



IMHRO

GLOBAL INNOVATION FOR BRAIN HEALTH

Training the Brain: Enhancing Mental Health Neuroplastically



A bright future for mental health

People receiving care in today's mental health system may wish treatment options were more safe, effective and accessible. Fortunately, neuroscientists, many funded by IMHRO (One Mind Institute), are making rapid-fire discoveries that are already translating into treatments patients can use. One approach advancing at a brilliant clip harnesses a property of the brain called neuroplasticity.

In this short e-booklet you will learn what neuroplasticity is, and how emerging treatments can capitalize on it to enhance mental focus, mood regulation and life quality. This class of non-pharmaceutical treatments shows promise to help patients across the psychiatric spectrum. Reading on, you may find many new reasons for hope.

The information contained in this e-booklet (A) is not intended as a substitute for professional medical advice, diagnosis, or treatment, (B) should not be construed as the provision of advice or recommendations, and (C) should not be relied upon as the basis for any decision or action, including without limitation the diagnosis or treatment of any health problem. Always seek the advice of your physician or other qualified health provider with any questions you may have regarding a medical condition, and never disregard professional medical advice or delay in seeking it because of something you have read in this e-booklet.

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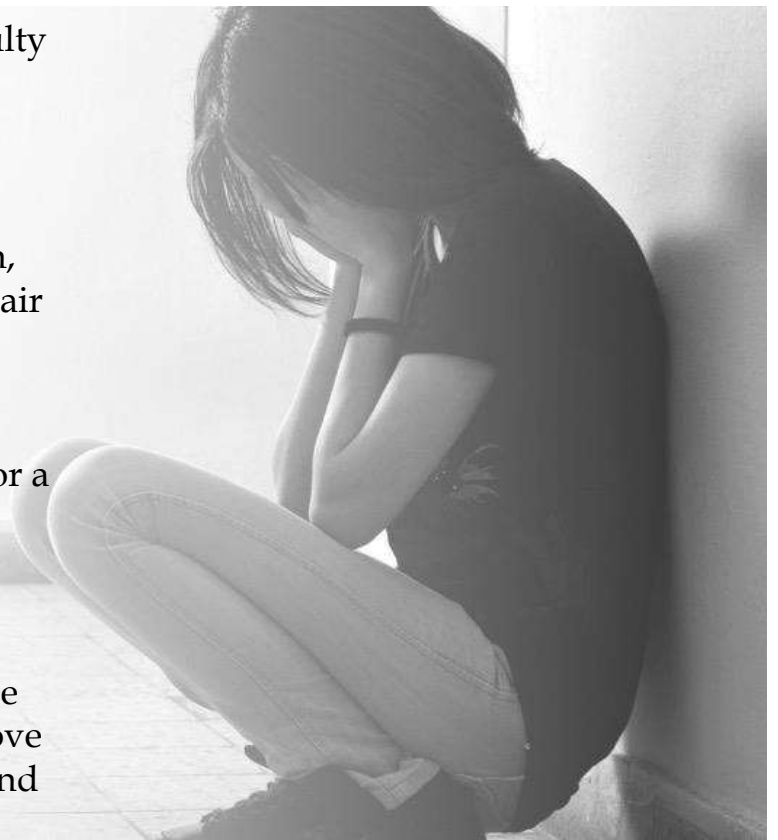


CHALLENGES WITH CURRENT TREATMENTS

Major recovery challenges in mental illnesses: impaired mood regulation & cognition

Do you or your loved one experience difficulty thinking clearly, sustaining attention to projects, remembering important details, or even keeping up in conversations? Do you often feel too low to get out of bed? Many psychiatric conditions, including depression, bipolar disorder and schizophrenia can impair cognition (attention, memory and thinking) and mood regulation.

These symptoms can form a big challenge for a fulfilling life. Success at jobs, happy relationships, personal achievements and contributions to the community – so many things that make life worthwhile – build on healthy cognition and mood. However, these impairments are presently difficult to improve with first-line medicines – and medicines tend to carry troublesome side effects.



