

NeuroGym: A Scientific Executive Review

Introduction

Neuroplasticity has replaced the formerly held position that the brain is a physiologically static organ. By actively being mindful and partaking in cognitive exercises, the brain is able to improve its functions by growing new neurons and forming new connections between existing neurons [11]. Founded in 2011 and guided by its advisory board of neuroscientists, psychologists, medical doctors and researchers, NeuroGym effectively utilizes the natural neuroplasticity of the brain to create commercially available products based on available science.

As a constantly working organ, the brain is in charge of various cognitive functions, from processing and perceiving sensory stimuli to motor control and memory storage. Habits and beliefs, that are stored in long-term memory, can be challenged when one engages in a novel, learning experience; this “aha” moment results as a rapid shift in neural activity takes place and allows for a new habit or belief to be formed [26]. This is exactly what NeuroGym’s Innercise methods do; they help one adopt new perceptions and behaviors that can solve old problems efficiently. Moreover, the Innercises apply practical mental exercise techniques scientifically shown to improve mental and emotional functioning.

The benefits are far-reaching and have resulted in providing upward spirals of positive emotion to counter negativity and unproductive behaviors, relieve fatigue, decrease stress levels, and increase positive behaviors to achieve success. These proven techniques can train the brain to adopt a healthy lifestyle, release undesired thoughts and habits, and tune the brain to triumph in life.

By capitalizing on a series of evidence based techniques that include cognitive priming, success meditation and visualization, hypnotherapy, subliminal programming and behavioral modification, NeuroGym has successfully engendered a positive change in the lives of its clients; the efficacy of NeuroGym’s techniques will hereby be further elaborated.

Cognitive Priming

Priming is an effect in which an exposure to an initial stimulus holds the tendency to affect responses to subsequent stimuli. In other words, the verbal, visual and auditory cues that are sent to the brain, elicit a change or an improvement in memory recall and emotional regulation. It is an imperative phenomenon because people can undergo behavioral changes without being completely aware of the stimuli driving those changes.

There are several forms of priming: repetition, conceptual, semantic and associative. Numerous research studies have examined the effects priming has on one’s memory and subconscious state

of mind. The precuneus, a cortical region hidden in the posteromedial parietal cortex, has been found to be activated in a few cognitive processes such as visuo-spatial imagery, episodic memory retrieval and self-processing; it is also hypothesized to be involved in a network of regions responsible for the self-conscious state [6]. A research study aiming to investigate the function of the precuneus observed that the precuneus was activated during the recall of highly imaginable words as well as abstract words; this in turn stimulates the distributed brain regions involved in episodic associative memory retrieval [16].

Episodic memory allows us to recall details of an event through three stages of memory processing: encoding, consolidation/storage and retrieval. The prefrontal cortex plays a huge role in the retrieval of episodic memories; research studies have found greater Positron Emission Tomography (PET) measurements of regional cerebral blood flow in the prefrontal cortex as the subjects were engaged in memory retrieval tasks [15].

Another research experiment observed an activation of the inferior frontal cortex in participants when they were scanned with functional Magnetic Resonance Imaging (fMRI) while performing tasks associated with cognitive priming in musical sequences [32]. Scientific experiments have found the prefrontal cortex to be responsible for executive functions, such as the prioritization of tasks, decision making considering multiple sources of information and reward values [17]. When an individual partakes in an activity associated with cognitive priming, his/her precuneus and prefrontal cortex get activated; this in turn may result in better decision making skills consciously and subconsciously.

Numerous aspects of behavior from social interaction to accurate perception of surroundings can be altered due to priming. Although an initial skepticism existed on the effectiveness of semantic priming, research has shown that priming could truly induce positive behavioral changes; in fact, it can potentially affect impression formation and social behavior. A comprehensive meta-analysis of 167 studies observed that sequential priming tasks are significantly linked to behavioral measures ($r = .28$). These studies covered multiple methodologies and settings [14]. In a study that looked into correlations between food advertising and obesity, it was found that advertising of food may trigger snacking behavior. Children were tested to consume 45% more food when exposed to food advertising than those who were not exposed [5]. Therefore, cognitive priming plays a huge role in our lives, affecting our thought processes and behaviors directly and indirectly.

