase 3

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 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.

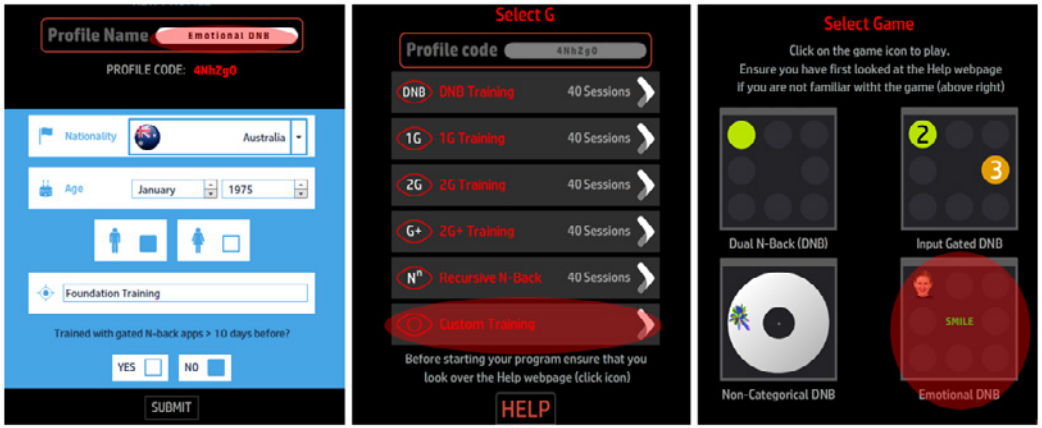
At the end of the Session have a look at your **n-back performance graph**. If you have achieved a 2-back average, then you should move to Phase 3. If not, do another Session of Phase 2 on your next day's training Session, and continue from Session to Session until you have reached a 2-back average with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

PHASE 3 (Optional)

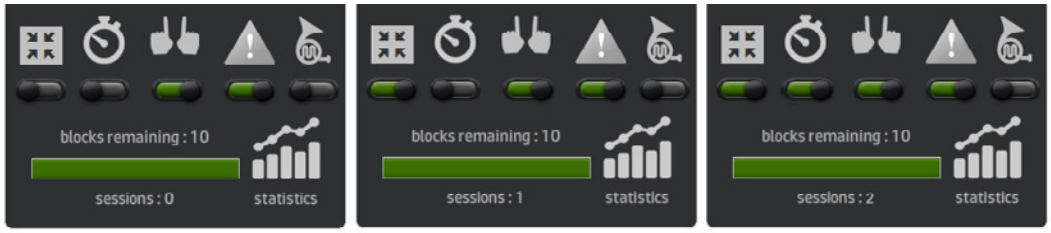
Between each training Block of a Session switch **Speed** (clock icon as shown above) ON and OFF - one block ON, one block OFF. This option increases the cognitive load by increasing the speed of the task. This Phase is optional. If you opt for this Phase, ensure you get an n-back Session average of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

DNB Foundation Challenge pt 2

You now need to set up a 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 here:



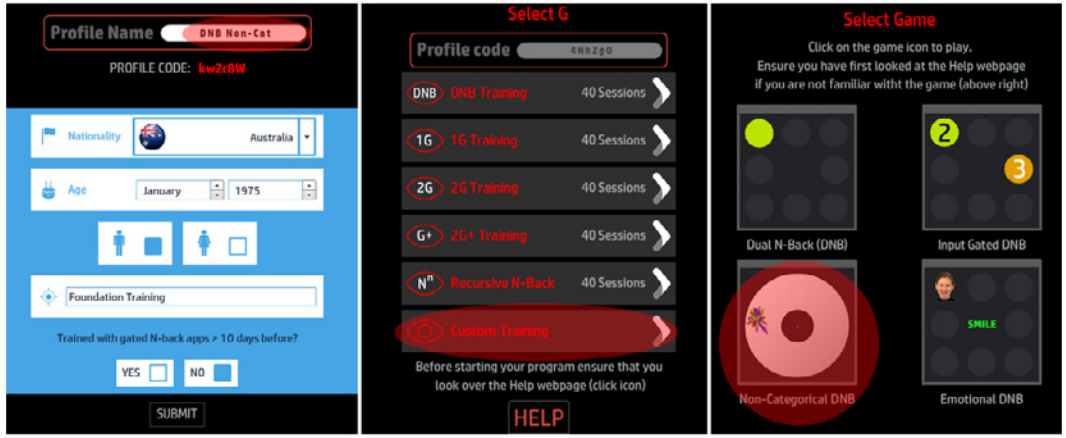
As in the classic DNB, there are 3 Phases in your training – and the Option settings you use are exactly the same as with the classic DNB game you have been playing.



Phase 1 Phase 2 Phase 3

DNB Foundation Challenge pt 3

You now need to set up a Profile with the name '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 here:



As in the other two DNB games, there are 3 Phases in your training (see screen-shots on previous pages).

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 full **Cross-Modal Training.**

DNB Foundation Challenge pt 4

For as long as you want in your total 6-8 weeks training, you can now alternate between the Classic DNB, Emotional DNB and Non-Categorical DNB for each daily Session - either Phase 2 or Phase 3 for each. This means that between blocks you can alternate with Interference / Speed switched ON/OFF. Variety is good.

This **multi-modal training** should help you triangulate on the underlying executive functions underlying fluid intelligence (Gf) capacity, rather than developing game-specific strategies that will not generalise.

This results in more powerful **far-transfer** effects to working memory, cognitive control and general inelligence (G).