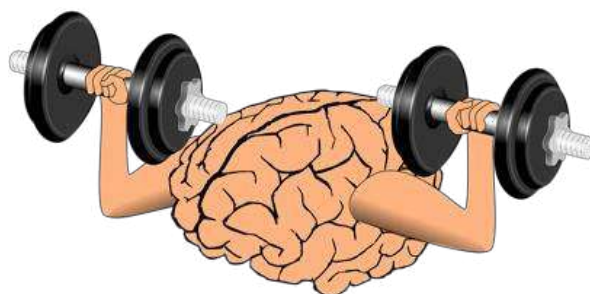


**A PROMISING NEW
TREATMENT APPROACH**

What are Neuroplasticity-based treatments?

Fortunately, a promising form of non-drug treatment is being tested that is designed to improve cognition and mood in a lasting way. Patients who have used these treatments in conjunction with medicine and comprehensive support have made significant gains toward recovery. Neuroplasticity-based treatments, done right, can strengthen the specific brain networks impaired in a range of psychiatric conditions.

How do these treatments work? In one word – the brain is – **plastic**. The brain is made up of networks of cells called neurons, and each network is involved in numerous activities, like daydreaming of your loved ones, planning what to cook for dinner, or reading an e-book. Neuroplasticity is the brain’s ability to reform and strengthen its neural networks with sustained experience in a given activity. This process works a bit like bodybuilding: The more you “exercise” a neural network, the stronger the intensity of the signals that travel on it, and the easier its mental activities become.



The brain is like a muscle: “use it or lose it”...

If we can create *training or stimulation* to strengthen impaired neural networks by using plasticity...

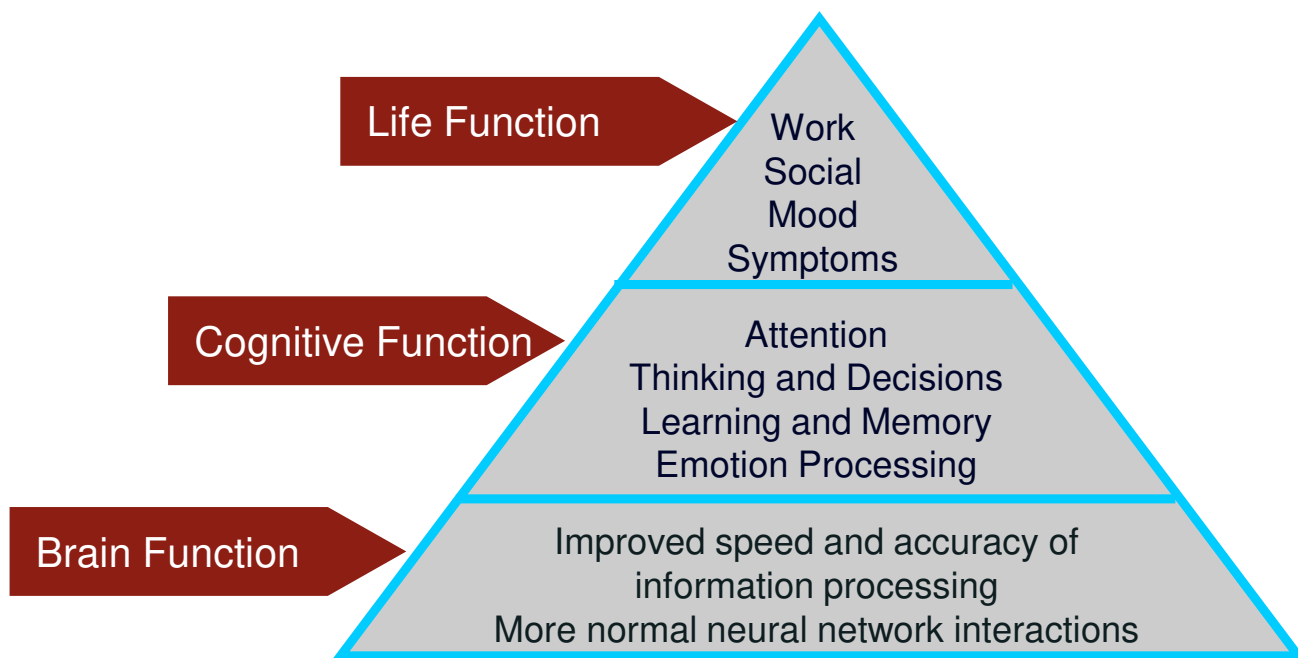
Improve the speed and accuracy of information processing networks

