

THE BENEFICIAL EFFECTS OF PHYSICAL EXERCISE ON THE LANGUAGE LEARNERS' MIND, BODY, AND BRAIN

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ABSTRACT

In this paper, I encourage the use of moderate physical exercise at regular intervals as a means to promote enhanced attention, focus, learning, and memory for English language learners. I make the claim that physical exercise and movement have played a pivotal role in human physical and cognitive evolution and that exercise ought to become a routine part of our English language lessons at all levels of instruction. I show the physiological, emotional, and cognitive benefits of exercise and conclude by offering six enjoyable and effective exercise activities that English language teachers can use in their classes to strengthen the encoding, learning, and memory processes of their students.

INTRODUCTION

The human brain has developed over the centuries not by sitting or by being sedentary, but rather by moving and exercising (Medina, 2014; Randolph, 2013a; Ratey, 2002). This paper looks at the essential presence of physical activity as a key factor for English language learners (ELLs) in English language and culture classes—whether they be regular lessons or testing days. First, I will address the common problem that often plagues English language learning classrooms. Next, I will suggest the simple but highly effective solution of physical exercise. I

will, then, survey the benefits of exercise related to the body, the emotions, the mind, and the brain. I conclude by offering six physical exercises that English language teachers (ELTs) can implement in their respective classes. These have proven to help ELLs improve their learning and memory at heightened levels.

THE COMMON PROBLEM OF INACTIVITY

The human brain has been developing for millions of years. During that time, our ancestors were moving about (i.e., walking or running) on a daily basis. Anthropological studies show that males walked close to 20 kilometers per day, and females walked half of that distance (Medina, 2014). Yet the concept of distance itself is not as important as the activity. What is significant is that we were constantly moving for centuries, and this movement led to enhanced learning and successful evolution. That is, “[l]earning and memory evolved in concert with the motor functions that allowed our ancestors to track down food, so as far as our brains are concerned, if we’re not moving, there’s no real need to learn anything” (Ratey & Hagerman, 2010, p. 53).

If our brains have evolved naturally from an active and exercise-driven life, we should question, then, why our ELLs, particularly in higher education are sitting down when they are asked to encode, learn, and remember the various aspects of a language or information from a content-based class. We must remember that throughout the course of human history, movement and learning have been parallel activities and have thus become very significant aspects of our evolutionary DNA. In short, to have students sit and learn is an unnatural activity for the brain, because “[t]hat which we call thinking is the evolutionary internalization of movement” (Llinás as cited in (Ratey & Hagerman, 2010, p. 40).

Moreover, a vast body of research has shown that sitting, especially for long periods of time, is harmful for the various stages of learning and memory (Agus, 2012; Biswas et al., 2015; Centers for Disease Control & Prevention [CDC], 2010; Jensen, 2008; Medina, 2014; Ratey & Hagerman, 2010; Sousa, 2011). After a few minutes of sitting in class, our ELLs' bodies begin to relax, and their breathing naturally slows down. Consequently, their lungs generate less oxygen for the brain. This state of sitting may potentially cause challenging cognitive issues because the brain needs a healthy supply of oxygen for it to function optimally. "[I]f our students are confined to sitting, then they will be less likely to absorb the material in the lesson, and they will also lack that spark needed to become emotionally engaged in the content" (Randolph, 2015, p. 2). In short, the basic problem that students currently face while attempting to learn is the amount of time that they spend sitting in class.

THE SOLUTION – EXERCISING THE BODY, FEEDING THE BRAIN

The problem of sitting while studying or learning—either in-person or online—ushers in countless short- and long-term cognitive and physiological issues (Henneman, 2015; Randolph, 2013a, 2013b; Ratey & Hagerman, 2010; Warburton, Nicol, & Bredin, 2006). These problems, however, can be easily solved by implementing various kinds of physical exercises and breathing techniques in our English language lessons. This can be done both before and during class (Randolph, 2016; Schmidt-Kassow et al., 2013).