DNB FOUNDATION TRAINING: TARGET LEVELS

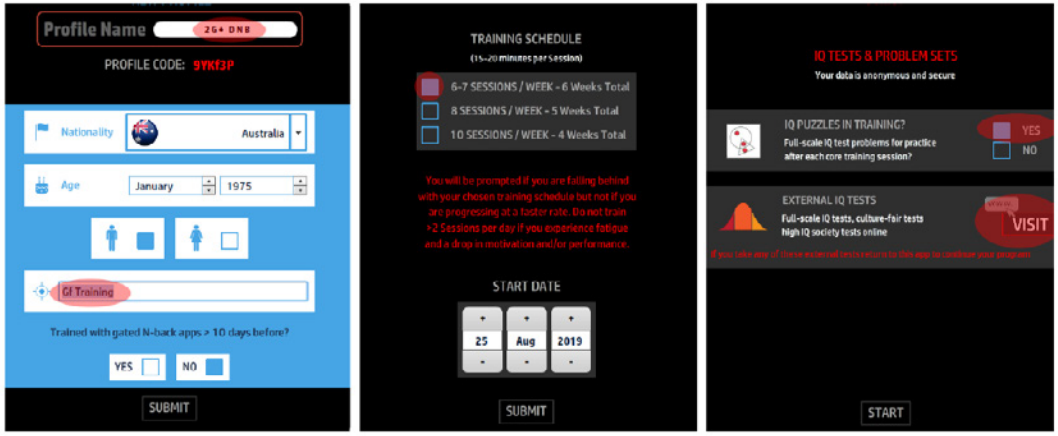
Look at your average n-back performance reach at least a 3-back level on each game. However, try to increase your n-back level as high as possible for each game.

If you achieve a 3-back for each game and maintain it for at least 4 weeks, you can be confident that your training has resulted in long-term neuroplasticity changes in core fluid intelligence (Gf) capacity.

If you want an even harder challenge you can try the **2G+ DNB Challenge.**

2G+ DNB Challenge

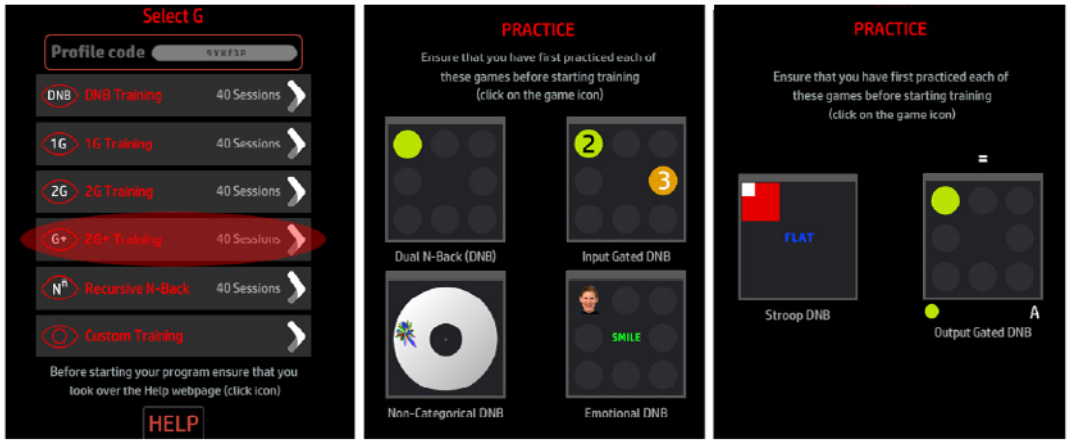
For the the 2G+ challenge, you need to set up a Profile with the name '2G+ DNB'. For your Training Schedule, select 6-7 Sessions/week. Optionally select Puzzles (in i3) or Tutorials (in HighIQPro). Selecting this provides access to full scale IQ test practice problems in i3 and strategy tutorials in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



The normal recommendation is to train only one Session per day, for as many days as you decided in your training program (see Section 0.11 above.

If you train within an hour of going to sleep, you may find that training gains are accelerated due to the consolidating effects of sleep. But this is not necessary.

Next you need to select the 2G+ game as shown here:



The 2G+ DNB Challenge requires competence in a number of component games first. The first part of your training involves being familiar with each of the 6 practice games shown above: Dual N-back, Input Gated DNB, Non-Categorical DNB, Emotional DNB, Stroop DNB and Output Gated DNB. Once you have reached a basic level of understanding of each of these games, you can progress to the actual 2G+ game that pulls them all together into one powerful Gf training program.

If you have come from the **DNB Foundation Challenge** you will only need to familiarize yourself with the Input Gated DNB, Stroop DNB and Output Gated DNB games, prior to starting the training Challenge. Try to attain an n-back level of 2 in each before continuing to the 2G+ DNB game.

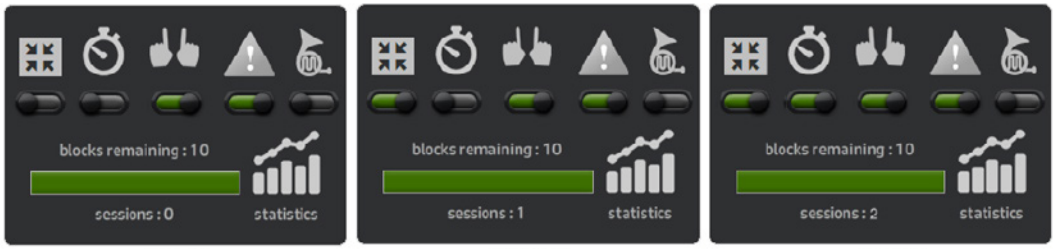
As in the DNB Foundation Challenge, you need to practice with **Response Switching** and **Interference** options switched on for some of the Blocks (see above). Also, earlier on in your training ensure you have **Error Feedback** on. This can be switched off later, as you develop more expertise.

THE 2G+ DNB GAME

This cross-modal game targets input and output gating from your current working memory store as you play the game – and this can help with 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.



Phase 1 Phase 2 Phase 3

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 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 in 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 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 training program, you can continue to alternate from Block to Block with Interference (and Speed if you opt to) switched ON and OFF. You can vary the combinations of ON or OFF for both options semi-randomly. The variety in your training enhances the IQ far-transfer from your training.

Your goal is to increase your n-back level in each game as high as you can.

The average of your n-back levels is a measure of your fluid intelligence (Gf) capacity. Anywhere above a 3-back show a high Gf capacity.

