COMPUTER-BASED BRAIN FITNESS PROGRAMS FOR TRAUMATIC BRAIN INJURY REHABILITATION

Katherine W. Sullivan  M.S., CCC-SLP, CBIS
Walter Reed National Military Medical Center
Center for Neuroscience and Regenerative Medicine
Defense and Veterans Brain Injury Center
The views expressed in this lecture are those of the author and do not necessarily reflect the official policy or position of the Department of the Navy, Army, or Air Force, the Department of Defense, nor the U.S. Government.

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I have no relevant financial or nonfinancial relationships with the products described, reviewed, evaluated or compared in this presentation.

Unclassified
Goals

- Describe the Brain Fitness Center (BFC) at Walter Reed National Military Medical Center (WRNMMC)
- Demonstrate a variety of the programs used in our BFC
- Discuss ways to choose the right products for your setting and your patients
- Provide tips and tools for starting a similar “Brain Gym” concept at your facility
- Review evidence-based research in the literature and ongoing studies at WRNMMC
Patient Population

Wounded Warriors are Unique

Post-Deployment Syndrome

- Co-Morbidities
  - Poly-trauma
  - PTSD
  - Other(s)

- Prolonged transition phase

- Future (employment, living, family) is often unknown

- Blast injuries similar to civilian mTBIs, or not?

Lessons Learned May or May Not Translate to Civilian Care
24 year old male injured in OEF in an IED blast in December of 2010. He was diagnosed with a mTBI and is receiving cognitive rehab for the complaints listed in the circle below.
Providing Novel Rehabilitation Approaches for our Population

Walter Reed National Military Medical Center (WRNMMC)

Identified a population:
- Any OIF/OEF service member with subjective complaints of cognitive dysfunction

Determined access:
- 225-250 service members with the diagnosis of a traumatic brain injury (TBI) living on base at any time

Continue to learn if appropriate:
- Mostly a very motivated, self-driven population; however, not always medically stable, available for ideal dosing, or typically of mTBI
Opened its doors in November of 2008 with clinical, research and education goals

To serve the 225-250 service members with the diagnosis of a traumatic brain injury (TBI) living on base at any given time

Will see any patient with subjective cognitive complaints following deployment
# Walter Reed Brain Fitness Center Goals

<table>
<thead>
<tr>
<th>Clinical</th>
<th>Education</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Supplement cognitive</td>
<td>• Create a center for cognitive and</td>
<td>• Develop and implement research protocols to improve</td>
</tr>
<tr>
<td>rehabilitation by using</td>
<td>TBI resources for patients and their</td>
<td>our understanding of computer-based cognitive</td>
</tr>
<tr>
<td>computer-based programs to</td>
<td>families</td>
<td>rehabilitation outcomes</td>
</tr>
<tr>
<td>enhance recovery</td>
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<td></td>
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</tbody>
</table>

- Walter Reed Brain Fitness Center Goals
Total BFC Patient Population
as of November 2012

- 307 Patients have visited the BFC
  - 207 TBI
  - 100 Other CVA, PTSD, ADHD, Aneurysm, Chemofoq etc.

- Average of 24 Sessions (1 to 300+) in 96.0 BFC days

TBI Severity

- Mild 141
- Moderate 32
- Severe 19
- Penetrating 15
Patient Participation

- BFC patient participation is individualized based on:
  - Referral request
  - Guided recommendation (goals, complaints, severity)
  - Patient preference

- Goal of daily 6-8 week program
  - A second or third 6-8 week program is available for appropriate patients
  - Not always realistic

- Communication with providers
  - Rehab rounds, family meetings, etc.
  - Notes in medical charts
  - Other as needed
BFC Clinical and Research Outcomes Measures

- Objective cognitive assessments and self-report questionnaires are utilized at the time of the intake evaluation, at approximately 6-8 weeks, and at the time of discharge or discontinuation.

- Automated Neuropsychological Assessment Metrics (ANAM)
- Mayo-Portland Adaptability Inventory-4 (MPAI-4)
- Neurobehavioral Symptom Inventory (NBSI)
- Satisfaction with Life Scale (SWLS)
- Post-Traumatic Stress Disorder Checklist – Civilian Version (PCL-C)
How Brain Training is used at WRNMMC?