Reflecting for a moment on the history of physical exercise's impact on learning and its significance in our everyday lives, we see its importance dates back 2,000 years in the recorded writings of philosophers and physicians of ancient Greece and India (McPherron & Randolph,

2014; Tipton, 2014). For instance, the implementation of exercise played a major role in Plato's *Republic* (375 BC/1985). In fact, Books III and VII go into detail about the need for physical exercise and its effect on learning and the well-being of the body and soul (see 410 b-c; 536-537). Hippocrates, the credited author of *the Hippocratic Oath* and the renowned "Father of Medicine," also held physical activity in high regard. In Hippocrates' medical work, *One Regimen in Acute Diseases*, he suggested that "[e]ating alone will not keep a man well; he must also take exercise. For food and exercise, while possessing opposite qualities, yet work together to produce health" (380 BC/1931, p. 229). In addition to the Greeks, Susruta (600 BC), a prominent physician from ancient India, was also a strong proponent of exercise, arguing that it is "absolutely conducive to a better preservation of health" (as cited in Tipton, 2014, para. 6).

If, then, major historical figures dating back two millennia advised the employment of exercise and current neuroscientists (Schmidt-Kassow et al., 2013), professors of psychiatry (Ratey, 2002), and molecular biologists (Medina, 2014) are promoting it, why is exercise not a core educational tool used in our ELL classes? For exercise, even the smallest dose, can go a long way. Implementing physical exercises in our classes will not only make the students feel better physically and emotionally, but it will also help them learn at faster and more effective rates (Jensen, 2008; Randolph, 2015; Ratey & Hagerman, 2010; Winter et al., 2007).

THE BENEFITS OF EXERCISE – "I MOVE, THEREFORE I EXIST"

I have often thought that Descartes should have said, "I move, therefore I exist" (Randolph, 2013a, para. 14). For it is movement that truly defines who and what we are. Our brains need oxygen and glucose—these are two crucial ingredients produced during exercise that

help foster a healthy and effective brain; and, consequently, they help foster more effective learning.

The word “health” comes from the Old English word “hæth.” Interestingly enough, the word means “whole” or “complete.” That is, if we are whole or complete with a sound mind and body, then we are “healthy.” Exercise, more than any other activity (Jensen, 2008; Reynolds, 2012), helps us develop and maintain this “complete wholeness”—in- and outside the classroom.

There are, of course, skeptics who negate the importance of physical exercise and its relation to learning, dismissing it as unnecessary. They especially take issue with using it as a tool in the classroom. These skeptics, however, are becoming rarer due to the vast body of research and papers written on the myriad of benefits that exercise offers (Randolph, 2016; Ratey & Hagerman, 2010; Warburton, Nicol, & Bredin, 2006). In fact, there are over 5,000 papers alone that have been published on the unique protein known as *brain-derived neurotrophic factor* (BDNF). This is a highly important protein released during exercise that helps the brain grow and stay cognitively productive. Much of this research shows specifically how exercise nurtures both cognitive and physical health via a protein such as BDNF (Ratey & Hagerman, 2010).

The benefits that exercise yields are impressive, and educational neuroscientists have argued that physical education classes in schools are vital because they foster *neurogenesis* (i.e., the growth and development of new neurons) in the students' brains. “There are no data that say that about any other class at school!” (Jensen, 2008, p. 39). Without question, the benefits of exercise are wide in scope: They include physiological benefits for the body, emotional benefits for spiritual well-being, and cognitive benefits for the mind and the brain. Let us take a look at these effects on the body and brain and how they help develop better language learners.

Physiological benefits for the body

Exercise helps the body become stronger and maintain a healthy immune system. It is widely known that minimal exercise, such as moderate walking or gentle yoga postures/stretching, can promote muscle and bone strength, increase circulation, maintain a healthy heart and lungs, increase blood and oxygen to the brain, and create the all-important progenitor cells for cellular repair and maintenance throughout the body. Moreover, exercise is a leading factor for preventing various chronic diseases (Warburton, Nicol, & Bredin, 2006).

The simple act of exercising can also lead to longevity. In a 2012 study on exercise and mortality, the research concluded that by getting the recommended weekly allowance of 150 minutes of moderate exercise, we “can expect a 1-to-7 return: seven extra minutes of life gained for each minute spent exercising” (Goldberg, 2013, para. 7). In essence, each step a person takes on a walk or run, or each stroke a person takes in a pool, lengthens his or her life. Exercise truly is the elixir of life—this concept is based on both scientific research and our evolutionary history.