02.3

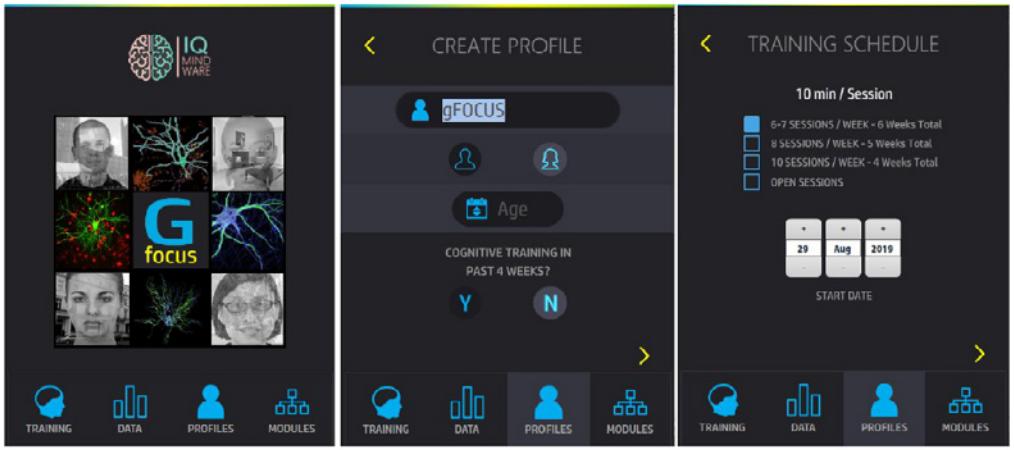
Gf Capacity Training

You can optinally supplement your DNB working memory training (Section 0.21) with **attention focus** training using the **gFOCUS** app. It is recommended you do a session of your DNB training AND a session of gFOCUS training on the same day - either together or at two different times during the day - for maximum Gf capacity gains.

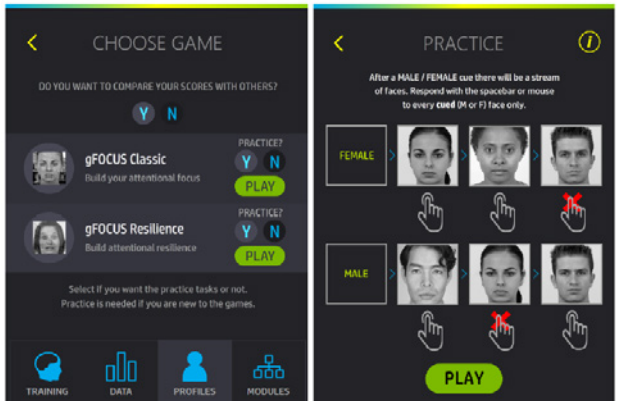
You can purchase gFOCUS for $15 as an existing IQ Mindware customer by e-mailing admin@iqmindware.com. Ask for the existing customer discount.

gFOCUS Challenge

As with the i3 Mindware and HighIQPro apps, you can set up multiple Profiles in

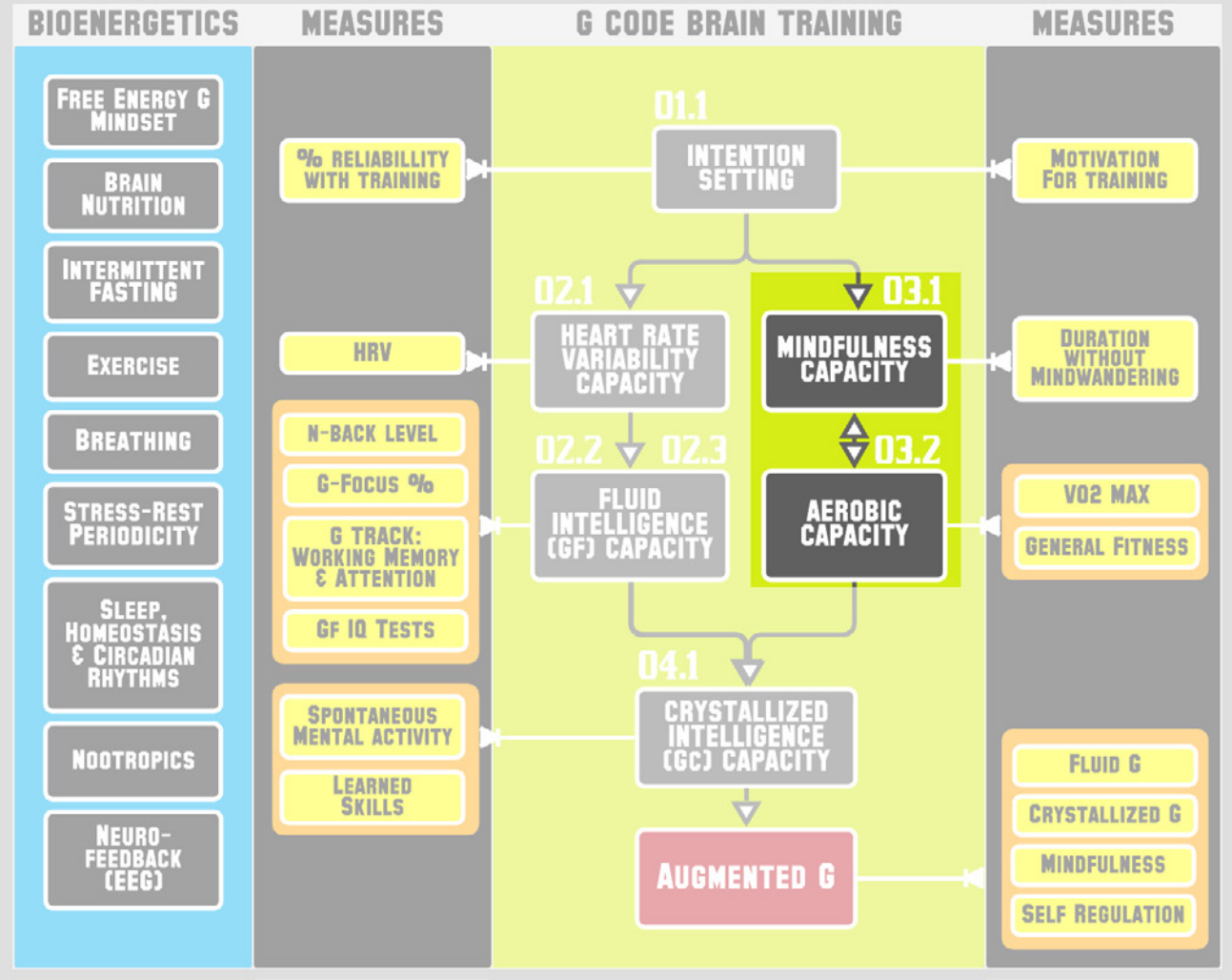


For the gFOCUS Challenge select the gFOCUS Classic game shown here in the screenshot – along with 'Y' for practice.