NeuroGym's techniques incorporating cognitive priming will allow one to stay at the present moment, let go of habituated biases and judgements and allow oneself to attain betterment.

Success Meditation

Meditation, initially considered an Eastern spiritual practice has been gaining rapid popularity globally, due to the increasing evidence based research suggesting the benefits of this technique. Due to the physiological and neuropsychological effects meditation tends to instill within the brain, it is now often considered an alternative way to reduce stress and anxiety, stimulate positive feelings and maintain concentration.

Meditation has also been shown to affect levels of neurotransmitters within the brain, specifically GABA (gamma-aminobutyric acid), norepinephrine, and serotonin [18]. Research studies have found a decrease in GABA in individuals with anxiety [2, 18, 19], decrease in serotonin in individuals with depression and an increase in norepinephrine in rats as they responded to fear inducing stimuli [27]; consequently, there are several studies that observed an increase in GABA [8, 13], an increase in serotonin [4] and a decrease in Norepinephrine in individuals who practice meditation [18].

A recent meta-analytic study added that mindfulness-and acceptance-based interventions have phenomenal benefits when treating anxiety [33]. Moreover, more than 20 studies have reported that mindfulness can enhance weight loss and lower symptoms related to binge eating, emotional eating and overeating [12, 23].

NeuroGym's guided meditations focus on increasing self-esteem, engendering positive thoughts and improving personal growth. This technique is backed up by correlational findings that suggest meditation to be associated with positive personality characteristics. In a study that compared non-meditators, beginners, short-term and long-term meditators, it was found that the longer one meditates, the greater the significant increase in positive personality growth [31].

Therefore, mindful meditation allows one to remain relaxed as he/she nonjudgmentally introspects himself/herself, noticing the flow of thoughts and emotions that rise and fall in the mind. An increased control over attention can lead to lowered anxiety as attention is shifted away from negative triggers and stimuli. This will result in one becoming more aware and focused on positive self-growth and becoming less distracted by negative thoughts holding one back.

Visualizations

Guided imagery is a bio-behavioral intervention that engages all the senses and affects behavior and physical responses in individuals, and may elicit responses similar to that which occurs when the actual stimulus is present [20]. Guided imagery can relieve stress and anxiety levels, ease chronic pain conditions and improve physical function. Additionally, visualizations may also help alter any unpleasant memories one might have. A research experiment has shown that

negative emotional memories from childhood can be undone by re-scripting the event and imagining a different outcome or solution (1).

Imagery protocols and programs based on imagery have been found to reduce depression, anxiety and build a sense of empowerment [9, 10]. Visualizing relaxing and energetic images have also been shown to relieve fatigue scores. A longitudinal, controlled clinical trial looked into the effects of a 6 week intervention of guided imagery on pain level, functioning status and self-efficacy in people with fibromyalgia, a disorder that results in sleep problems, fatigue and chronic muscle pain. While one group of participants received usual care, the other received three audiotaped guided imagery scripts and were required to use at least one tape every day for 6 weeks; they also had to report weekly frequency of use. The study determined that guided imagery helped improve functional status and sense of self-efficacy when managing pain [21].

NeuroGym offers numerous, effective visualization techniques that promise to alleviate stress and anxiety, stay goal-oriented and reach financial, emotional and personal success.

Guided Hypnotherapy and Subliminal Programming

Hypnosis is a tool that has been shown to be effective both on its own as well as in concert with other methods of treatment. NeuroGym guides the clients to use self-hypnotic induction procedures and deepening techniques which allow them to relax their mind, body and soul. During hypnosis, the mind is in a state of focused concentration as well as physical relaxation. At this state of mind, the unconscious mind may be able to adopt new beliefs and habits, and overcome any unwanted behaviors, fears and destructive habits.

