

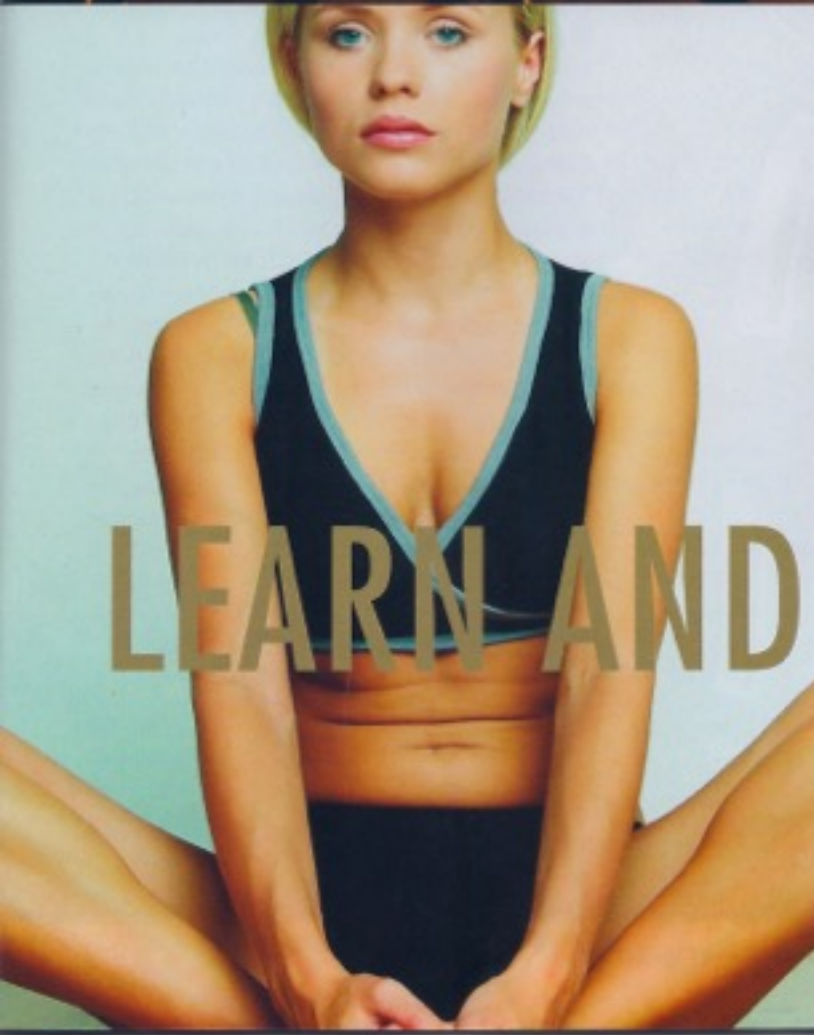


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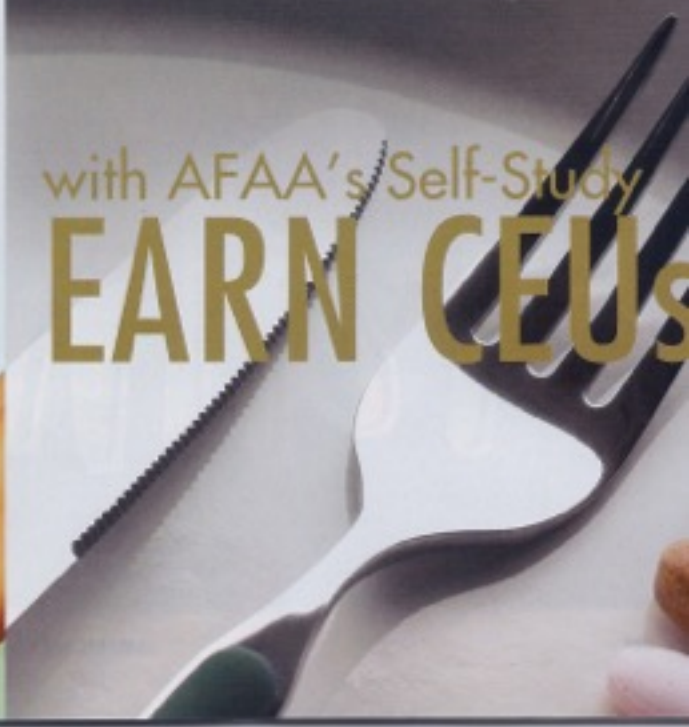
Train the Brain!