On the principle that varying your training in different modalities increases training gains, once you are familiar with the gFOCUS Classic game, you can optionally create a second Profile to train with gFOCUS Resilience.

Additionally, this provides evidence-based training for emotion regulation.


BIOENERGETICS
MEASURES
G CODE BRAIN TRAINING
MEASURES
FREE ENERGY G MINDSET
BRAIN NUTRITION
INTERMITTENT FASTING
EXERCISE
BREATHING
STRESS-REST PERIODICITY
SLEEP, HOMEOSTASIS & CIRCADIAN RHYTHMS
NOOTROPICS
NEURO-FEEDBACK (EEG)
% RELIABILLITY WITH TRAINING
HRV
N-BACK LEVEL
G-FOCUS %
G TRACK: WORKING MEMORY & ATTENTION
GF IQ TESTS
SPONTANEOUS MENTAL ACTIVITY
LEARNED SKILLS
01.1
INTENTION SETTING
02.1
HEART RATE VARIABILITY CAPACITY
02.2
02.3
FLUID INTELLIGENCE (GF) CAPACITY
03.1
MINDFULNESS CAPACITY
03.2
AEROBIC CAPACITY
04.1
CRYSTALLIZED INTELLIGENCE (Gc) CAPACITY
AUGMENTED G
MOTIVATION FOR TRAINING
DURATION WITHOUT MINDWANDERING
VO2 MAX
GENERAL FITNESS
FLUID G
CRYSTALLIZED G
MINDFULNESS
SELF REGULATION

03

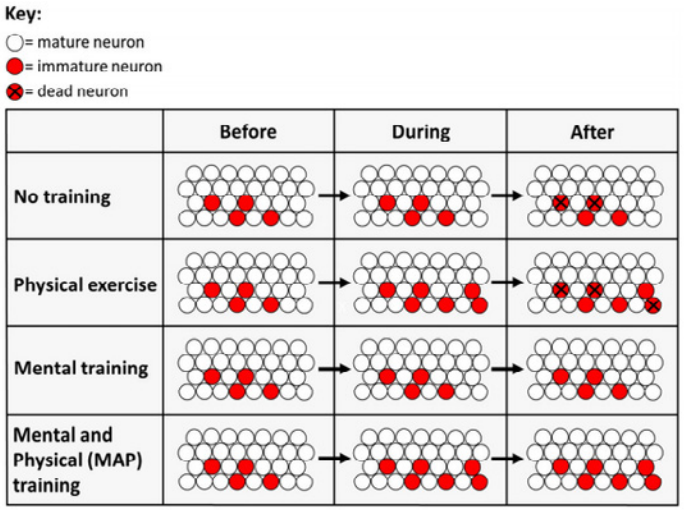
Mindfulness Capacity + Aerobic Capacy Training Synergy

Neurogenesis & MAP training

As Improving G depends on the birth of new brain cells (neurogenesis) in part of the brain key to memory and learning called the **hippocampus**.

There is a daily production of several thousand (e.g. 5000-10,000) new hippocampal neurons - a process called **adult neurogenesis.** Some of these cells will survive and integrate into functional neural circuits that help cognition but within just 2 weeks many will die through programmed cell death.

Researchers have looked extensively at the cognitive performance effects of combining aerobic exercise with meditation, and there is a strong cross-training synergy effect. The neuroscientist Tracy Shors calls this MAP (Mental And Physical) training.



03.1

Mindfulness Capacity Training

This element of G CODE training needs to be combined with an aerobic capacity building workout. The meditation should be at least 10 minutes and can be done **before or after** your workout, depending on your preference.

Mindfulness meditation

This meditation involves sustaining selective attention moment by moment on a

a chosen object, such the sensations of breathing or the beat of a metronome.

This is a different type of meditation from open monitoring meditation in which attention shifts mindfully and non-reactively to anything that occurs in experience without focusing on without any explicit object that you focus on.

In this practice you constantly monitor the quality of your attention while holding focus on an attentional anchor. Let's say that you are focusing on the sensations caused by breathing. You might notice that the focus has shifted to the pain in your knee or to thoughts about what you have to do at work. The practice requires that you recognize that your attention has been distracted, and then 'release' the distraction, returning to the intended anchor such as the breath.

Mindfulness meditation thus develops three skills that regulate attention:

1. A **meta-monitoring awareness** that allows you to quickly recognize distractions as they occur, without getting lost in them for prolonged periods.
2. The ability to **disengage from distractions** without further involvement. The ability to let go of, or shift your attention away from, thoughts, emotions, sensations, that may be diverting your attention.
3. The ability to **re-focus** on the chosen object of attention.

Progress can be measured by the degree of effort required to sustain the intended focus, or how often you need to break a distracting train of thought and reset your focus on the anchor. You may also notice that as you practice, your state of imeditative absorption develops.

As a beginner you are having to process more distractions and the three attention-regulation skills are engaged more frequently. As you advance, attention.

settles more stably on the chosen anchor. At the most advanced levels, the three attetionn skills are needed less and less frequently, and the ability to sustain focus becomes effortless.

Mastery of this kind of meditation comes with a sense of metabolic lightness and vigor. There is less emotional reactivity, and the need for sleep may be reduced.

RELAXED, NON-JUDGMENTAL CONCENTRATION

The focus in mindfulness meditation requires a kind of **relaxed attention** – not one that is over-controlling. There is often a sense of making an effort to sustain concentration, of striving to control the mind and make something happen. It is important to not become caught in a striving effort. It is easy to be tempted into trying to achieve something, such as staying with the breath for much of the sitting, and then evaluating what is happening as a "good" or "not good" meditation.

Ultimately what is wanted is a clear and relaxed attention without continual striving and evaluation.