Emotional benefits for spiritual well-being

When we exercise, our body becomes a natural, organic pharmacy, dispensing very crucial neurotransmitters. Scientists are currently aware of more than 60 different kinds of neurotransmitters in the brain. Two of these—dopamine and serotonin—are responsible for fostering healthy moods and positive emotional responses (Collins, 2017; Knecht et al., 2004). These neurotransmitters can also help balance our ELLs' moods and inspire an excitement regarding the reward system in learning new aspects of a language such as vocabulary. In addition, dopamine is an important chemical which helps boost our students' working memory (Jensen, 2008). All teachers are well-experienced with the presence of inactive students.

However, if we implement exercise before and during class, we will be able to help our students engage in learning by promoting heightened levels of these crucial neurotransmitters. These, in turn, will nurture increased levels of happiness, enhanced self-esteem, risk-taking, and a sense of emotional or spiritual well-being. And perhaps most important, different kinds of exercise inhibit the unwanted feelings of emotional and psychological stress (Ratey & Hagerman, 2010). In short, exercise is the needed tool for enhancing a fun and engaging class.

Cognitive benefits for the mind and brain

I have shown in the previous sections how exercise has always been an essential part of our lives. The powerful effect it has on the brain is what has kept our civilization evolving and developing. A study at the University of Illinois demonstrated that “[e]xercise ... does more to bolster thinking than thinking does” (Reynolds, 2012, para.1). This rich boost in cognitive activity is due to a number of exercise-related factors. For instance, when there is oxygen and blood going to the brain, a number of important neurotransmitters are being released, and BDNF is being secreted. These all help the brain function at its optimal level. Let us take a brief look at these factors and survey three case studies that shed light on how necessary and crucial exercise is for learning and memory.

The science behind exercise's impact on learning is relatively simple: The more you exert the body, the more blood and oxygen go to the brain, and the more those needed neurotransmitters for learning and memory release their chemicals, causing the brain to better focus and learn. A number of the neurotransmitters that help with mood balance also help with learning and memory. Acetylcholine, dopamine, epinephrine (also known as adrenaline),

norepinephrine, and serotonin are all released during exercise, and these also are responsible for emotional balance, focus, cognitive arousal, attention, awareness, learning, and memory.

Exercise also promotes and releases extraordinary neurotrophins. These are certain proteins that foster the survival of existing neurons, help in developing new neurons, and increase the efficiency of neural communication in the brain. One neurotrophin in particular—BDNF, that I mentioned above, is highly significant for our ELLs. BDNF helps our students' minds and brains in a number of crucial ways. The presence of BDNF

- creates new neurons (i.e., it promotes *neurogenesis*);
- strengthens existing neurons and neural connections;
- promotes the ideal neural situation for learning;
- improves memory and learning;
- creates more BDNF;
- helps nurture good sleep patterns; and it
- promotes weight loss (Ratey & Hagerman, 2010).

In fact, Ratey and Hagerman (2010) have termed BDNF an all-powerful “Miracle-Gro for the brain” (p. 19) because of how it uniquely generates new neurons and profoundly helps boost learning and memory. If instructors want to create the optimal learning environment for their students and build more efficient brains in the process, they merely have to include exercise as a routine part of their lessons.

Naperville Central High School in Illinois has set up an exercise program that has gained national attention, primarily because the program has helped the students learn and increase their interest in school. The physical education teachers in Naperville created what is called the *Zero Hour PE* class. This extra class allows students to exercise one hour before their regular classes begin for the day. According to Duncan, a physical education teacher at Naperville Central High

School, the point of the exercise classes is to prepare the students' brains so that they can learn and digest the material in their academic-based classes with ease and enthusiasm. "Basically, we're getting them to that state of heightened awareness and then sending them off to class" (as cited in Ratey & Hagerman, 2010, p.11).

The students (both native and non-native users of English) who participated in the class showed a 17 percent increase in enhanced reading and content comprehension. This was much different than those who did not take the Zero Hour PE class. They improved by only 10.7 percent (Ratey & Hagerman, 2010). The success of this class has continued over the years because the students have benefited from the powerful effects of exercise. Here again, we see that learning and movement work hand in hand as mutual ingredients for a healthy brain.

