Exercise and Cognitive Performance

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Double Dutch
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By Gregory Pardlo

"The girls turning double-dutch
bob & weave like boxers pulling
punches, shadowing each other,
sparring across the slack cord
casting parabolas in the air. They
whip quick as an infant's pulse
and the jumper, before she
enters the winking, nods in time
as if she has a notion to share,
waiting her chance to speak. But she's
anticipating the upbeat
like a bandleader counting off
the tune they are about to swing into.
The jumper stair-steps into mid-air
as if she's jumping rope in low-gravity,
training for a lunar mission. Airborne a moment
long enough to fit a second thought in,
she looks caught in the mouth bones of a fish
as she flutter-floats into motion
like a figure in a stack of time-lapse photos
thumbed alive…"

I did not just wake up one day feeling more intelligent than the day before. Instead, it was a gradual process, one that did not really seem to occur until after it occurred. The transition between being sedentary to being active played a quiet yet loud role in the process. Quiet in a way that I did not realize that being active was the reason behind my academic success in school. Loud in the sense that it played a major role in the process.

BACKGROUND INFORMATION: THE PHYSIOLOGY

In the book *When Breath Becomes Air*, Paul Kalanithi describes, "every operation on the brain is, by necessity, a manipulation of the substance of ourselves" (Kalanithi, Paul). In this case, the same can be said of exercise. Many studies in our time have shown that exercise has a major impact on our cognitive performance. Exercising is the operation being performed on the brain that manipulates the brain to

perform efficiently. In almost all cases, “exercise is a subcategory of physical activity. Exercise is a physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective” (Caspersen 128). The component of fitness that is being measured in this research is not exactly physical though, instead, it is physiological and intangible. In this specific scenario, scientific experiments prove that individuals,18 and older, who are generally active daily, execute cognitive tasks at a more advanced level than those who do not participate actively. But what exactly measures academic performance? Many people who exercise, exercise to look leaner or become stronger. These goals can be measured through different examinations such as checking someone’s weight on a weight scale, measuring one’s BMI, or by measuring one’s body composition through bioelectrical impedance. Unfortunately, testing an individual's intelligence is a bit more difficult than running an objective test to determine one’s body fat percentage. Cognitive performance is seen through cognitive function which is a “broad term that covers many different aspects of mental functioning including thought process, memory, attention, concentration, and creativity” (Rasmussen). The system has not changed, a variety of tests including IQ tests or advanced placement exams, or a student’s grade point average is still used to predict one’s intelligence and achievements. But, through these different tests we can compare and see how an individual has improved cognitively from one point in time to another.

Exercise has been seen to affect the brain in multiple ways, directly and indirectly. It has been said that “a single 30-minute session of moderate-intensity level of exercise could improve memory, planning, and reasoning, and shortens the amount of time needed to complete cognitive tests” (Beatty, E. K). As noted earlier, cognitive function consists of memory, attention, as well as many other important aspects that help us problem solve, remember facts and memories, and think outside of the box. Staying physically active has a direct and grand impact on specific areas of the brain such as the “executive central command” (Kravitz, L). This so called ‘executive central command’ center controls “working memory, planning, scheduling, multitasking and dealing with ambiguity (e.g., such as doubt and uncertainty)” (Kravitz, L). These four components of the executive central command tend to be effected by age. As we age, these factors tend to decline in performance, meaning that it becomes quite difficult to remember things, organize, multitask, and deal with our own problems. Working out our main muscle, the brain, slows this aging process down. We actually “reduce both the biological and cognitive consequences of aging” (Study Finds Aerobic). No more forgetting where you put your house keys or your wallet. In conjunction to strengthening the executive central command center of the brain, staying physically active benefits the brain by improving “a youth's perceptual skills, intelligence quotient, achievement, verbal tests, mathematic tests, developmental level and academic readiness” (Kravitz, L). Instantly having a proficient memory and problem-solving skills leads to performing better in school, on tests, or in general just intellectually. In many ways, exercise contributes to academic prosperity through an indirect manner. These aspects are equally as important as those that have a direct effect. Exercise plays a considerably large role in ameliorating “mood and sleep, and reduces stress and anxiety” (Godman, H). Being cranky, sleepy, stressed, and/or anxious are problems that “frequently cause or contribute to cognitive impairment” (Godman, H). Obtaining rest and relaxing the

mind and body can not only help students pay attention in class but also help them retain the material that they have been over. On top of that, “students with a high level of exercise had better relationships (including greater intimacy and more frequent touching), were less depressed, spent more time involved in sports, used drugs less frequently, and had higher grade point averages than did students with a low level of exercise” (Field, T). Exercise helps one achieve total balance and control over all aspects of their lives, physical, social, and mental. Having and maintaining relationships with family members and friends is a benefit from working out daily, maintaining a balanced diet, and receiving plenty of rest. Exercise is the one stop fix for all of these problems, killing not two but three birds with one stone.