Average patient visits: **112 per month**

- Different reasons providers refer:
  - Cognitive training not compensation
  - Homework that can be intensive and monitored
  - Maintenance and transition for discharge with software
  - Schedule filler or distraction

- Different reasons patients stay:
  - Empowerment, self-betterment
  - Perceived or real functional benefits
  - Self-driven (select group); motivated
Brain Fitness Center Patient Satisfaction Survey

This computer program helped my recovery process:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.1</td>
<td>4</td>
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</tbody>
</table>

I thought the time commitment to the program was realistic and easy to accomplish:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td></td>
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</tbody>
</table>

I found the content of the computer program to be fun and engaging:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.1</td>
<td>4</td>
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</tbody>
</table>

I found the content of the computer program to be appropriately challenging:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

I would like to have this computer program at home:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.1</td>
<td>4</td>
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<td></td>
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</tbody>
</table>

I am glad I participated in this program:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.6</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I would recommend this computer program to other service members:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.7</td>
<td>4</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Access to education materials and a brain injury specialist was helpful:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3.5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

I felt this computer program helped me in the following areas (circle all that apply):

- Memory: 56
- Concentration/Attention: 64
- Math: 17
- Decision Making: 28
- Real-world tasks: 15
- Listening: 52
- Visual tasks: 38
- Vocabulary: 14

Results of the first 71 completed surveys:

Above: Number of participants, out of 71, who felt the program helped in various areas.

Left: Average responses to survey questions. 0 (Strongly Disagree) to 4 (Strongly Agree)

“Program is very worthwhile. Good learning environment and the progressive challenge is entertaining. I would love a copy of the program, and I believe each unit should have a program similar to the BFC.”

- Dr. Evil*

“Great program helped me in life/work environments… Recommend to everyone. This is good and very helpful.”

- John Smith*

“It has been a pleasure working with all of you guys in the Brain Fitness. I hope a lot of soldiers will take part in this. I benefit a lot from the Brain Fitness. Thanks again. Roger out.”

- Harrison Ford*

* Alias chosen and used by patient during each computer session
Patient Satisfaction
Per Program (33 Dakim, 28 Posit, 5 Both)

Self-Perceived Areas of Improvement
Total

<table>
<thead>
<tr>
<th>Area</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>60</td>
</tr>
<tr>
<td>Concentration/Attention</td>
<td>50</td>
</tr>
<tr>
<td>Math</td>
<td>40</td>
</tr>
<tr>
<td>Decision Making</td>
<td>30</td>
</tr>
<tr>
<td>Real-World Tasks</td>
<td>20</td>
</tr>
<tr>
<td>Listening</td>
<td>15</td>
</tr>
<tr>
<td>Visual Tasks</td>
<td>10</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5</td>
</tr>
</tbody>
</table>

Self-Perceived Areas of Improvement
By Program

- **Dakim**
- **Posit**
- **Both**

<table>
<thead>
<tr>
<th>Area</th>
<th>Dakim</th>
<th>Posit</th>
<th>Both</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration/Attention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>25</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Decision Making</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Real-World Tasks</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Listening</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Visual Tasks</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Vocabulary</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
What is Brain Training?

- Combination of research to support cognitive training (neuroplasticity) and a baby-boomer market has driven “brain training” mainstream

- Brain games
  - Cross-word puzzles 2.0

- Brain training
  - Defined as the structured use of cognitive exercises aimed at improving specific brain functions
  - Differentiates between mental activity and mental exercise
Programs available in the WRNMMC BFC

- Dakim Brain Fitness
  - Cross-Trainer

- Posit Science - Classic
  - Auditory Processing

- Posit Science - Insight
  - Visual Processing

- Posit Science - BrainHQ
  - Auditory, Visual, and Executive Functioning

- Lumosity
  - Web-Based, Cross-Trainer

- Cogmed
  - Working Memory

- mPOD/OVEI
  - Neuro and biofeedback

- Nintendo DS
  - Brain Age, Brain Age II

- Mobile Applications
  - Training on the go
Dakim BrainFitness

• Cross Training Domains:
  
  Short-term memory, long-term memory, critical thinking, calculation, visual-spatial, language
  
• Five levels of challenge
  
  • Level 1: No cognitive decline
  • Level 2-3: Age-related decline
  • Level 4-5 Mild-to-moderate cognitive impairment (MCI) or dementia
  