The faithful and solid marriage between BDNF, key neurotransmitters (i.e., dopamine and epinephrine), and exercise has also been shown to enhance vocabulary acquisition. A 2007 German study looked at how exercise helps in acquiring vocabulary. Winter et al. (2007) discovered that their subjects learned vocabulary 20 percent faster after doing an intense physical exercise workout. BDNF, dopamine, and epinephrine were also significant factors. "More sustained BDNF levels during learning after intense exercise were related to better short-term learning success, whereas absolute dopamine and epinephrine levels were related to better intermediate (dopamine) and long-term (epinephrine) retentions of the novel vocabulary" (Winter et al., 2007, para. 1).

The Naperville case and the 2007 German study looked at encoding and learning post-exercise, which both appeared to be highly successful and influential. However, a study by Schmidt-Kassow et al. (2013) took a different approach and looked at exercise both before and

during vocabulary acquisition. Schmidt-Kassow et al. (2013) examined three different groups: (1) a physically inactive group that learned vocabulary; (2) a post-exercise group that exercised on cycle ergometers before learning vocabulary; and (3) a group that exercised on the cycle ergometers while simultaneously learning the new vocabulary. This study focused on 81 German females and their process and results of studying Polish. After two sets of tests, the group that exercised *while* learning had the best results. It is important to note that the exercise was not strenuous but moderate in nature. In short, light to moderate exercise while learning also results in better learning and memory.

EXERCISE ACTIVITIES THAT ENERGIZE THE BODY AND THE BRAIN

From the above research, it is clear that exercise is a highly effective tool for enhanced learning, memory, and emotional and physical health. How, then, can ELTs implement physical activities into their English language lessons? Throughout the years I have created a number of pre-class and during-class exercises that have helped students focus and learn at impressive rates. These are usually relatively short, two- to five-minute activities that yield very positive results and are fun for students. I will next describe the activities from the two categories (i.e., pre-class and during-class activities), and I will discuss some of the reasons for doing each one.

Before I introduce the activities, I would like to briefly highlight two significant points related to the exercises done in class. First, I have found it important to explain to my students what we are doing and why. If they are aware of the benefits of the exercise activities and know the various activities are supported by current research in neuroscience, the students are more apt to participate and do so with interest and enthusiasm. Second, although I have termed these pre-

and during-class exercises, the pre-class activities can be done at any time. I thus encourage teachers to use these physical exercise activities before introducing or teaching key ideas or crucial information (Randolph, 2016).

PRE-CLASS EXERCISES

The Happy Hall Walk

The Happy Hall Walk is a fun and relatively quick pre-class exercise. Before the lesson begins or as soon as everyone is present, I lead my students up and down the hall for one to three minutes. We walk as quickly as possible to increase the heart rate. This promotes more blood and oxygen to the brain and gets the students focused and attentive from the moment the academic portion of the class begins. If the classroom I use is large enough, then I simply walk the perimeter of the room with the students. This has an advantage because I can review the content or certain aspects of the previous day's lesson while we walk. It is a great way to also review vocabulary or grammar points. The idea of *reviewing while moving* has proven to be very effective for my students' long-term memory of various language skills and content in my classes. I am certain that the students are benefitting from the same dynamics as established by the Schmidt-Kassow et al. (2013) case study.

Sweet and simple tai chi yoga variations

Sweet and Simple Tai Chi and Yoga Variations are essentially fun, full-body stretches. These tai chi or yoga-like stretches and postures get the heart rate up and simultaneously encourage an awareness of breath practice. They are a great way to motivate learning and create a positive atmosphere in the classroom. For a visual example of this, see my YouTube video at

Patrick T. Randolph's Exercise for the Brain

(<https://www.youtube.com/watch?v=E65StVJTzVU>).

Nifty knees and jumping jack jamboree

The Nifty Knees and Jumping Jack Jamboree is another short but powerful pre-class exercise. This exercise has three parts. First, we begin by running in place for 30 seconds. During this time, we lift the knees gradually higher. Then, we gradually lower them and stop. Next, we do five side-straddle jumping jacks with the right foot forward and the left foot backward. Then, we switch with the left foot forward. The jumping jacks are also done for 30 seconds. For the third part, I have the students run in place for another 30 seconds. We conclude by inhaling and releasing three long and slow breaths. This is a simple yet potent exercise because it increases the heart rate and provides plenty of oxygen flow to the brain.