These changes are not the only transformations occurring within and inside of our brains. Oddly enough, just like bicep curls increase the size of the bicep muscle within the arm, exercise in general increases different areas of the brain. These areas include the hippocampus, prefrontal and medial cortex, and basal ganglia. These three anatomical portions of the brain are incredibly similar yet different to each other in their own ways. The hippocampus’ primarily associated with memory. I like to remember the hippocampus by thinking of it as all of hippo [big] memories you make on a college campus. Regularly exercising, raising your heart rate, and sweating “appears to boost the size of the hippocampus, the brain area involved in verbal memory and learning,” so that you can remember all the good times you had in college without struggling to travel back to the past (Godman, H). Researchers have compared MRIs, brain scans, to reveal that “fit children had thicker hippocampi, which is thought to have helped their memory” (Beatty, E. K). Moving on to the prefrontal and medial temporal cortex, the portion of the brain that is responsible for controlling thinking and memory. Studies suggest, just as the hippocampus, that the prefrontal cortex and the medial temporal cortex have “greater volume in people who exercise versus people who don’t” (Godman, H). Last but not least, the basal ganglia achieve some growth in size as well. According to Beatty, “fit children had much larger basal ganglia. This is the part of the brain that helps maintain attention and improves the ability to coordinate thoughts and actions” (Beatty, E. K). This increase in size is due to the fact that exercising stimulates growth factors in the brain, leading to an increase in blood flow and new formations.

As mentioned, growth within the brain occurs when an individual is consistently exercising. Growth factors are “chemicals in the brain that affect the health of brain cells, the growth of new blood vessels in the brain, and even the abundance and survival of new brain cells” (Godman, H). Exercise stimulates growth factors, which set out to form new blood vessels and new brain cells. The formation of new blood vessels goes hand in hand with the increased blood flow. The abundance of blood vessels allows blood to travel more efficiently to the brain, especially in times of need such as during and after a workout, “improving brain circulation (for oxygen and nutrient delivery), function and health” (Kravitz, L). An increase in blood flow has proven to be extremely beneficial to certain areas of the brain such as the hippocampus, “the key brain region affected by Alzheimer’s disease” (Beatty, E. K). Growth factors influence neurogenesis, also known as generation of new brain cells, as well. Neurogenesis in the brain “improves the microstructures of white matter in the brain,” leading to “faster conduction between brain regions and cognitive performance” (Beatty, E. K). Along with

the hippocampus, the anterior cingulate is another key region “where we saw increase in brain blood flow, indicating higher neuronal activity and metabolic rate.” (Study Finds Aerobic). This region of the brain has been linked to superiority in later life.

As a personal trainer, I have seen many phenomenal and mind-blowing physical feats. It is easy to see that exercising on a daily basis can transform our bodies. Unlike our exterior, the brain is not exactly visible unless we have a scalpel ready to cut it open. We can see the muscular bulges in our bodies. We can readily measure the circumference of the different body parts with a simple measuring tape. Unfortunately, the same cannot be done with the brain. We cannot easily see a measurable difference in our brains’ structures after we exercise, but, through experiments involving MRI scans we have done just that. But, just as one’s strength, endurance, and power declines with inactivity, an individual’s cognitive function also tends to deteriorate. You cannot expect to lose weight, lose fat, or build more muscle mass if you do no keep up with a workout plan just like you should not expect to instantaneously become smarter and perform better in all tasks after one workout.

CONSISTENCY THROUGH AEROBIC EXERCISE

Now that we know the reason behind why physical activity improves cognitive function, we need to discuss what type of physical activity aids this process. Programs consists of a combination of “aerobic exercise, resistance training and flexibility are quite effective for cognitive function improvement” (Kravitz, L). But, the most important of the three is aerobic exercise. This includes, but is not limited to, running on a treadmill or riding a bike. Studies have reported that an “exercise duration (ranging 55-60min),” stimulates the muscles and the brain (Li, Joanna W). Aerobic exercise is the only one out of the three exercises that really elevates your heart rate. Elevating your heart rate is most important in increasing blood flow to the brain, which feeds the brain. In the United States, there is already concern for the massive sedentary population. Thanks to the advanced technology in our time period, many of us choose to be lazy and it is becoming harder and harder to get up on our feet. Lack of daily activity and exercise can lead to many negative conditions such as obesity, diabetes, and in the worst-case scenario, death. These are not the only issues that can arise from being inactive on a daily basis. Just as important as the rest of the body, is the brain. A lack of exercise can ultimately worsen cognitive performance. Luckily, aerobic exercise comes with many potential benefits. Many individuals already know that aerobic exercise raises one’s heart rate and this helps with weight loss, fat loss, muscular definition, energy, and many other physical benefits, but, aerobic exercise also works out the brain. Performing aerobic exercise on a daily basis can improve an individual’s cognitive performance. In fact, studies show that “fine and gross motor skills are positively correlated with several aspects of cognitive functions and with academic performance” (Geertsen, S).

Consistently staying active is the only way to improve one’s cognitive function. Exercise is not just a one-time deal. If an individual stops exercising for a couple of

days, the blood flow to his/her brain will decrease, and he/she will return to a sedentary state. Exercising and growing our brains is just like exercising our bodies, but unlike just exercising our bodies, exercising our brain is not only growth but also fuel. Some people may also argue that exercising has harmful effects as well, physically and mentally. Physically, people become more susceptible to injuries through exercising, and mentally, people perform poorly at school or work because they are spending more time at the gym than studying or working. This can be true in extreme cases. Working at a gym as a trainer, I notice some people who physically perform past their abilities. They pick up heavy weights that their bodies are not ready to endure and they perform with poor form and posture which will eventually lead to injuries. Very few people, I have noticed, come in and spend countless hours at the gym, making me wonder when they get work done or when they even go home to sleep and rest up. In general, though, physical activity can be very beneficial, physically and mentally, but too much of anything is not good. To exercise enough to stimulate the body and the brain, an individual should know the limits of their body, understand proper form and movement, stop when he/she feel like they have aggravated a muscle in their body, workout for 45 to 60 minutes, and make sure that he/she is getting enough rest so that his/her brain and body can recover properly.