Strengthen and normalize the neural networks that are important for healthy behavior

This should improve functioning in a range of psychiatric illnesses

Targeted brain training or stimulation may provide foundation for improved quality of life

So, by “buffing up” the specific neural networks that are impaired in brain diseases like depression or schizophrenia, treatments like specially designed “games” on digital devices, or, in more severe cases, “pacemakers for the brain,” can harness neuroplasticity to help people enhance their wellness in a lasting way.





**A BRAIN TRAINING
PIONEER BEGINS TO
HELP PATIENTS**

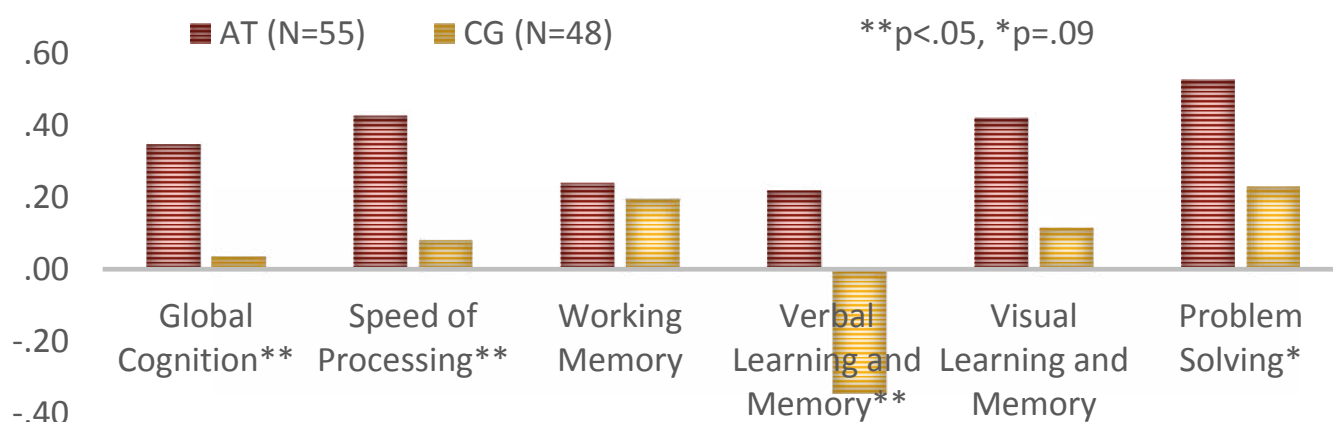
Dr. Sophia Vinogradov's 1998 brain training pilot study has started a sea change in treatment science

In 1998, funded by IMHRO (One Mind Institute), Dr. Sophia Vinogradov at the San Francisco VA Medical Center conducted a pilot clinical trial of a treatment based on a computer-game-like program now called BrainHQ, to see how well it would improve cognition in schizophrenia patients. Her early results, even with small groups of volunteer subjects, proved so promising that the National Institute of Mental Health provided her with funding to expand her research. Since then, her lab's studies have consistently discovered that targeted, digital cognitive training can improve patients' cognition, function and quality of life.



Eight weeks of Auditory Training drives improvements in cognition compared to Computer Games