• Dynamically self adjusts

• Based on standardized neurological tests

• Scoring (satisfaction only)

Source: http://www.dakim.com
124 Types of Games
Dakim Exercises Based On Standardized Neurological Tests

**Domain: Short-Term Memory**

**Standardized Neurological Test/Exercise**
- Wechsler Memory Scale
- Digits Forward Test
- Point Digit Span
- Letter Span
- Recurring Figures Test
- Picture Scanning of Behavioral Inattention Test
- Wechsler Memory Scale -III Family Pictures
- Weschler Memory Scale-III
- Hopkins Verbal Learning Test-Revised
- Four Unrelated Words
- Benson Bedside Memory Test
- Auditory-Verbal Learning Test
- Wechsler Memory Scale, Logical Memory
- Memory Assessment Scales

**Exercise Description**
- Recall a sequence of numbers
- Subject is instructed to point out a number or letter sequence read by the examiner on a large card on which the numbers 1 through 9 appear sequentially
- Cards containing geometric or irregular nonsense figures are shown, with some repeating. Subject is asked to indicate which designs were seen previously.
- Look at series of pictures carefully and both name and point out the “major items” in the pictures.
- Recall words after incremental time delays
- Examiner reads stories, asking subject for an immediate free recall of facts

**Dakim BrainFitness Exercise**
- Memory Mambo
- Word Wager
- My Favorite Things
- What’s Unique
- Odd Couples
- Famous People Little Known Facts
- Picture Pairs
- Make a Story
- Mazie’s Face Finder
- Book Briefs
- Keep Your Eyes Open
- News Flash
Posit Science

- Software to specifically target auditory (Brain Fitness Classic) or visual (Insight) processing
  - “Bottom-up: top-down” approach to fundamentally improve the brain’s capacity to process information
  - Based on the principals of neuroplasticity and requires intense dosing
  - Research indicates improvements in processing, attention, memory and anecdotal reports of improved daily living

- New web-based program (BrainHQ)
Posit Science: Brain Fitness Classic

HIGH OR LOW?
Encourages faster sound processing

TELL US APART
Practices distinguishing similar sounds

MATCH IT!
Sharpens precision of sound processing to improve memory of sounds

SOUND REPLAY
Practices remembering information in order

LISTEN AND DO
Works out working memory, which is critical to many cognitive tasks

STORY TELLER
Promotes stronger memory for details to strengthen communication skills
Insight Exercises

CRASH RISK EVALUATOR
Find out how much your brain notices in your peripheral vision and your crash risk

BIRD SAFARI
Sharpens your visual precision and expands your useful field of view

JEWEL DIVER
Exercises divided attention so you can track multiple moving objects at once

SWEEP SEEKER
Speeds up visual processing so you can spot and react to things more quickly

ROAD TOUR
Expands your useful field of view and speeds up processing for safer navigation

MASTER GARDENER
Works out your working memory so you can recall visual details
Hi Henry! What would you like to do today?

- focus my Attention
- increase my Brain Speed
- improve my Memory
- enhance my People Skills
- coming soon: sharpen my Intelligence
- coming next: tune up my Navigation

My Brain Progress

How does my brain fitness compare to others?

BrainHQ Community Stats

- 916,972 levels completed
- 2,211,762 stars earned

Invite Friends | My Cards

What's on your brain?

Submit

Henry Mahncke (you): beat a threshold in Divided Attention 4 hours ago | comment

Lisa Wu (your friend): Completed grid 1 of Master Gardener 1 days ago | comment

Lisa Wu (your friend): beat a threshold in Jewel Diver 1 days ago | comment

Lisa Wu (your friend): Completed a triplet of Insight modules 1 days ago | comment

Lisa Wu (your friend): beat a threshold in Jewel Diver 1 days ago | comment

Lisa Wu (your friend): beat a threshold in Divided Attention

Why BrainHQ About the Exercises Brain Resources Science Membership

Attention
Divided Attention
Target Tracker
Double Decision
Mixed Cues

Brain Speed
Peripheral Challenge
Visual Sweeps
Sound Sweeps
Eye for Detail

Memory
To-Do List Training
Memory Grid
Syllable Stacks

People Skills
Recognition
In the Know
Face to Face
Face to Face

### My Progress

#### percentile  
<table>
<thead>
<tr>
<th></th>
<th>61</th>
<th>74</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention</strong></td>
<td>74th</td>
<td>+16.83</td>
</tr>
<tr>
<td><strong>Brain Speed</strong></td>
<td>71st</td>
<td>+23.38</td>
</tr>
<tr>
<td><strong>Memory</strong></td>
<td>55th</td>
<td>+33.5</td>
</tr>
<tr>
<td><strong>People Skills</strong></td>
<td>25th</td>
<td>+12.33</td>
</tr>
<tr>
<td><strong>Intelligence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Navigation</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### My Usage

Your last login was on 10/17/12.