People have different preferences when exercising. An individual may only perform cardiovascular exercise every time they workout, another person may only lift weights, someone else may only take group fitness classes, yoga, or Pilates. No one likes to do something that they do not enjoy, but making sure to find a balance and incorporating some form of aerobic exercise into their workout regime is important in strengthening the brain. Like in any area in our lives, it is imperative that we find balance. Since some people are so far deep into their daily workout regime, they may neglect to understand why this balance is so important since they are set into their ways, but by educating them and providing them with the knowledge and all the resources that they need to truly understand why the balance is important, we can help change their routine.

After I figured out that being active and exercising daily had benefited my performance in school and my energy level, I began going for morning runs before school, especially on exam days. Sticking to this plan and being consistent, was one of most important key aspects in this situation. The article “Brain Benefits of Exercise Diminish After Short Rest” shows that being inactive or sedentary for even just ten days can cause “striking changes in blood flow now. Much less blood streamed to most of the areas in the runners’ brains, and the flow declined significantly to both the left and right lobes of the hippocampus” (Reynolds, G). The hippocampus is an important structure of the brain that is associated with “verbal memory and learning” (Godman, H). Forgetting things tends to become more of a serious problem as we age. Unfortunately, we cannot completely stop our bodies from aging but we can manipulate and change our mental age by taking care of our brains through daily exercise.

INDIRECT FACTORS AFFECTING COGNITION

Since the beginning we have known and come to the terms that physical activity is beneficial to our bodies. Throughout my research, I have covered that physical activity, complex aerobic activity in particular, can provide benefits to one's cognitive development through direct improvement in memory, problem solving, planning, critical thinking, and focus. This happens because exercising causes neurogenesis, the generation of new nerve cells, and an increase in blood flow which in turn increases the size of multiple structures in the brain such as the hippocampus, basal ganglia, and prefrontal and medial cortex. All of these are direct factors in the development of cognition. Aerobic exercise has proven to provide direct benefits to the brain but there has also been indication that indirect variables are also enhanced, further benefiting cognitive function. Exercise tends to improve sleep, nutrition, mood, and reduces stress and anxiety. These in turn enhances "cognition through its effects on mediator variables such as depression, sleep, appetite (diet), and energy levels and by postponing or preventing age-related disease (e.g., diabetes, hypertension) known to affect cognition." (Spirduso)

As discussed, indirect measures also influence cognitive function. Sleep, eating habits, and mood can affect one's cognitive performance, improving demands such as memory and critical thinking. As of right now, our societies' sleeping and eating habits are extremely poor. On average, we should be getting 7-8 hours of sleep, but this is not the case for many people. In fact, we get a lot less than this. 40% of Americans get less than the recommended 7 hours of sleep on average per night. After a long day of studying, working, engaging with others, and physical exercise, our brains and bodies need to rest. Rest and recovery is important because it helps us digest a day's worth of information and events, and allows our muscles to relax for once. This in turn gives the brain and the body a chance to jump back to its working state the next day, allowing us to perform to the best of our abilities, physically and mentally. Sleep influences our cognitive performance every day and is directly correlated with memory retention. When we go to bed, our brains stay up to organize everything we have learned and done that day, so that when we wake up we can refer back to such information and events without too much difficulty. Other than memory, there are other problems that are prevalent when we do not receive enough sleep. One obvious issue we see is that "measures of response speed are extremely sensitive to sleep loss" (Kerkhof). Lagging often occurs when our bodies do not receive enough through the night. If you have ever woken up and felt like your life is moving in slow motion then you have not had enough sleep. As I said, this is pretty obvious. Most people understand that their brain's respond a lot slower with a lack of sleep and rest. If a lack of sleep becomes a consistent issue, occurring almost every night, overtime "cognitive performance functions such as attention, working memory, and cognitive throughput [will] deteriorate" (Kerkhof). Now, how does exercise play a part in this? Aerobic exercise and weight bearing, resistance exercise, improves sleep quality. Most reports and articles have their test groups self-report individual sleep quality using the Pittsburgh Sleep Quality Index. Many physicians advise those individuals with sleep issues such as insomnia to participate in moderate-vigorous to ease those problems.

Over the years, America has experienced a non-stop growing rate of obesity throughout the country. We already know that a lack of physical activity can not only take a toll on your body physically but it can also take a toll on your brain mentally. Unfortunately, nutrition goes hand in hand with this situation. Overeating is not the only concern though, undereating is also an issue that can and will affect cognition. Consuming a balanced meal is just as important as exercising daily to keep one's brain mentally sharp. Nutrition, the food one eats on a day to day basis, can fuel his/her brain, either positively or negatively. We can see that nutrition begins to affect cognition as early as pregnancy. What mothers consume during their pregnancy can actually affect their child's brain development. We have heard a lot about how consuming alcohol during pregnancy can cause Fetal Alcohol Spectrum Disorders, but our focus falters from seeing how other nutritional aspects in a mother's diet can become an issue. The early years of life are the most important time to make sure a child's nutrition is monitored because "the first few years of development had marked a positive impact on measures of language, memory, and perception" (Burkhalter). More specifically, through research, we see that "cognitive performance was higher for those children whose mother consumed the protein-energy supplement during pregnancy and lactation" (Burkhalter). Protein is not the only macronutrient that is necessary for the betterment of cognition. All of the macronutrients, complex carbohydrates and unsaturated fats, are needed in moderation. Other than what to eat, how much to eat is also an important question. Many people I come across on a daily basis as a trainer make excuses for missing breakfast almost every morning before work or school. The next time you decide to fast in the morning, remember that "early morning fasting is associated with a decreased ability to problem solve" (Burkhalter). Consuming three to five meals daily is not only important in ensuring that our muscles have enough energy to function but is also imperative for our brains to act efficiently. Having a "balanced meal has been related to marked, positive changes in disposition, attentiveness, and motivation among individuals 19–33 y of age" (Burkhalter). Again, how does this tie into to exercise and cognition? I mentioned earlier that exercise increases the appetite, so therefore an individual's diet influences cognition.