Apart from assisting with memory recall, hypnosis has several other benefits. Research studies have shown the efficiency of hypnotic therapy. Brain structures associated in the regulation of consciousness are activated when one undergoes hypnotherapy. A research study observed that the cortical areas associated with regulating states of consciousness, self-monitoring and self-regulating were activated during hypnosis based on results from Positron Emission Tomography(PET) scans; it also found an increase in mental relaxation and absorption [25]. Another research experiment illustrated that a combination of hypnosis and Cognitive Behavioral Therapy results in a faster reduction of re-experiencing symptoms of acute stress disorder (ASD) initially after treatments; muscle relaxation tends to be another symptom of hypnosis, which can also decrease anxiety levels [3].

Subliminal stimuli are stimuli that fall into the subconscious, a mental state in which an individual is not aware of the information he or she is processing. The effectiveness of such stimuli has so far been shown to affect individual responses and stimulate mild emotions. Subliminal stimuli tend to trigger actions rather than instill whole new ideas. Used properly,

however, subliminal stimuli can boost learning abilities, increase memory, and help change long-term habits. In an experiment that examined the subliminal effects of verbal stimuli, it was found that the differences in definitions between words (“Happy” or “Angry”) influenced the associated conscious thought in drawings of an expressionless face; the participants felt more pleasant with the happy pairings, when compared to the angry pairings [30]. A group of women who received auditory subliminal messages, as brief as 4 milliseconds, lost more weight than their counterparts who did not. Over a period of time, the difference in weight continued to increase [29]. NeuroGym’s subliminal programming methods will focus on retraining neural networks, so one will subconsciously be tuned to thinking positive thoughts and be able to work on his or her success without any doubts, stress, anxiety or fear.

Behavioral Modification

NeuroGym provides several behavior altering techniques; behavior modification can be achieved a plethora of ways. Positive and negative reinforcement are both tools that can be utilized to induce or extinguish certain behaviors. Behavior modification relies on both positive and negative reinforcement as well as punishment to progressively shape the targeted behavior and guide it into the desired direction. There are various principles involved in behavioral modification, and they are implemented depending on whether a behavior is being maintained, negated, or changed.

One of NeuroGym’s most effective behavior modifying technique is affirmations. As one comes up with his/her personal affirmations and start repeating them in the correct brain wave state, he/she will be able to modify his/her behavior accordingly by slowly believing in the affirmations and experiencing them as if they are already true. In 1916, a French therapist named Emile Coue, recommended his patients to repeat the following affirmation 20 times, twice a day: “Every day in every way, I’m getting better and better.” He presented in a Psychological Congress, that his patients would attain better health by following his recommendation to repeat the affirmations; he would use this for patients suffering several disorders [7, 24]. One group of participants in the study was repeating self-affirming statements of three reasons why their most important value was essential for them, and an example proving the importance; the other group had to mention three reasons why their least important value might be important to someone else, and an example when the importance was demonstrated. The former group of subjects reported eating more fruits and vegetables at follow-ups after 7 days and 3 months, when compared to the latter group, which acted as a control [14]. The self-affirmation manipulation successfully increased a health-promoting behavior.

Self-affirmations play a significant role in lowering anxiety and encouraging work productivity. There are several studies that support the effectiveness of reframing any problem or worry into a self-affirming statement such as, “I can do this” and “I will succeed.” A recent research study reported that participants who wrote about a particular stressful event with more self-affirming

words and details about the event had lower stress levels and less anxiety symptoms when compared to the other group who utilized more negative affect words [22].