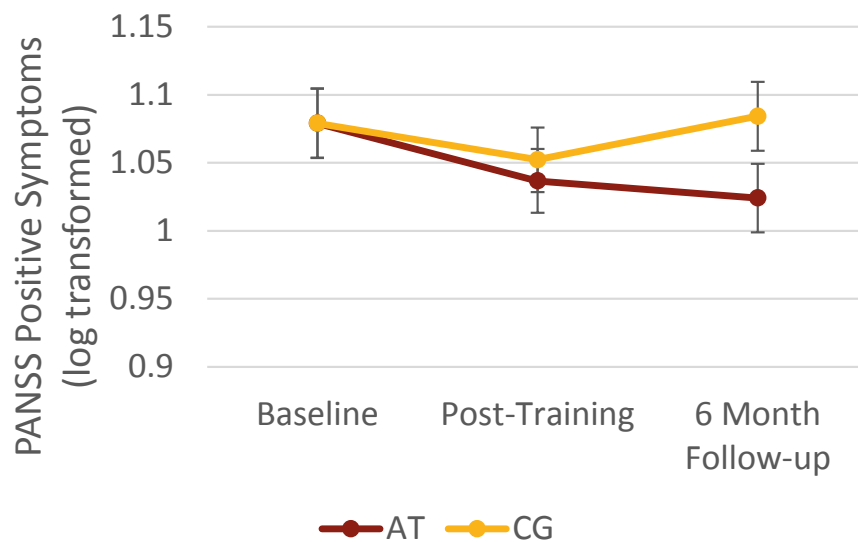
Schizophrenia patients who have used Dr. Vinogradov's training curriculum show significant improvements in global cognition, processing speed, verbal learning and memory, and a small improvement in problem solving ability. Comparing these changes (red bars) with those induced by a similar dose of conventional computer games (yellow bars) underscores just how helpful cognitive training can be.



Interim data reported in Fisher, Loewy, Carter, Ragland, Niendam, Vinogradov, Schiz Bull 2014

Reduction in symptoms continues after training

These benefits can continue to grow after the training is finished. Among Vinogradov's patients, auditory cognitive training (red line) has actually reduced schizophrenia symptoms, like hallucinations and delusions, and that reduction is even stronger six months after training stops. This effect may grow because trainees may use their newfound benefits in ongoing life, further strengthening their brains' abilities.



Data presented by Sophia Vinogradov at IMHRO Music Festival for Brain Health 2013



A NEW WORLD OF DIGITAL THERAPIES

Neuro Gaming: “Gamification” to Make Training Fun

Cognitive training can be very helpful for people with a range of mental health challenges. But because it requires sustained focus (you have to practice it consistently for at least two months for real benefit), the lack of motivation so many with schizophrenia or depression feel can get in the way. One solution is to make the exercises even more fun. To this end, Dr. Vinogradov has co-founded a conference called ESCoNS, sponsored by IMHRO (One Mind Institute), aiming to stimulate the addition of fun into neuroplasticity-based treatments by enlisting the aid of the entertainment software industry. Now called XTech, this annual conference sparks collaborations to produce exciting therapeutic games and brain health technologies involving virtual reality, brain-wave reading headsets, and more.



Digital therapies can be accessed even in remote areas

Today, many patients are benefiting from these experimental technologies around the world. In May 2016, ClinicalTrials.gov listed 1596 clinical trials related to cognitive training. Some of these trials are being conducted remotely, meaning that you do not have to go to a lab to participate – all that you need is a compatible computer or mobile device and an internet connection. This internet-enabled distribution can someday enable quality digital therapeutics to reach patients in areas in which clinics are scarce.



PsyberGuide.org: A consumer guide to digital therapies

Many of these technologies are available to consumers. But not all of these programs are based in solid science. How can patients make informed choices?

PsyberGuide is a website, managed by IMHRO (One Mind Institute), which rates and reviews software for treating mental health conditions. PsyberGuide helps consumers choose what software might help them best. It provides objective ratings by a team of expert scientists, and offers a consumer rating system so that real users can share their own impressions of specific programs. Today, the PsyberGuide team has rated over 70 apps for a range of conditions, including schizophrenia, mood disorders, anxiety, and post-traumatic stress. Learn more at psyberguide.org.





**A NEUROSTIMULATION INNOVATOR
ADVANCES TOWARD CURES**

What is Neurostimulation?

Brain training is just one form of neuroplasticity-based therapeutics. This approach works well for patients who have cognitive impairments and are already fairly stable.

Another approach, for patients with more severe impairments, is *neurostimulation*. Have you heard the term “brain waves”? Underlying our varying states of mind, our brain’s neural networks constantly process oscillating electrical currents in varying rhythms. For one part of the brain to communicate properly with another, the two regions must be in sync. In neurostimulation, a device delivers electrical or magnetic stimulation to the brain until those regions adapt to a new electrical rhythm. This process enables the brain to “learn” healthier internal connectivity, improving patients’ mental and emotional health.