Between the two, sleep and nutrition, we can easily test and prove that lack of sleep can cause a lack of focus, attention, and memory, all leading to a lower cognitive performance, but, there is no exact science to prove that nutrition can improve or hinder one's cognitive function. But, I do not believe that we need to scientifically prove it, experimenting can be just enough. See how you feel after eating certain foods. If you eat something high in sugar, you will find yourself jumpy for probably an hour and then you will crash. Instead, if you are consistently eating complex carbs such as sweet potatoes and green vegetables you will feel fuller and will stay energized much longer.

Leading a healthy life style is a goal for many people including myself. As a personal trainer, I strive to lead by example through exercise, nutrition, mindset, and regeneration. I value balance between these four areas. I exercise five to six times a week for about an hour to two hours. I follow a meal plan made specifically for me with all of my macronutrients listed out to help me reach my goals. I am extremely committed

to leading a healthy and fit way of life. I also strive for at least 7 hours of sleep each night. I personally value each and every one of these aspects because I understand how important it is to implement a balance between them in my life. Many people assume that it is only important to just get in a workout at the gym, but that is not true. Finding harmony between these four, exercise, nutrition, mindset, and regeneration, is extremely vital not only for your physical body but also for your cognition. For my research, I will have my two clients who have agreed to be a part of my research to write down what their sleep schedule is every night. I will also have them write down every meal that they eat and we will go over these habits every session that we train so that I can make sure that they are progressing on the right track. Unfortunately, no one can lead a perfect life. From work to school, stress keeps us up at night sometimes and eating straight through the stress. Sometimes a full 7-8 hours of sleep is not enough. And sometimes healthier options are not so affordable. How we choose to live our daily lives coincides with many factors such as our values, budget, and time. In fact, these factors are usually the most challenging to get past. Even though on most nights I get enough sleep or most days I eat according to my meal plan, there are some days and nights where I end up slacking off and that is okay until the slacking off once in a while becomes a daily habit.

Many individuals do not understand why the indirect factors such as sleep and nutrition are so vital for proper functioning of the body and the brain. Educating the public about the important of exercising and how it relates to sleep, nutrition, mood, and stress, and how those in turn affect cognitive functioning is a priority. Right now, media is the most prevalent method of distribution for information. Through the use of blog posts we can inform the public about the knowledge that we currently have regarding exercise and academics. Also, using events to present information can be a method of distribution. Some trainers might just “prescribe” exercise and nutrition plans to their clients but educating the client is just as important so that they can understand the reason behind the process. Without a general understanding how will one be motivated to do something? They won’t be. Educating my clients is one of my priorities and another method to disseminate knowledge.

We have seen through multiple lenses how aerobic exercise is directly beneficial to develop and improve cognitive function but what is not mentioned is how exercise also influences other habits which also contribute to building stronger cognitive performance. I briefly went over how exercise directly influences cognition and then dove deeper into how it also indirectly influences cognition through sleep and nutrition. Getting plenty of rest is important because just like any other muscle in the body, the brain needs to relax and sort everything out. Eating well, making sure one is eating enough of each macronutrient and consuming enough vitamins and minerals through their diet will also get the brain pumping and ready to perform.

TECHNOLOGY AND ITS ROLE ON COGNITION

Selections from Henry David Thoreau's Walking (1863)

I think I cannot preserve my health, unless I spend four hours a day at least—and it is commonly more than that—sauntering through the woods and over the hills and fields, absolutely free from all worldly engagements. …When sometimes I am reminded that the mechanics and shopkeepers stay in their shops not only all the forenoon, but all the afternoon too, sitting on crossed legs, so many of them--as if the legs were made to sit upon, and not to stand or walk upon—I think that they deserve some credit for not having committed suicide long ago.

Moreover, you must walk like a camel, which is said to be the only beast which ruminates while walking. When a traveler asked Wordsworth's servant to show him her master's study, she answered, "Here is his library, but his study is out of doors."

At present, in this vicinity, the best part of the land is not private property; the landscape is not owned, and the walker enjoys comparative freedom. But possibly the day will come when it will be partitioned off into so-called pleasure-grounds, in which a few will take a narrow and exclusive pleasure only—when fences shall be multiplied, and man-traps and other engines invented to confine men to the public road, and walking over the surface of God's earth shall be construed to mean trespassing on some gentlemen's grounds. To enjoy a thing exclusively is commonly to exclude yourself from the true enjoyment of it. Let us improve our opportunities, then, before the evil days come.