LAWRENCE BISCONTINI, MA

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BUILDING MENTAL
MUSCLE TOWARD
NEUROPLASTICITY

BY LAWRENCE BISCONTINI, MA



train THE brain!

THE THEORY:

A plethora of body training approaches abounds today, but sometimes trainers give little attention to treating the brain as if it were a muscle needing sets, repetitions, and even overload. The original term “plasticity” regarding brain training dates back to 1890 in *Principles of Psychology* by William James. And lately it has evolved to the full term “neuroplasticity,” applying similar fitness concepts of adaptation, sets, repetitions, timed performance and specificity.¹ Recent research has revealed the importance of neuroplasticity training combined with physical movement skills to strengthen, improve and overall change brain regions.^{2,3} Learning to train the brain’s different capacities can help manage anger, fear and depression,⁴ plus serve as a viable complement—and sometimes alternative—to intervention brain medication.⁵ Combining the usual theory-with-practice approach consistent with AFAA methodology, this article gives both practical and affordable tips for adding neuroplasticity brain training into protocols for today’s group fitness instructor and personal trainer.

THE SIDES OF THE BRAIN

Many brain specialists have written on the complicated nature of the sides of the brain and their importance. For this article, the most valuable take-away urges trainers to integrate games

that tax not only individual sides and areas of the brain, but also the brain's sections working collectively. The left hemisphere of the brain mostly controls these skills: analytical, language, math, memories of names and words, motor skills (right side of the body) and speech. Conversely, the right hemisphere of the brain mainly controls: creativity (including problem solving), emotions, memories of images (such as faces), spatial zones, patterns of details, and motor skills of the left side of the body.

IMPLEMENTATION

To be considered neuroplastic training, the mental tasks need a simultaneous physical task as well.⁶ Asking a client to execute any type of brain skill, even having him/her seated doing sudoku puzzles, for example, indeed works a particular area of the brain, but such activity does *not* constitute neuroplasticity training because physical movement must accompany the brain's task.

Anyone who has ever needed to engage in an even moderately challenging brain skill while walking and talking, such as recalling one's first memory or finishing a complicated math problem with no paper handy, will confirm how much easier it becomes to stop and think. Stopping the body's movement serves as way to decrease the sensory input to the brain and allow it to concentrate on other processes. While that may prove more comfortable, again it does not make for neuroplasticity training because the body must be moving. Therefore, instructors and trainers must be aware of the need to choose and adapt the appropriate level of physical movement for client(s) to accompany any of the suggestions outlined here.

COMMON EXAMPLES

Conversation Example:

"What did you have for dinner last night?" seems an innocuous question between trainer and client. To be sure, the answer depends on the client's ability to use a certain amount of memory, but this does not constitute neuroplasticity training. However, asking a client to list in reverse order what he or she ate for dinner the previous night while the moving (as in squatting, for example) constitutes neuroplasticity training for two reasons. First, the task requires the mind to work simultaneously with the body engaged in a movement skill. Second, and more specifically, the memory-recall and spatial skills of reverse order come from right-brain tasks.

Lunge Example:

Another common example could be asking a client to make a list alternating between fruits and vegetables while doing alternating forward lunges. Lunging forward with the left leg, he could say "broccoli," for instance, and then when lunging forward with the right leg, he could say "pineapple." This also constitutes neuroplasticity training because the mind works while the body engages, and the problem solving (alternating between fruits and vegetables without stopping) are right-brain tasks. Typically, instructors and trainers have students count sets and reps out loud, but this does little to tax the brain and quickly can become almost mindlessly hypnotic. Problem solving in this example not only allows the trainer to do the counting, but also gives the clients and classes additional workload toward neuroplasticity training.