HOW TO DO THE MEDITATION

There are lots of web resources for how to do focused attention or breath focused meditation. Here I pick out some of the standard practices and points of advice.

MEDITATION POSITION

The position you meditate in is important. Sit in a comfortable position, where you feel upright, balanced and relaxed. Back straight, shoulders relaxed, head up. Close your eyes and relax the muscles around the eyes and face. You could choose

to sit on a chair. Or you could use a meditation cushion (or any substitute) and sit cross-legged on a mat or carpet – like this:

MEDITATION PRACTICE 1

Time required: 10 minutes (or longer).

This meditation has four progressive stages leading to a higher levels of meditative absorption or concentration. You could divide each session up equally, and use your phone's timer to mark the transitions.

You could divide each session up equally, and use a timer to mark the transitions.

STAGE 1

In the first stage you use counting to stay focused on the breath. Take a deep, breath, expanding your belly and keeping your shoulders relaxed. After the out-breath, just before your next in-breath, you count one. You then repeat the breath cycle and at the end of the second out-breath count two, and so on up to ten. And then you start again at one. If you lose track of your counting during this practice, simply start your counting again at one.

STAGE 2

In the second stage you subtly shift where you attend to as you breathe, counting before the in-breath, anticipating the breath that is coming, but still counting from one to ten, and then starting again at one.

STAGE 3

In the third stage you drop the counting and simply attend to the breath as it comes in and goes out, feeling the sensations of the chest and belly and nose as you breath in and out. If you get distracted by sensations in other parts of the body, or thoughts or images that take you out of the zone of your focus, gently turn your attention back to the breath and the sensation it provides.

STAGE 4

In the final stage the focus of concentration narrows and sharpens, so you pay attention to the subtle sensations where the breath enters and leaves the body. Once again, you should be gaining useful practice in the three attention skills of monitoring, disengaging from distraction and re-focusing on the focal point.

The object of focus need not be the breath. It could be internal or external, for example:

- A mantra – repeating a word, phrase, or sound over and over
- A visualization – picturing a place or an object
- A body part – focusing on a particular area or sensation in the body
- A candle flame– looking at a flame to focus the mind
- A sustained sound – such as listening to a gong or chime

MEDITATION PRACTICE 2

Time required: 10 minutes (or longer).

This is essentially doing just Stage 3 in the 4 stage method above.

1. Take a deep, cleansing breath, expanding your belly and keeping your shoulders relaxed, and hold it in for the count of six. Exhale, and repeat twice more.

2. Breathe normally, and focus your attention on your breathing. As you breathe expand your belly rather than moving your shoulders up and down. This is called abdominal breathing. Don't breathe too quickly or too slowly; just breathe at a natural rate, but more deeply. You could try to breath out for a little longer than you breath in which has a relaxing effect. If your thoughts drift toward the stresses of the day ahead or of the day behind you, gently refocus on your breathing and remain in the present moment.

Continue this for as little or as long as you like, and as you continue you should notice that your body is more relaxed and your mind is more centered.

MEDITATION PRACTICE 3: OPEN MONITORING EXTENSION

Time required: 10 minutes (or longer).

This style of meditation is often built on a foundation of focused attention. You could start a practice off with focused attention (perhaps the first 10 minutes) and then proceed to open monitoring meditation.

Instead of concentrating on something, your attention is open and remains **aware of everything that you are experiencing**.

All experiences are perceived as they happen, with a goal of remaining non-judgemental toward oneself, and not engaging your motivations such as 'I need to do this' or 'I should have done that'.

You can be aware of the stream of consciousness for any of these:

- Thoughts
- Feelings
- Memories
- Sounds
- Smells
- Bodily sensations

The objective is to be 'present' in a non-judgemental awareness of your spontaneous experience. Mindfulness meditation reduces focus on our self-critical thoughts and ego-related cognition, but makes us more mindful of a broader

range of personal emotions and experiences. This practice is of benefit for the rational detachment needed to be less prone to ego-related cognitive biases involving emotions, fears and desires. It is also beneficial for general wellbeing.

COMMON ISSUES FOR MEDITATORS

MIND WANDERING – GETTING LOST IN THOUGHT

If you find your thoughts drifting a lot at first, don't worry that you're doing it 'wrong. Noticing that you've drifted and refocusing to your breathing is part of the practice. At first, you may be surprised at how active and uncontrolled your mind is. Don't be concerned but accept and patiently 'sit with' whatever comes up. As the meditation expert Tara Brach advises:

"There is no need to get rid of thoughts; this is not the purpose of meditation. Rather, we are learning to recognize when thinking is happening so we are not lost in a trance—believing thoughts to be reality, becoming identified with thoughts. Because we are so often in a thinking trance, it is helpful to quiet down some. Just like a body of water stirred up by the winds, after being physically still for a while, your mind will gradually calm down…It takes practice to distinguish the trance of thinking - fantasy, planning, commentary, dreamy states - from the presence that directly receives the changing experience of this moment."

PHYSICAL PAIN & RESISTANCE

In addition to mental business, it is inevitable that we all experience some unpleasant physical sensations. If you are not used to the posture, there may be some discomfort in simply sitting still. And you might become aware of tensions in the body that were ignored because of being preoccupied by day to day

concerns. Or, you might be injured or sick, and become more directly aware of the pain that comes with that condition.

Meditating with physical discomfort may involve simply shifting your posture. Otherwise we could use a mindfulness technique to open some space for focused attention breath meditation. Allow the unpleasantness to float in awareness, noticing how it is experienced in the body and how it changes, and notice how you are relating to the sensations.

Is there motivational resistance? If so, let these attitudes be included with a mindful attention. This kind of'mindfulness should then allow for more relaxation and spaciousness to re-focus on the breath. If the physical unpleasantness is intense and wearing you out, you could try more directly focusing your attention on your breath.

ADDITIONAL TIPS

- Give it time - meditation takes practice. If you're expecting to get immediate results you may not stick with it.
- If one type of focused attention meditation doesn't work for you, try another one. Experiment to find one that works for you. Also note that focused attention meditation cultivates concentration and this is not the same outcome as open monitoring meditation.
- Consider meditating beyond the recommended 10 minutes, after you have been doing it a while. With practice, meditation becomes easier and more effective.
- Consider using guided meditations that you download or stream from the internet.
- If you have the time and motivation, consider signing up for a retreat - one day, a weekend, or longer. The experience will deepen your practice.