Throughout the day, there are a number of us are constantly sitting on our butts for hours, reading, writing, working, and learning. How often do we get up onto our feet? Exercise has unfortunately become an option these days because the majority of the American population is sitting in chairs all day and all night, reluctant to move. Even those who attend the gym on a daily basis, still spend most of their lives sitting in a chair at a desk. Not only has sitting become a problem, but so has technology. Our lack of interaction with nature and the real world has inhibited our cognitive development and performance. Our hesitation to go out and explore contributes to the issue of a steady decline in our cognitive performance. Today, it is understood that sitting is equivalently deteriorating to our health as is smoking, for many reasons. But, I can argue that technology is to sitting as sitting is to smoking. We know now that a lack of movement, daily aerobic exercise in particular, can derail our cognition, but what has not been discussed is how overworking and technology can both also be factors in this case, and to what extent. In our world today, we are surrounded by an unlimited supply of technology. New inventions and innovations are coming out each and every day to make our lives easier but are these new products and services truly a service or a disservice to our brains' cognitive function? How many times have you pulled out your phone's calculator to simplify a fairly uncomplicated math problem, something you could have solved in your head or at least by pulling out a piece of paper? To be completely honest, I know that I have done this on more than just one occasion, and I thought to myself afterwards, "Wow, I feel so stupid for pulling out my calculator. I should have been able to do that in my head!" Not only is it becoming more difficult to complete even the simple tasks, but it is also noticed that our attention span is now equivalent to that of

a fish's. Now, we are only "able to concentrate" for about eight seconds at a time. The decrease in our attention span is due to our increased usage of technology. Many people believe that they do not need to work as hard anymore since they have the technology to back them up. People will argue that not all technology is bad for cognitive function, which is true to an extent. Just like not all food is bad for your health, not all technology is bad for one's cognition. It all depends and differs on the type of technology being used. Some TV shows for example, "Gossip Girl" can be considered "complete nonsense" because they do not provide any educational value. On the other hand, though, watching documentaries such as "Forks Over Knives" can be of great value towards one's cognitive development. But, sitting in front of a television in general can have negative effects on the brain. That period of time spent in front of the television stands for inactivity, physically and mentally. That time can be spent at the gym working out both one's mind and body.

Exercising is not the only way to engage one's brain, especially after a long day at work or school, sitting at a desk for hours at a time, overworking one's brain. Getting outside, away from all the machines is just as important as exercising. Rest and recovery is a major process in the development and the function of the brain. How can one expect his/her brain to function when it does not have the proper amount of time to recover? Fortunately, my work as a personal trainer requires me to be on my feet for the majority of the day. Unfortunately, being a student full time, being a trainer full time, and being an active member in clubs as well as other organizations has taken a toll on my body mentally. I do not get any time to myself because I am working such long hours. Not to my surprise, I came back from my mini, solo vacation to Seattle feeling rested and ready to work. Why? Because I put my phone away, I went hiking and actually interacted with other people without a device in my hands. I explored the city, educated myself through the rich culture surrounding me, coming back to New York with a fresh mindset. Now, I feel as if I am able to focus much better in class and work with much more energy than I did before my trip. It is crucial to get away from technology for even an hour of our waking lives. It will give our brains a time to relax and rejuvenate. Going outside for a walk or being active outside the walls of these buildings is also another way to engage with nature and its surroundings. People say that they do not have the time to "connect" with the world, but if they have the time to "connect" with friends on Facebook for hours at a time then they have more than enough time to go explore the real world at the least once a week.

Getting away from technology and the confinements of a building can be difficult as most of our lives consist of using technology and staying inside buildings. One thing I do when I meet new potential clients is that I sit with them for a good five minutes and create a calendar with them. At least one day a week I schedule a time for them to go outside for a walk in the park or complete some kind of activity that they can do outside in the city. I hold them accountable for their calendars by checking in with them once a week or once every two weeks, if they are not training with me, to see if they are completing all the tasks that they have committed themselves to. For clients XH and WY, I will ask both of them to record how long they are away from digital devices to

make sure that they both get some fresh air away from their electronics that can be potentially harmful to their minds.

We are stuck in a time where our world revolves around technology and technological advances. There are a number of us who are a group of overworking individuals who sit in chairs all day. Taking time off to get up out of a chair, get active in the city and explore, gives our brain's the rest we need. We are constantly on our phones and working and learning that our brains do not get a break until we hit our beds. Resting is just as important to our cognitive function when we are awake as when we are asleep.

GUIDANCE AND NEUROBICS

"the real lesson is that under conditions of true complexity—where the knowledge required exceeds that of any individual and unpredictability reigns—efforts to dictate every step from the center will fail. People need room to act and adapt. Yet they cannot succeed as isolated individuals, either—that is anarchy. Instead, they require a seemingly contradictory mix of freedom and expectation—expectation to coordinate, for example, and also to measure progress toward common goals. This (Gawande, Atul)."

The summer before the fifth grade, my older cousin forced me to go to boot camp with her for two months. Waking up every morning at 4 am against my will was the last thing that I wanted to do over my summer break. Stepping onto the scale for weigh-ins, I already knew that I was overweight but at that time I did not care enough to actually do anything about it. Yes, I woke up every morning to go to boot camp and yes, I kept a food journal but none of it really made a difference. I barely lost any weight and felt completely the same. Why? Because I just did not care. About a year later, I finally looked at myself and told myself that something needs to change, so I finally took the initiative and began working out on my own. But, I was confused as to what I needed to do to become healthy. I had no guidance and no support to help me. During this time, the game Wii fit, came out so I decided to take advantage of that. Jogging in place in the living room and doing step ups on the Wii board, I began to finally see the benefits of exercising on a daily basis. I realized that exercising did not have to be boring, it could actually be really fun. But, unfortunately, I was still lost. I was making progress but not enough. Soon enough, I decided to join a gym. Every night, I went to the gym with my sister and we took a stroll on the elliptical for an hour each day. The only activities I was comfortable doing at the gym was using the elliptical, the bike, and the treadmill. I still wanted more, yet I did not know which direction to head into. I was later informed about a new craze, Blogilates, and started following that. Having a calendar and workouts already made for me was super helpful and made my life easier by taking all the guess work out of the situation. Having a person to follow really set me up on a path.