SECTIONS OF THE BRAIN

Several key sections make up the brain. When they work in synchronicity during a moment of particular focus, this becomes an illustration of the work of the *mind*. The term "mind-body" in its truest sense comes from anything that originates in the brain as conscious movement with form, purpose, dedication and concentration. Using the brain in this manner, in its fullest capacity, all such work comes under the mind-body training umbrella.

The sections of the brain serve different purposes. Or each region of the brain serves a different purpose. The *cerebrum* is the largest portion of the brain and contains sections in both the right and left hemispheres: the frontal, parietal, temporal and occipital lobes. The *frontal* lobe controls several elements such as creative thought and problem solving, including decision making, intellect, judgment, behavior, attention, abstract thinking, physical reactions, muscle movements, coordinated movements, smell and overall personality. The *parietal* lobe deals with comprehension, language, reading, internal stimuli, tactile sensation and sensory comprehension. The *temporal* lobe controls auditory memories, speech, language and behavior. Finally, the *occipital* lobe controls vision.

The *cerebellum*, important for fitness instructors and trainers to understand, sits at the lower back section of the brain and controls balance, posture, and coordination of motor skills and movements.

Other sections of the brain containing glands comprise the limbic system. The amygdala helps the body respond to emotions, memories and fear. Its small shape resembles a raw almond, and the word itself means "almond" in Greek.

The *hippocampus* allows learning and memory of emotions, specifically converting temporary memories into permanent memories. The hippocampus also helps people analyze and remember spatial relationships, allowing for accurate movements.

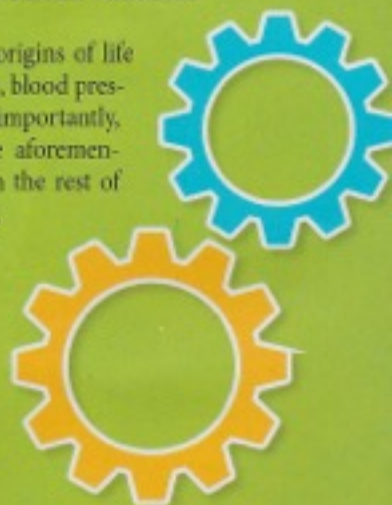
The *hypothalamus* region of the brain controls mood, thirst, hunger and temperature. It also contains glands that control the hormonal processes throughout the body. When clients understand the true feelings of physical hunger, this involves the hypothalamus. Making healthy choices about foods and portions involves the frontal lobe's decision-making properties.

The *thalamus* in the center of the brain controls attention span, pain sensing, and the input of constant sensations moving in and out of the brain.

In the brain stem reside the origins of life function, including our heartbeat, blood pressure and breathing. Perhaps most importantly, this section connects all of the aforementioned sections of the brain with the rest of the body through the spinal cord.

CHOCOLATE: THOUGHTS AND ACTIONS

In an effort to simplify the brain's sections, let's use chocolate as a practical example that





"HAVING A CLIENT recall the last four digits OF THE TRAINER'S PHONE NUMBER AT VARIOUS TIMES WHILE MOVING IN A 30- TO 60-MINUTE SESSION uses this left-brain skill."

illustrates the brain in action with the following thoughts and sayings. "I remember the first time I had dark chocolate truffles in Europe" and "I hope to find some that are as good" reflect the hippocampus (emotional memories). "I'm hungry for dark chocolate" uses the hypothalamus (hunger). "I remember that in French the truffles are called 'truffe'" uses the temporal lobe (memories of sound, language skills). "In a general sense, I love all kinds of dark chocolate" comes from the parietal lobe (abstract thinking). You search on the Internet where to buy European chocolate using the parietal lobe (reading skills). "I'm going to walk to the chocolate shop to buy some dark chocolate truffles" reflects the frontal lobe (decision-making and physical movement). "Walking into the chocolate store itself, I see the specific truffles I want to buy" uses the occipital lobe (vision). Finally, "I'm now eating my dark chocolate truffles, savoring each one as I bring them to my mouth and let them melt on my tongue" uses the cerebellum (coordinated movements).