03.2 Aerobic Capacity Training

AEROBIC WORKOUTS

'Aerobic' means 'with air'. It is a mode of energy production with the use of inhaled oxygen which can be sustained over long durations.

The **V02max** metric is a measure of aerobic capacity. VO2Max is the maximum amount of oxygen a person can utilize during intense exercise.

Aerobic exercise sustained at a moderate pace (aiming at 50-85% of maximum heart rate) for a minimum of 20 continuous minutes has a host of health benefits relating to weight management, blood pressure, cholesterol, lowered risk of heart attack, diabetes and cancers. It also has well-established cognitive resilience and performance benefits, and is effective in triggering the release of the brain-derived neurotrophic factor (BDNF) needed for growing new hippocampal brain cells and enhancing cognition.

Here's a table from the American Heart Association to help guide your aerobic training if you have the use of a heart rate (HR) monitor.

The figures are averages, so use them as general guidelines.

Age	Target HR Zone 50-85%	Average Maximum Heart Rate, 100%
20 years	100-170 beats per minute	200 beats per minute
30 years	95-162 beats per minute	190 beats per minute
35 years	93-157 beats per minute	185 beats per minute
40 years	90-153 beats per minute	180 beats per minute
45 years	88-149 beats per minute	175 beats per minute
50 years	85-145 beats per minute	170 beats per minute
55 years	83-140 beats per minute	165 beats per minute
60 years	80-136 beats per minute	160 beats per minute
65 years	78-132 beats per minute	155 beats per minute
70 years	75-128 beats per minute	150 beats per minute

Important Note: A few high blood pressure medications lower the maximum heart rate and thus the target zone rate. If you're taking such medicine, call your physician to find out if you need to use a lower target heart rate.

If you don't have an HR monitor, a recommended training level is that you are able to carry on conversations - or at the most intense, communicate with single sentences - while doing the activity. The training is not so intense that you tire after a few minutes, or that you can only speak single words while gasping for breath.

Some popular aerobic training options are:

- Hiking (varied terrain)
- Power-walking
- Running
- Swimming
- Cycling
- Fastpacking

ANAEROBIC WORKOUTS

'Anaerobic' means 'without air'. It is a mode of energy production without oxygen - typically at **high intensity** and for **short durations**.

There are two anaerobic energy systems. One (the ATP-CP system) provides immediate energy for instantaneous bursts of effort such as throws, sprints or jumps and can last from 0 - 10 seconds. The other (the lactic acid system), supplies energy for more sustained hard effort, lasting 10 - 120 seconds. This is associated with the feeling of burning in your muscles due to the build-up of metabolites such as lactate.

The evidence indicates that anaerobic training can increase aerobic capacity and VO2max, stimulate neurogenesis and improve cognition. Anaerobic training is an excellent complement to lower-intensity aerobic exercise.

Anaerobic training options include:

- High intensity interval training workouts (HIITs)
- Sprints and other high intensity track-and-field sports
- Circuit resistance/strength training
- Activities in some sports such as MMA

ONLINE GUIDES & APPS

There are many online resources and apps out there for both aerobic training and high intensity interval training or resistance training.

One suggestion for endurance training is the app Strava. You can connect to friends and a wider community through this free app, and it helps with motivation by maintaining extensive stats on your achievements and progress.

G CODE RECOMMENDATIONS

1. VARIED AEROBIC AND ANAEROBIC TRAINING

We tend to train in the 'middle ground' between easy aerobic training and high intensity interval training. One recommendation is to create a fork in your training and alternate between longer distance low-intensity aerobic training with high intensity interval training or resistance training.

2. SETTING TRAINING GOALS

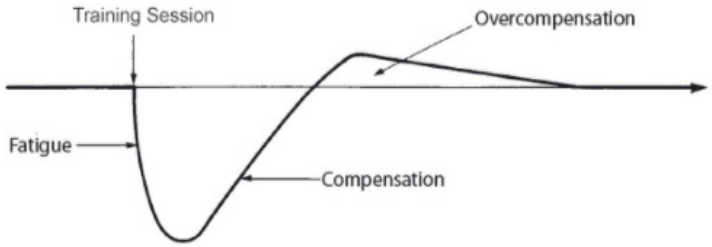
Another recommendation is to set yourself challenges that inspire you. For some running examples -

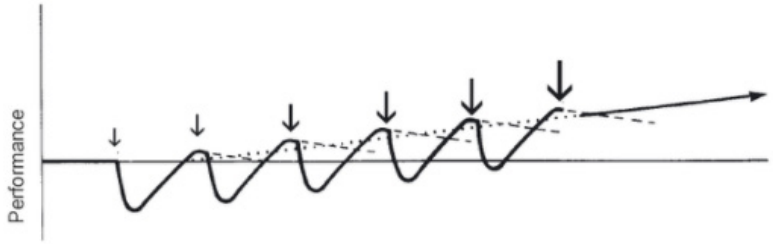
- To run 50 miles in a month (depending on your starting fitness level).
- To run your fastest 10km race.
- To run your fastest 100m sprint.
- To run a half marathon
- To run in a trail-running team race.
- To do an over-night fastpack run.

3. PROGRESSIVE LOADING

Biological systems can adapt to loads that are higher than the demands of normal daily activity. A given training session results in fatigue, and then a recovery ('compensation') period. If your training is sufficiently intense, there will be an increase in potential performance through both physiological and central nervous system (neuroplasticity) change - called 'overcompensation'.