Having someone to act as a guide can really help an individual begin their fitness journey. One of the reasons I chose to become a personal trainer was so that I can be that person that sets people on the right path, that pushes them in the right direction, towards their goals. Even on top of that, I want to show people that exercising can be enjoyable too. Making an exercise program based on an individual's wants and needs is an important part of guiding him/her and putting him/her on the right track. By using an individual's weight and body fat percentage in addition to their lifestyle, including: work, activity, nutrition, mindset, and rest & recovery, I can tailor an exercise program specifically for that person. Incorporating all aspects of one's lifestyle into an exercise program is extremely vital because everything a person does during their day and night affects their health and fitness. From how long they are sitting during work, how active they are daily, what they eat for breakfast, lunch, and dinner, to how they choose to rest and recover after a long day. Finding a balance between all aspects of life directly correlates with one's exercise performance and his/her progression in their exercise program.

When tailoring a specific exercise program, it is important to keep challenging the mind and the body. This is where neurobics comes in. Neurobics is the science of brain exercise. Our brains are stimulated through constant changes and challenges in our daily lives, so providing ourselves with new opportunities and setting new patterns every day helps strengthen our minds. There are three different ways in which this can be approached. The first condition is to "involve one or more of your senses in a novel context (Katz, Lawrence)." This is done through engaging different senses for certain tasks. For example, putting on pants with your eyes closed. The second condition is to "engage your attention (Katz, Lawrence)." In order to stimulate your brain, you need to participate in activities that "engage your emotion (Katz, Lawrence)." The third condition is to "break your routine in an unexpected, nontrivial way (Katz, Lawrence)." This can be simply done, for example, by taking a different route to school or work. It is difficult to incorporate all three conditions into just one task, same goes for exercising, but there are multiple ways in which you can tackle this. Engaging your senses during exercise can range from closing your eyes while performing a balance exercise, to plugging your ears during a kickboxing fitness class. What this does is that it forces one's brain to be more attentive now that he/she is forcing him/herself to use only four out of his/her five senses. Another way to get one's brain working during exercise is to challenge his/her sensorimotor control. Through the use of balancing techniques, using bosu balls, stability balls, balance pads, stability discs, and indo balance boards, one can test their brains. This will not only help posture but since sensorimotor control involves "visual, vestibular, and proprioceptive inputs from the Human Movement System (Clark, Mike)," it will also strengthen the brain over time. Reactive training is another way to train the brain and the body together, through enhancing the speed at which motor units are activated. This teaches the body "how to react, adapt, and respond quickly to demands placed on it (Clark, Mike)." As we have seen, reacting, adapting, and responding all involve the nervous system and the physical body. To improve motor behavior and neuromuscular efficiency with my clients, I will incorporate movements that will limit their senses and plyometric training into their workout programs. Being a personal trainer, it is my duty to engage my clients' attentions at the very beginning of our program. I do

this through connecting my clients to their goals. I connect them to their goals by asking them personal questions so that they can really dig deep and tell me why it is that they have that specific fitness goal, how they have tried to attempt to reach that goal in the past, what has hindered them from reaching that goal before, etc. On top of that, during each and every session, I continue to engage them by asking them how they feel about a certain exercise, what they would like to see, and how they feel overall after a workout. Lastly, to break their routine and keep things fresh, I make each and every workout different from the previous ones. Sure, there are a few exercises that I will come back to once in a while but I will make sure to keep from repeating an entire workout routine over again. This will again challenge the mind and the body because performing different movements will require the body and the brain to work together in new ways. Instead of just performing single joint exercises, performing complex, multi-joint exercises will further challenge the body and the brain.

In order to challenge oneself, one must be willing to try new things. These changes do not have to be life changing. Even small changes can make a difference. In context with physical training, small changes in one's everyday workout can force the engagement of your brain. Doing the same workouts every day or even every week can cause one's brain to sit back and relax. Think about it. When you are walking or driving to school or work every day using the same path, do you really have to think about it? You can be on the phone or jamming out to some music and not paying attention to where you are going at all and you will still get to school or work without any difficulty because it is a part of your daily routine so your brain does not have to do too much work to actually get you to school or work. When eating something new you have to think about how you are supposed to eat it and when it is finally in your mouth, your brain has to make out whether it likes it or not. The next time you try something new, try to pay attention to how much your brain actually has to work.

DISCIPLINE

"What is needed, however, isn't just that people working together be nice to each other. It is discipline. Discipline is hard--harder than trustworthiness and skill and perhaps even than selflessness. We are by nature flawed and inconstant creatures. We can't even keep from snacking between meals. We are not built for discipline. We are built for novelty and excitement, not for careful attention to detail. Discipline is something we have to work at (Gawande, Atul)."