Conclusions

NeuroGym's powerful techniques have been further validated by numerous research studies that demonstrate the efficaciousness of cognitive priming, success meditation, hypnotherapy, subliminal programming and behavioral modification. When practicing these introspective methods, one will be able to retrain the brain and encourage neural growth and connections. The Innercises will directly and indirectly allow one to create positive subconscious beliefs, abandon undesired behaviors and habits and increase affirmative thoughts and feelings. This will keep the individual focused and goal-oriented, not relapse into old, unwanted behavior, and attain personal growth physically, mentally, socially and financially. Further research is being conducted to explore the effectiveness of the methods as potential treatment options for a variety of conditions, as well as their efficaciousness in improving quality of life.

References

1. Arntz, A., & Weertman, A. (1999). Treatment of childhood memories: Theory and practice. *Behaviour Research and Therapy*, 37(8), 715-740.
2. Bremner JD, Innis RB, White T, Fujita M, Silbersweig D, Goddard AW, Staib L, Stern E, Cappiello A, Woods S: SPECT [I-123] iomazenil measurement of the benzodiazepine receptor in panic disorder. *Biological Psychiatry* 2000, 47:96-106.
3. Bryant, R. A., Moulds, M. L., Guthrie, R. M., & Nixon, R. D. (2005). The additive benefit of hypnosis and cognitive-behavioral therapy in treating acute stress disorder. *Journal of Consulting and Clinical Psychology*, 73(2), 334-340.
4. Bujatti M, Biederer P: Serotonin, noradrenaline, dopamine metabolites in transcendental meditation technique. *Journal of Neural Transmission* 1976, 39:257-267.
5. Cameron, C. D., Brown-Iannuzzi, J. L., & Payne, B. K. (2012) Sequential priming measures of implicit social cognition: A meta-analysis of associations with behavior and explicit attitudes. *Personality and Social Psychology Review* (published online 5 April 2012). doi: 10.1177/1088868312440047
6. Cavanna, Andrea E., and Michael R. Trimble. "The precuneus: a review of its functional anatomy and behavioural correlates." *Brain* 129.3 (2006): 564-583.
7. Coué, E. (1922). *Self mastery through conscious autosuggestion*. Malkan Publishing Company.
8. Elias A, Guich S, Wilson A: Ketosis with enhanced GABAergic tone promotes physiological changes in transcendental meditation. *Medical hypotheses* 2000, 54:660-662.
9. Freeman LW. Physiological pathways of mind–body communication. In: Freeman LW, Lawlis GF, eds. *Mosby's Complementary and Alternative Medicine: A Research-Based Approach*. St.Louis: Mosby, 2001b:2–33.
10. Freeman, L. W., & Welton, D. (2005). Effects of imagery, critical thinking, and asthma education on symptoms and mood state in adult asthma patients: a pilot study. *Journal of Alternative & Complementary Medicine*, 11(1), 57-68.

11. Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2010). Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. *Clinical psychology review*, 30(7), 849-864.
12. Godfrey, K. M., Gallo, L. C., & Afari, N. (2014). Mindfulness-based interventions for binge eating: a systematic review and meta-analysis. *Journal of behavioral medicine*, 1-15.
13. Guglietti CL, Daskalakis ZJ, Radhu N, Fitzgerald PB, Ritvo P: Meditation-related increases in GABA B modulated cortical inhibition. *Brain stimulation* 2013, 6:397-402.
14. Harris, Jennifer L.; Bargh, John A.; Brownell, Kelly D. Priming effects of television food advertising on eating behavior. *Health Psychology*, Vol 28(4), Jul 2009, 404-413.
15. Kapur, S., Craik, F. I., Jones, C., Brown, G. M., Houle, S., & Tulving, E. (1995). Functional role of the prefrontal cortex in retrieval of memories: a PET study. *Neuroreport*, 6(14), 1880-1884.
16. Krause, B. J., Schmidt, D., Mottaghy, F. M., Taylor, J., Halsband, U., Herzog, H., L. Tellmann, & Müller-Gärtner, H. W. (1999). Episodic retrieval activates the precuneus irrespective of the imagery content of word pair associates A PET study. *Brain*, 122(2), 255-263.
17. Krawczyk, D. C. (2002). Contributions of the prefrontal cortex to the neural basis of human decision making. *Neuroscience & Biobehavioral Reviews*, 26(6), 631-664.
18. Krishnakumar.D., Hamblin M.R., Lakshmanan. (2015). Meditation and Yoga prove to Modulate Brain Mechanisms that affect Behavior and Anxiety- A Review from a Modern Science Perspective. *Ancient Science*, 2015, 2.1, 13-19.
19. Malizia AL, Cunningham VJ, Bell CJ, Liddle PF, Jones T, Nutt DJ: Decreased brain GABAA-benzodiazepine receptor binding in panic disorder: preliminary results from a quantitative PET study. *Archives of General Psychiatry* 1998, 55:715-720.
20. Menzies, V., & Jallo, N. (2011). Guided imagery as a treatment option for fatigue: a literature review. *Journal of Holistic Nursing*, 0898010111412187.