DURING-CLASS EXERCISES

As noted above, the pre-class exercises can also be used for during-class exercises. The important idea to keep in mind is that students should physically move and do some kind of exercise every 20 minutes to keep the brain attentive and stimulated (Jensen, 2008). I used to do only pre-class exercises until I read the Schmidt-Kassow et al. (2013) study. It was then that I realized the crucial significance of learning and movement as complementary activities. Below are some specific during-class activities that are very effective.

Exercises stations

I created the concept of Exercise Stations to inspire students to exercise whenever they like. Exercise Stations are “designated corners of a classroom (usually the back) where students

can go to do their own, individual exercises when they are in need of an oxygen boost for their brains” (Randolph, 2013b, p. 18). On the first day of class, I explain to the students that a certain area of the classroom is assigned as the “Exercise Station.” I encourage them to use this when they need to refresh their minds. I have found the ELLs will use these stations without disrupting the lesson. I have also noticed in the past that the more diligent students will make frequent use of these (Randolph, 2016). However, all students, at some point in the term, will find these useful and helpful. The main point here is to let the students know that it is both recommended and healthy to take breaks to exercise the body and brain.

Stand and deliver

This particular exercise was inspired by having a large number of students in one multi-skills class while also having a relatively small classroom. As we did not have much room to move about, I asked the students to stand up when they either asked or answered a question or when they had something of interest to say. Although this old-school method took a while to get used to for some, all the students eventually participated. The idea was successful enough that I made it a permanent part of my *during-class exercises* (Randolph, 2016). Two major benefits of this activity are (1) it happens frequently so many students get exercise; and (2) the students mentioned that it also increases their heart rate. This simple act ushers in neurotransmitters like adrenaline, dopamine, and norepinephrine. These, as noted earlier, are highly important for attention, focus, learning, and memory.

The class clap

We may not necessarily think of “clapping” as a productive or enriching physical activity. However, recent research (Kim, Hong, & Jang, 2011) has shown that clapping is an effective

way to stimulate the brain. On a basic level, this makes complete sense. When one is clapping (the more vigorous, the better), he or she is exercising and causing more blood and oxygen to flow to the brain (Jensen, 2008). This, of course, will also promote the release of helpful neurotransmitters that strengthen attention, learning, and memory.

I initially used clapping to reinforce praise and create a positive and healthy classroom environment. I would consequently have the students clap to show support for a classmate who had given the correct answer to a question or asked a question that was impressive or thought-provoking. During one specific lesson, I noticed how frequently this happened and what a cognitive and emotional boost it gave the class; hence, I used it thereafter (Randolph, 2016). The Class Clap, then, is used not only to praise students, but also to energize them and bring their awareness to the present moment and refresh their minds. Although no research studies have yet confirmed that clapping in classes releases oxytocin, I believe that there is a profound sense of trust and empathy that develops through practice of the Class Clap.

CONCLUDING REMARKS

Physical exercise is a natural part of our lives, and its presence supports the learning process. Based on the historical value of exercise, and taking into consideration the vast amount of research in neuroscience, kinesiology, educational neuroscience, cognitive psychology, and even psychiatry, physical exercise seems to be the healthiest activity for the brain (Agus, 2012; McPherron & Randolph, 2014; Medina, 2014; Ratey & Hagerman, 2010; Reynolds, 2012; Sousa, 2011). In this article, I have shown the importance and benefits of using exercise in the ELL classroom. The six physical exercise activities I presented are by no means comprehensive, but rather a small sampling of what ELTs can use to enrich the cognitive skills, learning, and

memory of their students. In addition, physical activity adds to the enjoyment of the learning process and creates a natural means of acquiring information and asking the right questions to learn more about the English language and its uses. “Given all the activations happening at once, physical performance probably uses 100 percent of the brain. There is no known cognitive activity that can claim this” (Jensen, 2008, p. 39). If our ancestors wove learning and movement together to learn, grow, and evolve for thousands of years, then we ought to keep the tradition alive and make the most of it where it counts—in our ELL classrooms. It is exercise that will help meet the objectives of developing our students’ skills and pointing them in the right direction for language and life enrichment.

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