#### My Awards

You have earned cards. [see cards](https://brainhq.positscience.com/pscweb-free/start)
Lumosity

- Web-based brain games/training
- iPhone app available – allows continued training on the go
- Appropriate for school-age through adult
  - Easy to use
  - Adapts difficulty level based on progress of the user

Source: http://www.lumosity.com
Courses designed for users with specific medical conditions
- TBI, PTSD, ADHD, Cancer

Or, for targeting core cognitive abilities, such as:
- working memory, visual attention and fluid intelligence

Assessments allow users to track progress in:
- Attention
- Short-Term Memory
- Flexibility
- Processing speed
- Spatial Memory
- Working Memory
Cogmed

- Specifically targets working memory
  - Evidence-based program for improved attention

- The benefits of Cogmed training
  - Improves ability to focus and sustain attention
  - Leads to better complex reasoning skills
  - Improves professional and academic performance

- Intensive training
  - 25 training sessions over 5 weeks, 30-40 minutes each
  - Support by a Cogmed Coach
  - Can be completed in BFC or online at home
Cogmed

- 8 exercises per training session
- Remember and repeat a series of letters or numbers
- Track objects based on pattern, order, and position
- Dynamically adjusts difficulty level to match performance
- Training improvement index: Max Performance Level – Start Performance Level
• Personalized space designed for individuals to recover from stress and reach optimal levels of performance

• Patients are connected to biofeedback and neurofeedback sensors that measure physiological processes (muscle tension, breathing rhythms, heart rate, skin temperature, perspiration, and oxygen volume)

• Pending research at WRNMMC will compare results of bio and neurofeedback within the pod to feedback at a standard desk
Selecting Programs for your setting

- Consider population and typical cognitive complaints
  - Domain-specific programs
  - “Cross trainers”
  - Brain Games

- Decide if you want programs to be used independently or driven by a therapist

- Determine if a program’s dosing requirements are realistic for your rehabilitation environment

- Understand your population’s limitations (physical, emotional, etc.)

- Investigate any IT restrictions prior to purchasing programs

- Choose some programs that can be transferred for home use upon d/c

- If you have the resources – choose a variety!
Selecting Programs for your setting

- **Adaptability**
  - Programs should dynamically self-adjust
  - Hold participants at an appropriately challenging yet not a frustrating level

- **Intensity**
  - Significant repetition to drive real change
  - Process based to impact plasticity

- **Engagement**
  - Some means of feedback and rewards
  - Fun to increase compliance and sustainability
# Brain Training Software

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Pricing</th>
<th>Product Mode and Target Age</th>
<th>Brain Function</th>
<th>Recommended dosing by program</th>
</tr>
</thead>
<tbody>
<tr>
<td>(m) Power by Dakim</td>
<td>$295 for home software&lt;br&gt;$6-8,000 which includes software, hardware, and services that can be used by up to 12 users in clinical setting</td>
<td>Software program or complete system, ages 60 and older</td>
<td>Variety</td>
<td>40-60 minutes 3-5 times a week</td>
</tr>
<tr>
<td>Brain Fitness Classic by Posit Science</td>
<td>$197 for Auditory Software</td>
<td>Software Program, for adults</td>
<td>Auditory processing</td>
<td>40-60 minutes 3-5 times a week /6-8 weeks</td>
</tr>
<tr>
<td>InSight with Cortex by Posit Science</td>
<td>$197 for Visual Software</td>
<td>Software Program, for adults</td>
<td>Visual processing</td>
<td>40-60 minutes, 3-5 times a week</td>
</tr>
</tbody>
</table>
# Brain Training Software