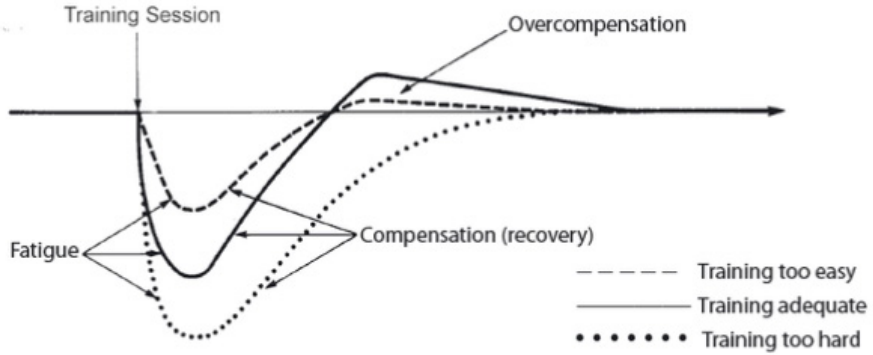
Training loads must be increased gradually, however, to allow for adaptation and avoiding injury or burnout. Varying the type, volume, and intensity of the training load allows for recovery. Loading must continue to increase incrementally as adaptation occurs - otherwise the training effect will plateau and further improvement will not occur.





3. RECOVERY AND HORMESIS

Adaptations to the demands of training occur slowly over long periods of time. Efforts to accelerate the process may lead to overtraining and burnout. On the other hand an inadequate training load will fail to result in raised performance capacity ('overcompensation').



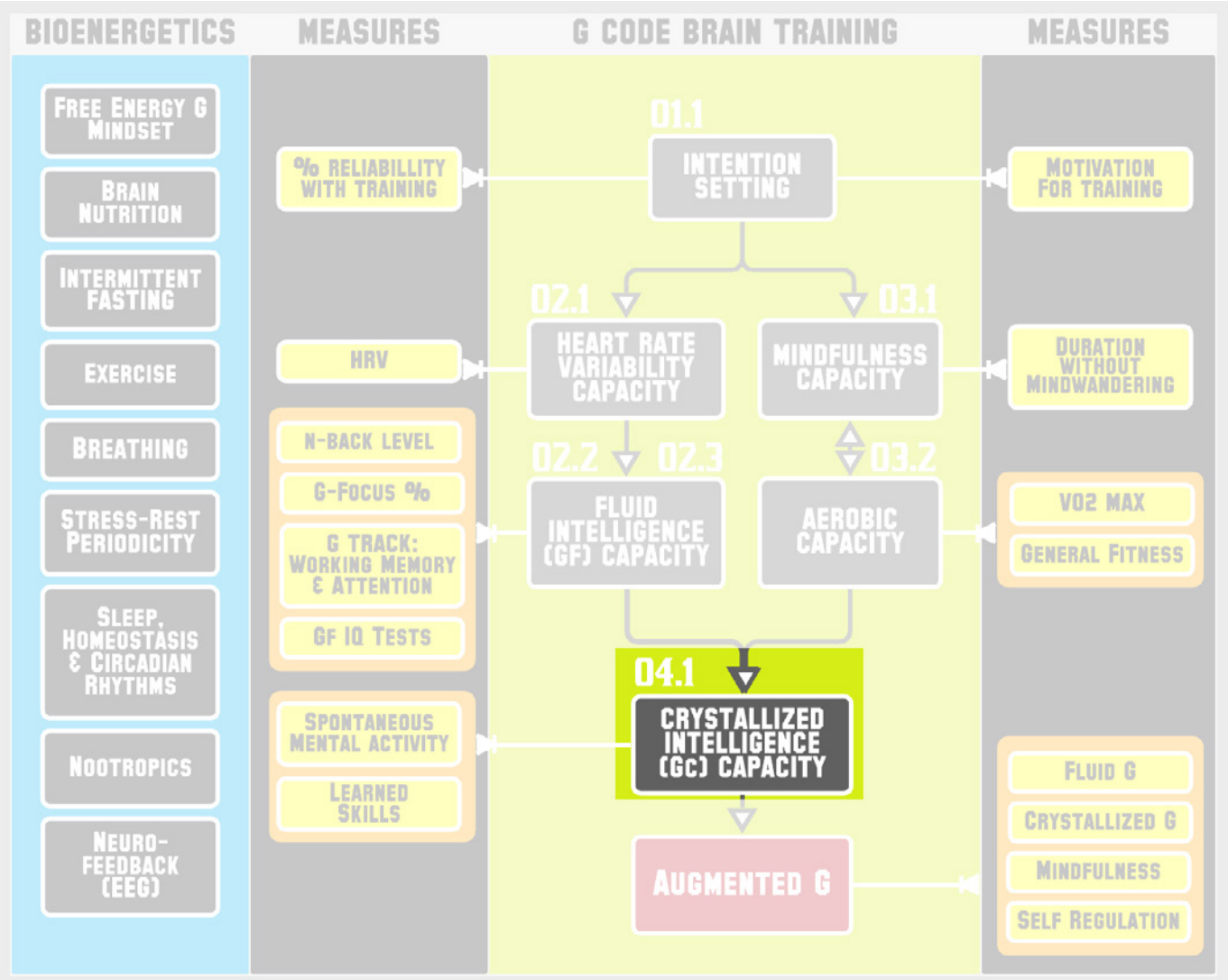
Training gains tap the biological response called the hormesis - a biphasic response to different levels of stress. The right amount of stress results in broad health, resilience and performance benefits, but too much stress results in diminishing returns, inflammation and burnout.

What is critical for progression is that you learn to regulate (1) adequate training intensity, and (2) adequate recovery periods where your main goals are to rest, sleep well and eat nutritious, brain healthy food. Periodic rest and recovery periods are absolutely critical to effective training programs.

Monitoring your daily morning **heart rate variability** using an app such as HRV4Training can help a lot with this kind of regulation.