TRAINING MIND AS MUSCLE

Before undertaking any of the suggested starting points for neuroplasticity training, it should be understood that we can train the brain as a muscle. Research reveals that the more an individual practices any brain skill, the same concepts of overload, specificity, fatigue and rest apply as they do with traditional training.⁷ Furthermore, trainers considering the addition of neuroplasticity training to their clients' regimen may also consider the traditional approach of three sets of 8 to 15 repetitions where possible, based within the framework of following practical suggestions as appropriate for each client. Simply engaging in a skill or two per

traditional 60-minute session does little to improve the brain's function over time because, like muscles, sets and repetitions of brain games work best.⁸

FACTORS AFFECTING BRAIN FUNCTION

While trainers cannot diagnose or prescribe specific conditions regarding brain training of clients, a basic understanding of new research-based findings can help everyone understand what both contributes to, and detracts from, optimal activities of daily life brain function. To be sure, all clients will prefer some brain games over others because, like people favor certain muscles and muscle groups, so, too, can we favor certain brain functions. Some people prefer doing left-brain mathematical puzzles such as sudoku, while others prefer right-brain activities such as contour drawing. It proves necessary, then, to include brain games using all different brain areas to offer well-rounded training, just as no trainer or instructor today would include abdominal crunches without spinal extension movements.

Several inverse relationships exist when it comes to brain training, and we can control many of these with lifestyle, nutritional approaches and sleep patterns. When the following factors *increase*, our optimal brain function tends to *decrease*:

- **cortisol**
(a stress hormone that can harm and even kill brain cells)
Research summary: The more stressful our lives become, the more cortisol accumulates in the blood, slowing down the brain's ability to process crucial functions quickly.⁹
- **sleep**
Research summary: The more sleep deprived the brain be-

comes, the less quickly it acts to process the right and left hemisphere functions. Most of the research agrees that the optimal sleep amount averages eight hours per 24 hours, which is not cumulative, such as power naps or the afternoon "siesta."¹¹

- **dehydration**

Research summary: The less water the brain has to conduct neural impulses from cell to cell, the more the brain slows down, and can also suffer in judgment.^{11,12}

- **hypoglycemia**

Research summary: The brain can only survive with glucose as its key substrate, so a lack of glucose (from insufficient caloric intake or from a severely low-carbohydrate meal plan) impairs its ability to function.¹³

- **disruptive, loud music over 95 decibels**

Research summary: Distracting, loud background music subconsciously distracts the brain (yet soft, instrumental classical music under 50 decibels may stimulate brain function in individuals with brain issues).¹⁴

- **depression**

Research summary: The brain of the depressed individual processes data much slower than that of an individual with enough of the euphoria-causing natural chemical serotonin.¹⁵

- **sedentary lifestyle**

Research summary: Even mild activity boosts peripheral calcium to the brain, which assists with the brain's overall functions. Calcium's role in the brain requires a delicate balance between the amount outside and inside of its cells. When this balance is disrupted, all of the brain functions can suffer.¹⁶

THE PRACTICAL: NEUROPLASTICITY GENERAL GUIDELINES

We have seen that neuroplasticity occurs with movement, but remember that the movement can range from simply sitting and raising alternating fingers (think: frail elderly) to plyometric burpees on a BOSU® Balance Trainer (think: athletes). Trainers must then choose the most appropriate mental tasks for clients that ideally undulate between right- and left-brain skills. As a caveat, drills work best when done in the client's dominant language, so polyglots should choose the language in which they dream. Most games come with timed suggestions, so try to follow those closely. For example, counting from 1 to 50 in increments of 7 digits may prove easy, but having to reach the number 50 in 20 seconds or less adds an extra layer of difficulty. For visual drills, using color reproductions where appropriate is important, such as in Table 1.