<table>
<thead>
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<th>Product Name</th>
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<th>Brain Function</th>
<th>Recommended dosing by program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cogmed</td>
<td>Contact company for exact pricing details; estimated cost $1500</td>
<td>A licensed psychologist provides program; three age specific software: pre-school, school-age, and Adults</td>
<td>Working Memory</td>
<td>35-45 minutes, 5 days a week / 5 wks.</td>
</tr>
<tr>
<td>Brain HQ by Posit Science</td>
<td>$10.99/Month $ 99/year</td>
<td>Online, for adults</td>
<td>Variety</td>
<td>30 minutes, 3 times a week</td>
</tr>
<tr>
<td>Brain Age by Nintendo</td>
<td>$19.99 for the game, which needs to be played on the Nintendo DS ($129.99)</td>
<td>Handheld device, for all ages</td>
<td>Variety</td>
<td>Daily</td>
</tr>
<tr>
<td>Lumosity by Lumos Labs</td>
<td>$9.95/month or 70.95/year.</td>
<td>Online or App., for all ages</td>
<td>Variety</td>
<td>40 hours to reach benefit</td>
</tr>
</tbody>
</table>
Get to know your program(s) and others on the market then consider the following:

- Functional complaint and goals
- Referral source and request
- Severity Level
- Realistic dosing
- Appropriate mode
- Consider motivation
- Use your clinical judgment
# THE SHARPBRAINS CHECKLIST™
## 10 Questions to Choose the Right Brain Fitness Program for You

How to Use: Answer all of these questions before you buy or use any product or service, computer-based or not, that makes any brain-related claims.

<table>
<thead>
<tr>
<th>Questions to Consider</th>
<th>Why</th>
</tr>
</thead>
</table>
| **Based on Scientific Research?** | □ Neurpsychologists are neuroscientists with a specialization in measuring and understanding human cognition and brain structure and function.  
□ PubMed (www.ncbi.nlm.nih.gov/pmc) is a service of the U.S. National Library of Medicine (www.nlm.nih.gov/) that includes millions of citations to scientific journals. If a scientist has not published a paper that appears in that database, he or she cannot make scientific claims. |
| 1. Are there scientists (ideally neuropsychologists) and a scientific advocacy group behind the program? | |
| 2. Are there published, peer-reviewed scientific papers written by those scientists? How many? | |
| **Measurable Claims and Benefits?** | □ Some programs describe the benefits so vaguely that it is impossible to tell if they will have any measurable results.  
□ Brain exercise is not a magic pill. You have to do the exercises in order to benefit, so you need certainty on the effort required.  
□ Simply by practicing something, we get better at it over time. The question is whether the improvement experienced in the program will transfer into real life. For that to happen we need assessments that are distinct from the exercises themselves. |
| 3. What are the specific benefits claimed for using this program? | |
| 4. Does the program tell me what part of my brain or which cognitive skill I am exercising and is there an independent assessment to measure my progress? | |
| 5. Is it a structured program with guidance on how many hours per week and days per week to use it? | |
| **Ensures Cross-Training?** | □ The only way to exercise important parts of our brain is by tackling novel challenges.  
□ In the case of brain fitness, “Use it or Lose it” applies. To all the different functional areas of our brain and the skills we need those areas to perform. |
| 6. Do the exercises vary and teach me something new? | |
| **Is it Exercise or Entertainment?** | □ Just as we need to work out our arm and leg muscles with increasing weight to develop them, good brain exercise requires increasing difficulty as well. |
| 7. Does the program challenge and motivate me, or do it feel like it would become easy once I learned it? | |
| **Good Fit for Me?** | □ Each individual has different goals/needs when it comes to brain health. For example, some want to manage anxiety, others to improve short-term memory, listen better, improve concentration levels, or reduce the probability of developing problems such as Alzheimer’s over the long-term.  
□ Some brain exercise programs have great short-term results but are very intense - requiring up to 5 hours a week. Others may not have such clear short-term benefits, but may require a shorter time commitment.  
□ Excess stress reduces, or may even inhibit, neurogenesis (the creation of new neurons). So, it is important to make sure not to do things that stress us in unhealthy ways. |
| 8. Does the program fit my personal goals? | |
| 9. Does the program fit my lifestyle? | |
| 10. Am I ready and willing to do the program, or would it be too stressful? | |