G = capacity to process free energy

problem solve


BIOENERGETICS
MEASURES
G CODE BRAIN TRAINING
MEASURES
FREE ENERGY G MINDSET
BRAIN NUTRITION
INTERMITTENT FASTING
EXERCISE
BREATHING
STRESS-REST PERIODICITY
SLEEP, HOMEOSTASIS & CIRCADIAN RHYTHMS
NOOTROPICS
NEURO-FEEDBACK (EEG)
% RELIABILLITY WITH TRAINING
HRV
N-BACK LEVEL
G-FOCUS %
G TRACK: WORKING MEMORY & ATTENTION
GF IQ TESTS
SPONTANEOUS MENTAL ACTIVITY
LEARNED SKILLS
01.1
INTENTION SETTING
02.1
HEART RATE VARIABILITY CAPACITY
03.1
MINDFULNESS CAPACITY
02.2
02.3
FLUID INTELLIGENCE (GF) CAPACITY
03.2
AEROBIC CAPACITY
04.1
CRYSTALLIZED INTELLIGENCE (GC) CAPACITY
AUGMENTED G
MOTIVATION FOR TRAINING
DURATION WITHOUT MINDWANDERING
VO2 MAX
GENERAL FITNESS
FLUID G
CRYSTALLIZED G
MINDFULNESS
SELF REGULATION

04

Learning & crystallized intelligence (Gc) capacity training synergy

Hypnagogic states

Non-directive meditation is not focused attention or open monitoring meditation, but a kind of deep relaxation meditation, a 'hypnagogic state' between being awake and sleeping - sometimes called 'dynamic sleep'.

Research shows that non-directive meditation practiced within 4-5 hours of a learning episode, helps augment **memory consolidation** and accessibility of the material learned - that is, **crystallized intelligence (Gc)**. Like sleep, it can help with idea fluency and creative insight in our problem solving. It targets the connectivity and functioning of the **Default Mode Network (DMN)**. The DMN is the network subserving our crystallized intelligence and our resting state preparedness and adaptability.

Non-directive also induces the parasympathetic nervous system's **relaxation response**, releasing from sympathetic 'fight or flight' preoccupations of intense challenges which is important for optimally tapping the hormesis response (see above).

For these reasons, non-directive meditation works synergistically following - within a few hours - periods of focused and challenging learning or problem solving, including your fluid intelligence capacity brain training.

04.1

Gc Capacity Training

This element of G CODE training should follow within 4 hours of a learning episode.

Yoga Nidra

There are many online guided yoga nidra practices that you could experiment with until you find one that suits you.

Here is a guided yoga nidra from Julie Hand on the Bulletproof Youtube channel..

And here is Jennifer Piercy's guided yoga nidra practice as an aid to sleep as well as a practice in its own right.

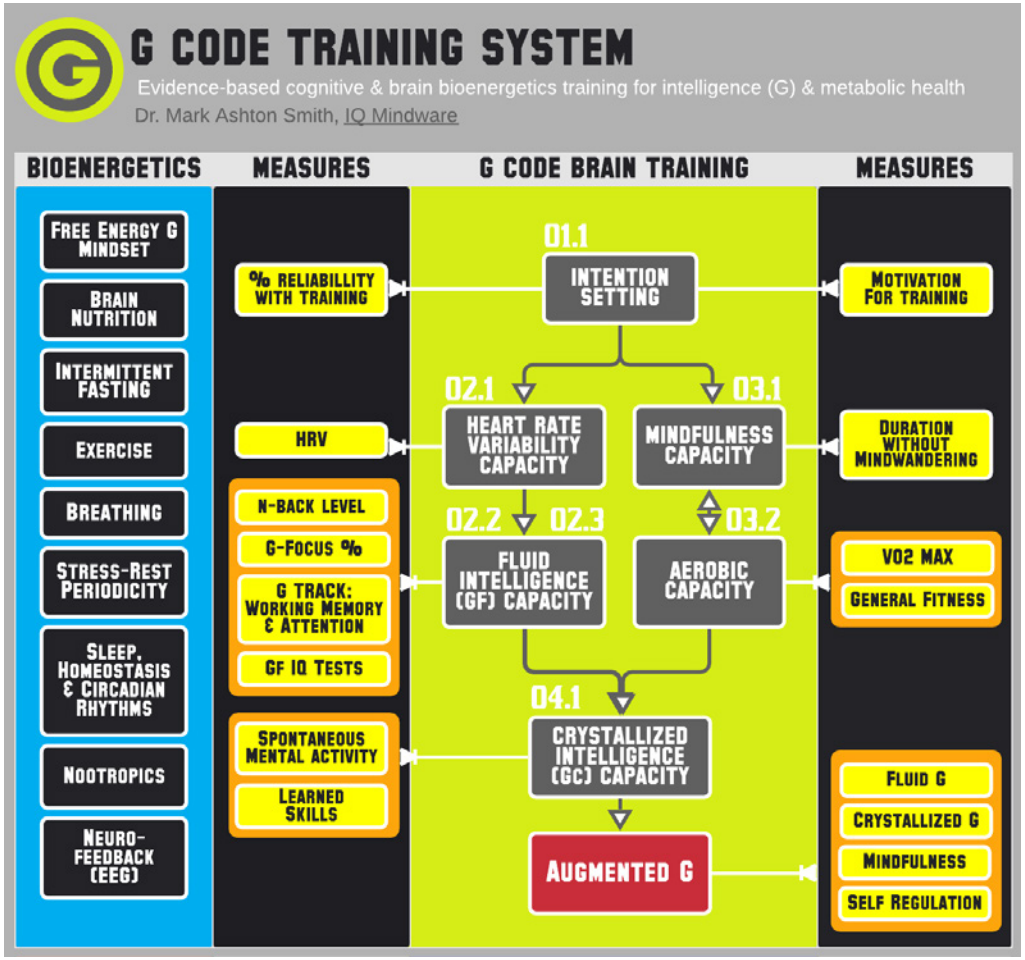
Both yoga nidra and sleep can be combined in memory consolidation and augmenting crystallizing intelligence capacity.

Acem/Transcendental meditation

If you want to follow a systematic meditation program, examples of non-directive meditation with Gc capacity benefits include Acem meditation and Transcendental Meditation which Acem meditation has adapted into a less 'metaphysical' system.

These meditations make use of mantras or sets of syllables which are repeated internally. You allow your mind to wander spontaneously, but in a space where the mantra is still maintained. This process helps develop non-judgmental detachment from the content of your mind-wandering but allows you to get absorbed in it.

G CODE BRAIN TRAINING GUIDE



DO YOU HAVE QUESTIONS? CONTACT ME.

You can find my apps on the IQ Mindware website. I also offer cognitive coaching.

Mark Ashton Smith, Ph.D.
IQ Mindware
HRP LAB LTD
Cambridge, England
E: mark@iqmindware.com

Link : http://www.iqmindware.com