When using amounts of objects, research agrees that the most desired number is 7.¹⁷ There are 7 days in a week, 7 colors of the rainbow, 7 main notes on the musical scale, and 7 digits to the phone numbers of most countries, so 7 items tax the brain in the most appropriate manner. To be sure, one could compensate with more or fewer items as appropriate for each individual or group because trainers match moves to people, not vice versa.

MEMORY

Many dissertations exist comparing the definitions of short- and long-term memory. For purposes of this article, consider any item a client can recall successfully after 29 minutes as a "memory bridge" between short- and long-term memory, often referred to in the research as "working memory."¹⁸ Having a client recall the last four digits of the trainer's phone number at various times while moving in a 30- to 60-minute session uses this left-brain skill, and if he or she can repeat the same successfully at the end of an hour, the bridge exists toward the potential of long-term memory. Regardless, trainers who see clients and classes regularly and build from week to week on memory recall work toward the overall long-term memory of their clients' left-brain skills.⁷

MOVEMENT GAMES

Engaging clients in simple right- and left-brain games during movements does not involve learning a new way to train clients; it merely involves adding an extra layer to what the clients already do. Starting clients with neuroplasticity games at first may prove new, frustrating, and even uncomfortable, but remember to encourage all clients that mental training, in an effort to build mental muscle as it were, can prove just as important as traditional movements to our overall health, aging and success. Instead of calling the tasks outlined in the above "exercises," this author recommends referencing the added layer of training as "brain games."

INITIAL GAMES

The following games serve as a departure point for starting neuroplastic training. To be sure, no games can include all of the brain skills possible, but these tax most of the faculties of the brain outlined earlier in this article.

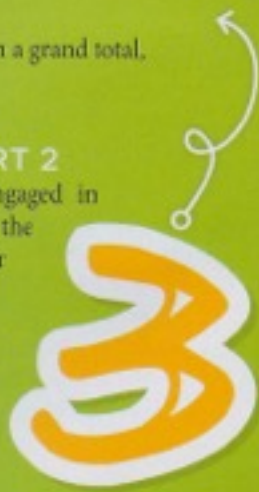
PHONE NUMBER GAMES PART 1

Game guidelines: Get the client(s) started in a "holding pattern" of movement, which can range from simple seated marching to more involved standing grapevines, squats and burpees. Recite the last four numbers of your (the trainer's) phone number, and then play the following games by asking the client(s) to:

- recite back the digits,
- recite the digits backward,
- add up the digits, two at a time, and sum a grand total,
- spell each digit forward,
- spell each digit backward.

PHONE NUMBER GAMES PART 2

After 10 minutes, with the client(s) engaged in completely different movement skills, repeat the above games, adding the first 3 digits of your (the trainer's) phone number. Continue in this fashion until the client(s) can execute some or all of the above every 10 minutes during activity. As a progression at that time or in future sessions, ask the client(s)



to add the area code and repeat playing all games as above. When clients pause to think, encourage them to “keep moving, and keep thinking,” reminding them of the two simultaneous keys for neuroplasticity training.

CONVERSATION GAMES

Engaging clients in what appears to be casual conversation can be neuroplasticity training when following a protocol involving both hemispheres of the brain to process information in an undulating format. The following conversation can be considered neuroplasticity training as long as at least one of the client(s) body parts is engaged in movement.

Starting Script for Brain Training— The Name Game, Part 1: What Did You Eat?

“Hi, [client’s name]. Today for our warm-up, let’s talk a little bit about you while you walk on the treadmill for a few minutes. I’m going to ask you a few questions that may get progressively harder, but it’s all in an effort to train your brain as well as your body. These are just games for fun, so there is no winning or losing, and we can stop it at any time. You should know that, just like when we train the muscles with overload and get tired toward our last repetitions, some of these games may make you mentally burned as well, and we want that.

“Tell me what you had for dinner last night in order, and I promise not to judge what you tell me, we’re just to use the words.”

[Client answers].

“Great. Can you now list those items in backward order?”

[Client answers].

“Awesome. Can you now list those items in forward order again, but spelling out each of those items?”