21. Menzies, V., Taylor, A. G., & Bourguignon, C. (2006). Effects of guided imagery on outcomes of pain, functional status, and self-efficacy in persons diagnosed with fibromyalgia. *Journal of alternative & complementary medicine*, 12(1), 23-30.
22. Niles, A. N., Byrne Haltom, K. E., Lieberman, M. D., Hur, C., & Stanton, A. L. (2015). Writing content predicts benefit from written expressive disclosure: Evidence for repeated exposure and self-affirmation. *Cognition and Emotion*, (ahead-of-print), 1-17.
23. O'Reilly, G. A., Cook, L., Spruijt-Metz, D., & Black, D. S. (2014). Mindfulness-based interventions for obesity-related eating behaviours: a literature review. *Obesity Reviews*, 15(6), 453-461.
24. Paulhus, D. L. (1993). Bypassing the will: The automatization of affirmations. *Handbook of mental control*, 573-587.
25. Rainville, P., Hofbauer, R. K., Bushnell, M. C., Duncan, G. H., & Price, D. D. (2002). Hypnosis modulates activity in brain structures involved in the regulation of consciousness. *Journal of cognitive neuroscience*, 14(6), 887-901.
26. Sánchez-Cañizares, J. (2014). The role of consciousness in triggering intellectual habits. *Frontiers in human neuroscience*, 8.
27. Selden N, Robbins TW, Everitt B: Enhanced behavioral conditioning to context and impaired behavioral and neuroendocrine responses to conditioned stimuli following ceruleocortical noradrenergic lesions: support for an attentional hypothesis of central noradrenergic function. *The Journal of Neuroscience* 1990, 10:531-539.
28. Shapiro, Shauna L., Gary ER Schwartz, and Craig Santerre. "Meditation and positive psychology." *Handbook of positive psychology 2* (2002): 632-645.
29. Silverman, L.H., Martin, A., Ungaro, R., and Mendelsohn, E. "Effect of Subliminal Stimulation of Symbiotic Fantasies on Behavior Modification Treatment of Obesity." *Journal of Consulting and Clinical Psychology*, 46(3), 432
30. Smith, G. J., Spence, D. P., & Klein, G. S. (1959). Subliminal effects of verbal stimuli. *The Journal of Abnormal and Social Psychology*, 59(2), 167.
31. Sridevi, K., Rao, P., & Krishna, V. (1998). Temporal effects of meditation and personality. *Psychological Studies*, 43(3), 95-105.

32. Tillmann, B., Koelsch, S., Escoffier, N., Bigand, E., Lalitte, P., Friederici, A. D., & von Cramon, D. Y. (2006). Cognitive priming in sung and instrumental music: activation of inferior frontal cortex. *Neuroimage*, *31*(4), 1771-1782.
33. Vøllestad, J., Nielsen, M. B., & Nielsen, G. H. (2012). Mindfulness-and acceptance-based interventions for anxiety disorders: A systematic review and meta-analysis. *British Journal of Clinical Psychology*, *51*(3), 239-260.