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**SHARPBRAINS**

**Brain Fitness for All**

[www.sharpbrains.com](http://www.sharpbrains.com)  
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The Science Behind Brain Training

- Review evidence for traditional cognitive rehabilitation
  - Keith Cicerone

- Understand neuroplasticity as it relates to rehabilitation
  - Michael Merzenich; IMPACT study

- Investigate support for specific programs and disorder types
  - Start with company websites

- Know the limitations of brain training
  - Nature study
**Purpose:** Determine the effectiveness of the BFC program and products through patient self-report questionnaires

**Method:** Chart review of the first 96 patients to participate in the BFC

**Participants and Procedures:** 29 patients who completed 3 questionnaires of self-reported symptom change before and after BFC participation in an average of 29 (range = 3 – 137) visits

**Results:** Statistically significant reduction in symptom severity based on MPAI and NBSI total scores (*p<.05). There was no significant difference in the SWL score.

**Caveat:** Population was highly heterogeneous and procedures varied widely.
Other Research at WRNMMC

- **Prospective, Randomized Control Study**
  - Efficacy and feasibility of Dakim and Posit Science programs as adjunct to cognitive rehab.

- **Retrospective/Prospective Clinical Database**
  - To include all past 300+ patients, current and future for large clinical database

- **CDMRP Grant BRAVE Trial**
  - 3 year, multi-site for new program being developed by PositScience

- **mPOD Study for mTBI Patients**
  - Compare neuro and biofeedback in a pod environment vs. outside the pod environment
Benefits and Limitations in the Rehabilitation Setting

Limitations

- Research limited on efficacy and generalization
- Blanket approach for various disordered populations
- Could lead to less monitoring
- Perceptions that the program “is enough”

Benefits

- Dosing recommendations
- Patient engagement with excellent graphics, game atmosphere
- Discharge benefits for maintenance and telerehabilitation
- Allows drill work for therapists to focus on functional activities
- May help increase efficacy of tx while decreasing cost
Take-Away Tips

- Maintain Flexibility
  - Technology changes, new programs are developed
  - Rehab is Rehab

- Listen to your patients
  - Understand their unique goals and needs
  - Record their feedback

- Maintain database
  - Streamline notes in template form
  - Be able to answer questions about your program quickly and accurately

- Remember you are part of a team
  - Usually an adjunct and not at stand-alone service
  - Your patient’s success depends on your collaboration with other health-care professionals
Ask good questions but don’t be left behind

Does it transfer? Is it functional? Not enough outcome data!

Not a gold standard. Lots of data coming, don’t be left behind!
References


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Studies In Clinical Indications Show Effects Across Broad Range of Cognitive Impairments

- **Schizophrenia (cognitive impairment)**
  - Fisher (2009) *Am. J. Psych.*: 55 patients, 2 arm RCT showed significant global cognitive function improvement
    - Further assessments showed fMRI changes, serum growth factor changes, and further improvement with longer training duration
  - Keefe (2012) *J. Clin. Psych.*: 53 patients, 2 arm RCT showed significant global cognitive function improvement

- **HIV Associated Neurocognitive Disorder (HAND)**
  - Vance (2012) *J. Assoc. Nurses AIDS Care*: 46 patients, 2 arm RCT showed significant speed improvement and significant instrumental activities of daily living improvement

- **Cancer/Chemotherapy Associated Cognitive Impairment (“Chemobrain”)**
  - Von Ah (2012) *Breast Cancer Research & Treatment*: 82 patients, 3 arm RCT showed significant speed, memory, and quality of life improvements

- **Mild Cognitive Impairment (pre-Alzheimer’s)**
  - Barnes (2009) *Alz. Dis. Assoc. Dis.*: 47 patients, 2 arm RCT showed trend towards improvement in memory

- **Traumatic Brain Injury**
  - Lebowitz (2009) *Archives of Physical Medicine and Rehabilitation*: 8 patients, single arm study showed improvement in cognitive speed and and reduced cognitive failures
Websites

- Dakim Brain Fitness
  - [www.dakim.com](http://www.dakim.com)

- Posit Science
  - [www.positscience.com](http://www.positscience.com)

- Lumosity
  - [www.lumosity.com](http://www.lumosity.com)

- Cogmed
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- mPOD
  - [www.hapiny.com](http://www.hapiny.com)