[Client answers].

“Good. Take the last item you mentioned and please spell it backward.”

[Client answers].

“Fantastic. Now take one other food item you mentioned and spell it backward.”

The Name Game, Part 2: Muscle Recall

“Now for something different, I’m going to tell you some body parts and muscles we’re going to work on today. I’ll say one and you repeat it, and then we’ll add on one item at a time until we have 7. Quads.”

[Client repeats, “Quads”].

“Good. Quads and hamstrings.”

[Client answers, “Quads and hamstrings”].

“Good start. Quads, hamstrings and ankles.”

[Client answers].

Game guidelines: Continue in this way until you have a list of 7 body parts. Some can be Latin names for commonly known muscles like “quadriceps,” but try to use some general areas, too, like

ankles and shoulders. Before finishing the game, see how well the client can name the items in reverse order. Be encouraging if the client finds any particular section of a game too difficult, then offer assistance as you would during fatigue in a traditional movement pattern. Within that day’s workout, try to recall the body part list every 10 minutes to see if the client can turn short-term memory into long-term working memory. As a progression in the future, play the game having the client choose items, adding a new one each time until you reach 7 body parts or muscles.

USING VISUAL AIDS AND EQUIPMENT

When working with personal training clients or group classes, visual aids (printed papers and actual objects) can serve as games to train both sides of the brain. If possible, laminating different types of cards with one skill per card can help trainers or instructors distribute games to clients and classes so they can engage in neuroplasticity training. Simply distribute cards, play the games, and collect and file the cards. Remember the caveat for this to work is that the clients must be able to have their hands free to hold the games while engaging the body in some form of movement.

Group instructors can choose between using laminated cards or, if available, data projection to display games on a wall or screen for all to see and play, while engaging in movement. Even studio cycling instructors whose rooms boast the luxury of digital display could play a world of brain games with their cyclists because the students already are moving, so any projected brain games would constitute neuroplasticity. Data projection gives students the advantage of having their hands free for other tasks.

EXAMPLE OF A VISUAL GAME USING PRINTED LAMINATION

Right-Left Hemisphere Integration: The following game forces right- and left-brain integration.

Game guidelines: While marching or squatting in place, read aloud the colors (not the words) of Table 1 in order from left to right, in three sets, with 10 seconds rest between sets. Try to accomplish each set in under 30 seconds.

TABLE 1

BLUE	RED	ORANGE	GREEN	BLACK
GREEN	GREEN	PURPLE	RED	RED
GREEN	WHITE	RED	ORANGE	RED
BLUE	PURPLE	ORANGE	PURPLE	BLUE
PURPLE	BLUE	YELLOW	WHITE	RED

For more of such brain games, both free and for sale, see list on next page.

TABLE 2

6SECONDS.ORG	MENTALSTRENGTH.COM
BRAINAGE.NINTENDO.COM	MYERSBRIGGS.ORG
BRAINMAP.ORG	OPENCENTER.ORG
FUNEDUCATION.COM	SHARPBRAINS.COM
HBDI.COM	IMPLICIT.HARVARD.EDU
MENSA.ORG	

EXAMPLE OF VISUAL GAMES USING OBJECTS: OBJECT RECALL GAME 1

Have 7 easily identifiable objects hidden and slowly reveal them, one by one, forming a line across the floor or table. After leaving the objects undisturbed for 30 to 60 seconds, return the objects back into their concealed area in the same order they came out.

Game guidelines: While marching or moving in place, notice the objects and try to remember them in order, without moving your lips. After the items are out of view, recite the objects in order from first to last (short-term memory) and then from last to first (short-term memory and spatial skills). Suggestions for 7 easily identifiable objects that work well for this game include a book, candle, cellphone, an apple, water bottle, towel and a pair of socks.

Alternative to Object Recall Game: Instead of using objects for clients to watch and then recall, play a verbal, add-on game with objects in the vicinity.