“Can we stimulate the brain to unlock the potential for learning and recovery in mental illness?”

-Dr. Vikaas Sohal

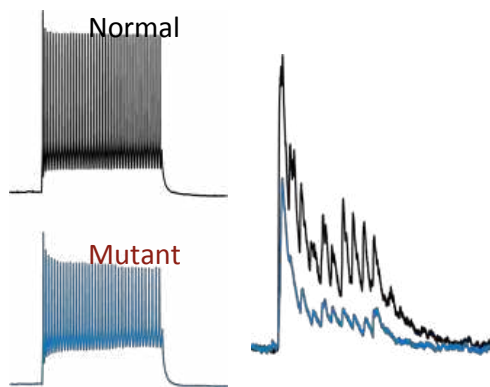
Although a form of neurostimulation has already been FDA-approved to treat depression, scientists, such as IMHRO Assistant Professor of Psychiatry Vikaas Sohal M.D., Ph.D., are exploring how it can improve cognition as well.



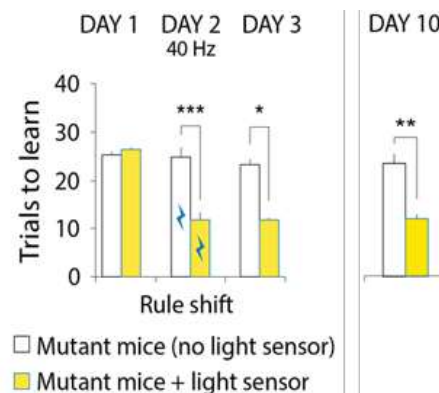
Neurostimulation remedies cognitive impairment in mice

Studying mutant mice, Dr. Sohal has discovered that stunted development of a specific type of neuron in the brain weakens the high-frequency brain waves called gamma oscillations, and impairs cognition. Mice with weakened gamma oscillations showed difficulty learning to solve a changing problem in new ways. When Sohal's team used neurostimulation to restore the mice's gamma oscillations, the mice were able to succeed at this rule switching task. Sohal tells us that "these benefits were long-lasting... the improvements in rule switching outlasted the stimulation, suggesting that **enhancing gamma oscillations in the human brain might accelerate cognitive remediation for individuals with schizophrenia**".

Gamma Oscillations in Mice Before Treatment



Mice Learn Persistently Faster After Stimulation



Data presented by Vikaas Sohal at IMHRO Music Festival for Brain Health 2014

Mouse discoveries can be applied to human therapies

In 2014, on the strength of these discoveries, Dr. Sohal and his collaborators at UCSF (including Dr. John Rubenstein and others) received two large grants from the U.S. government to explore turning what they have learned in their mouse studies into therapies to help humans struggling with anxiety, depression and schizophrenia. **“In the future, we may even be able to use the enhancer elements that John discovers to target and repair specific cell types in the human brain,”** says Dr. Sohal.



SUMMARY

- **Neuroplasticity** provides a treatment approach that, when added to medicine and comprehensive care, has improved recovery prospects significantly.
- **Brain training**, done consistently with clinical supervision, has been shown to improve cognition and reduce symptoms persistently.
- **Neurostimulation** has been shown to treat depression and may soon be used to enhance cognition.

Learn More About...

- Brain training and digital therapy apps:
PsyberGuide.org
- Digital therapies remote clinical trials:
UCSF Digital Health Core website
- Vikaas Sohal's Neurostimulation Research:
Sohal lab website
- IMHRO funded research overview:
imhro.org

**Thank you for reading *Training the Brain:
Enhancing Mental Health Neuroplastically***

Contributors:



Sophia Vinogradov, MD
UCSF



Michael Knable, D.O.
PsyberGuide



Vikaas Sohal, MD, PhD
UCSF



Brandon Staglin
IMHRO Communications

We Fight for Brain Health Every Day

Scientists funded by IMHRO (One Mind Institute) continue to push the envelope toward better therapies, preventions and cures for brain diseases. Thanks to our donors, we're building a brighter future for patients.

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