With any goal or dream, one needs discipline. Without discipline there is no consistency, and without consistency there is no achieving one's goals or dreams. Having discipline sets one's mind on the right path, keeping it focused so that it does not falter. Discipline forces oneself, even when he/she does not want to, to follow the path to his/her goals. Just like I did not improve my cognitive performance overnight, I also did not lose weight overnight. When I went to boot camp the summer before the

fifth grade, I had no discipline. I was forced to exercise when I went to the boot camp, so that stayed consistent. I was also told to write down everything thing that I ate during the day in a journal. I wrote in the journal every day, mainly because I knew that the trainers would check it, but I lied. I lied about what I ate every single day. I had no discipline, so I ate whatever I wanted, from brownies to cakes, and chose to cover it up with lies just because I knew that someone was looking. But, I did not realize how this would actually impact me in the long run. I knew that I was overweight and I needed to lose that weight but I was not disciplined enough to figure out that writing in a food diary was not for the main reason for the trainer to see, but rather for me to look at what I am eating every day to stay consistent and stand strong in my fat loss journey. This activity was supposed to keep me accountable and responsible for my own actions but instead I chose to lie which only hurt myself in the long run.

When looking at myself now, I see that I am more disciplined than I ever was before in my life. This is because I finally have a specific goal. Having a specific goal is one of the first and most important steps of becoming disciplined. A goal with specific numbers and a time frame are more likely to be achieved than goals such as, “I want to lose weight.” To strengthen this goal that many people have, one must put a specific number behind the broad goal. This is why when my clients tell me that they want to lose weight, I ask them how much are they looking to lose, and if they do not know then I try to help them out by measuring their body fat percentage. When measuring their body fat percentage, I let them know what category, essential fat, athlete, fitness, average, and obese, they are in and then tell them about how much body fat percentage they would have to lose to drop a category. Not only does this provide them with a specific goal but it also helps them figure out where exactly they are and where they should strive to be. Many people do not have a specific goal mainly because they do not know what “healthy” really is.

By educating people, you give them more of a chance to understand what they are getting into and what they will go through. That was another reason why I was not disciplined when I first began to exercise, I did not really know where I was. My pediatrician kept telling me how much I weighed and that I needed to lose weight. No other information was given to me at all, which made it extremely difficult to even find a starting point. Even when attending boot camp, I was confused. The trainer just told me to eat “healthy”. Now what does that even mean? People keep throwing that word around like even they know what it means when they really do not. People use the word “healthy” when defining themselves without any illness such as diabetes or the common cold. Others use the word when eating salads, because all salads are healthy right? False. So, what exactly is healthy? Well there are multiple definitions. Depending on one’s height, weight, and age, his/her body fat percentage can be in the healthy range. One can also eat healthy. People choose to eat healthy by consuming more greens, calculating their macronutrients, the amount of protein, carbohydrates, and fats they are consuming, based on their weight, activity levels, and fitness goals. There is no one definition for “healthy” because people have different goals, and based on those specific goals there are different definitions.

Back to being disciplined, being informed and educated helps one stay more disciplined because now he/she has the information that he/she needs to make an educated decision based on his/her goals. Without knowing how to do something and why to do something it becomes increasingly difficult to figure out and know which path to carve out for oneself. My disciplined fitness journey began only about a year ago when I came across a personal trainer, Michael Morelli Jr., who is now my role model. Even now that I am a personal trainer, I look up to him for advice and new information so that I myself can set myself up on the right path, and also so that I can also share that information with my clients. Once I began following him, I saw how much a meal plan and an exercise program can be of benefit. Having something written down forces one to go through with it rather than trying to remember every little detail. I had a nutritionist create a special meal plan for me specific to my goals, to lose body fat and to gain lean muscle mass. To stay even more disciplined, I meal prep all of my meals for the week every Sunday so that there was no reason for me to steer off the path. With exercise programs, I plan in advance what I would be training every single day, such as what exercises, how many reps and sets, and when I would take rest days. I also adjust the plan if I knew there was a day that I could not exercise so that I can still stick to my goals. While working out, I write down how many reps, sets, and with how much resistance I actually completed so that I can go back to it later and see what I need to improve on and continue doing to reach my goals of losing body fat and gaining muscle mass.

Before I came across Michael Morelli Jr. I was very much uneducated about how to stay “healthy” and “fit”. So, I think the main concern with staying disciplined is knowing exactly what one is doing and taking the guess work out of everything. You won’t know where you are going unless you know what you are doing. Being active on social media as a personal trainer is very important to me. Social media is an easy way to connect with people across the world and to learn new information. What I like to do is, study up a bit, or use my personal experiences to help out others. I try to educate my followers on social media as much as I can so that they can truly understand what they are doing. I have been working on creating a blog so that I can share more information about health and fitness. This would be a platform where people can check in once in a while to learn new information, find great exercise routines, and recipes that they themselves can share with others as well. With this I hope to create a special platform for my clients so that they can interact with me when they are not with me. This platform would provide them with an online resource where they can easily find their exercises, along with videos to walk them through the exercise just in case they have forgotten what we have done together, and etc.

Discipline will come through hard work, planning, and knowledge. Knowing what path to take, how to set oneself up on that path, etc. will keep one focused on his/her goals. But, in order to reach any goal, one must have the commitment, the mindset, to conquer that goal. Without a strong mindset, it is difficult to do anything. Most people are less likely to achieve any goal that they make if they do not have the commitment.