OBJECT RECALL GAME 2 USING PERMANENT OBJECTS

Game guidelines: While the client (or class) is moving, ask the client (or individuals from class) to call out one object he or she can see in visual proximity, such as a stationary clock. Then add an object, and repeat the object list from the start. Continue in this format until the client(s) have recited up to 7 objects, and engage them in recall that is forward and then backward. Suggestions for 7 easily identifiable objects that work well for this game in the gym environment include a clock, water fountain, towel station, trash bin, teenager running on a treadmill, a stationary bike, and a bulletin board. Every 10 minutes, ask the client(s) to recite the "list of today's items" forward and backward from either Object Recall Game.

IN SUMMARY

Neuroplasticity training involves engaging clients in an approach that fuses a mental and physical simultaneous component. While many approaches exist, the starting point for trainers and instructors involves merely understanding the different types of tasks that the brain can do while engaged in movement. Finding and coupling the appropriate types of brain

games with movement for classes and clients continues to be one of the waves of the future for both group fitness and personal training as program design becomes more holistic and integrative in nature.

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LAWRENCE BISCONTINI, MA, has been involved in brain training since an eye operation in 1972 left him without sight for several months in recovery. As an Advisory Board member on the International Council on Active Aging and as an "active ager" himself, Lawrence dedicates a great deal of time to making practical the most recent research on keeping the brain as young as possible. He neither supports nor endorses any of the sources from Table 2. Find Lawrence at www.findLawrence.com.

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Train the Brain!

Code No. 0134

1. The left side of the brain mainly controls:

- A. speech, language, math and analytical skills, memories of names and words, and motor skills of the right side of the body.
- B. creativity (including problem solving), emotions, memories of images like faces, spatial zones, patterns of details, and motor skills of the left side of the body.
- C. the ability to enjoy chocolate.
- D. the ability to think new thoughts.

2. Neuroplasticity training requires:

- A. the brain to work.
- B. the body to work.
- C. the brain and the body to work simultaneously.
- D. an understanding of the hormones in the body.

3. The cerebrum is the largest portion of the brain containing:

- A. frontal lobe.
- B. parietal lobe.
- C. temporal and occipital lobes.
- D. all of the above.

4. The frontal lobe controls:

- A. speech.
- B. behavior.
- C. vision.
- D. tactile sensation.

5. The parietal lobe controls:

- A. judgment.
- B. behavior.
- C. muscle movements.
- D. tactile sensation.

6. The occipital lobe controls:

- A. speech.
- B. vision.
- C. decision making.
- D. language.

7. The temporal lobe controls:

- A. intellect.
- B. problem solving.
- C. reading.
- D. behavior and speech

8. The _____ deals with the overall coordination of physical movement patterns.

- a. cerebellum
- b. big toe
- c. heart
- d. amygdala

9. An increase in all of the following impairs the overall brain function except for:

- A. cortisol.
- B. rest.
- C. hypoglycemia.
- D. dehydration.

10. Too much of the hormone _____ can actually kill brain cells.

- A. cortisol
- B. estrogen
- C. dopamine
- D. serotonin

11. Classical music played under _____ decibels can promote brain function.

- A. 50
- B. 60
- C. 70
- D. 80

12. Neuroplasticity games work well when having clients try to remember, group, and add items up to a total of _____.

- A. 4
- B. 5
- C. 6
- D. 7

13. Having a client recite a phone number backward uses:

- A. memory and spatial skills.
- B. emotional and creative skills.
- C. recall skills of family names.
- D. problem solving skills of the left-side of the brain.

14. _____ skills form part of the Phone Number Games.

- A. Spelling
- B. Problem-solving
- C. Creative Writing
- D. Choreography Creation

15. The Object Recall Game uses objects that the client:

- A. can recall from his or her home environment.
- B. sees in his or her immediate vicinity.
- C. can remember from childhood.
- D. saw recently in the grocery store.



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2. A B C D	10. A B C D
3. A B C D	11. A B C D
4. A B C D	12. A B C D
5. A B C D	13. A B C D
6. A B C D	14. A B C D
7. A B C D	15. A B C D
8. A B C D	

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