PROMOTING EXERCISE AT SCHOOL AND WORK

The prevalent issue behind the United States becoming a lazy, coach potato nation is due to the fact that the young children, the adults of the future, are not being educated on why it is so important to participate in some sort of cardiovascular exercise every day. Physical Education time in grade school is being defunded, meaning that this time to be active is being taken away from the students. This is due to the fact that educators see this course as unnecessary and a waste of time, yet these same educators expect students to perform on an honor roll level (receiving only A's and B's on report cards). This is ridiculous because it has been proven that academic "performance improved after 10 minutes of classroom exercise breaks compared to the sedentary condition" (Howie, E). Implementing physical activity during the school day allows students to concentrate and focus. Sitting in school all day becomes exhausting and by the end of the day students can barely keep their eyes open because our attention span is now shorter than a goldfish's.

School is not the only area of concern though, exercise breaks during work can prove just as beneficial. Reducing work hours and incorporating a fitness break into the work schedule has shown "significant increases in self-rated productivity, that is, increased quantity of work and work-ability and decreased sickness absence" (Schwarz, Thiele). Sitting for hours at a time doing paperwork or in front of a computer screen wipes our brains out. Technology is one of the reasons why our attention span over the years has decreased. The proven method to regain awareness and attention is through blood pumping, heart beating exercise.

The overweight, obese, and diseased population keeps growing year by year, meaning that many more minds are not performing to the best of their abilities. It has become easier to just sit around and watch TV or play video games with technology as a prevalent force in our society, but technology is also taking away our time to be active. Not only is technology a factor but so is school and work as mentioned earlier. Implementing a daily activity schedule not only helps us build stronger and healthier bodies but also smarter and healthier minds.

For many years people have believed that the brain cannot be altered through any means. It has been assumed that what we were born with is all we have to deal with. Not only that, but for some reason, it is believed that the brain is somehow disconnected to the rest of the body, yet it is the one organ in our bodies that keeps our muscles and organs in check while keeping it connected. So, if our brains are the reason for our muscular contractions than why is it difficult to believe that exercise can improve cognitive function?

For each and every movement, our brains fire neural impulses down our nerves causing muscular contractions which provides for our movements. Now, think about learning how to play a new sport. During my sophomore year of high school, I decided

to join the field hockey team. That year I played for the junior varsity team and had high hopes and dreams of moving on to varsity the following year. While on the junior varsity team, I did not get much field time because most of the girls on the team were more experienced than I was, so, that summer I practiced every day. The varsity coach held three to four hour practices six times a week and I showed up to each and every day because I knew that in order to develop my skills I needed to practice over and over again. Just as an athlete continues to practice to become a better player, one must continue to practice to improve his/her cognitive performance. How exactly can practice improve cognition? By becoming active aerobically every day. But not just any aerobic activity will get the brain pumping. Staying active in what we call zone three, otherwise known as Aerobic Heart Rate Zone, where one is exerting 70-80% of their maximum heart rate, is where one will see the most benefit to the functioning of the brain. On top of that, it is found that more complex movements in aerobic activity such as kickboxing truly challenge the brain. This is because, the brain is forced to put in an effort to remember the movements. The more one askes his/her body to move, the more neural impulses the brain will have to fire to get the muscles moving. This ultimately challenges the brain and challenges are needed to create any type of change.

SELF-STUDY

As a personal trainer, I have seen many indications where exercising in zone three has reinforced the proven fact that getting one's heart rate up to 70-80% of his/her maximum heart rate will lead to changes in the brain. So far, two clients of mine have agreed to participate in my study to see how their daily activities add up to affect their cognitive functioning. One individual is a female who is 23 years old and has recently began graduate school. We will label this individual as XH. The second participant is a male who is of 43 years and works in accounting. We will call this individual WY. Neither one of these individuals have participated in much physical activity during the past year, but they are both looking to become more active and are looking to lead a healthier lifestyle by exercising on a daily basis. I will be following clients XH and WY for eight weeks, implementing new techniques to strengthen their bodies and their brains, as well as monitoring their physical and mental activities. Before our very first session, I will ask both clients to download the "Elevate" app. This app is known as a brain training app which focuses on testing an individual's focus, processing speed, memory, and problem-solving skills. Each "Elevate" training session lasts about five minutes. We will take our first "Elevate" test immediately after our first training session and take another one immediately after our last training session together (span of eight weeks). This will help to capture their progress throughout the eight weeks of our training.

Certainly, there are multiple variables that play a factor in cognitive performance. In fact, cognitive function can be split up into four different domains "(1) the characteristics of the individual, such as, age, skills, knowledge, health, and other resources; (2) cognitive strategies; (3) the nature of the material; (4) criterion tasks such as recognition, recall, problem solving, and others". As we can see, we can already point out differences between the two participants, XH and WY, that can contribute to

their cognitive functioning. First, there is a twenty-year difference between the two. This gap includes twenty years of experience and knowledge that cannot be transferred. Experience can provide a lot more intellectual ability because this means that an individual has seen and done many things that could potentially have changed the way he/she thinks and how he/she behaves. When looking at health we can compare body fat percentages and see that XH has a 22% body fat percentage meaning that for a 23-year-old female she falls in the ideal range. For individual WY, his body fat percentage is 23.5% which is average for a 43-year-old male. As of right now I do not have any information on either of the individual's cognitive strategies but will dive deeper into that when I see them during their first session. Moving on to number three we see that testing material can become an issue. Examinations are not 100% accurate in calculating one's cognitive efficiency. Just like there can be variations in an individual's weight or body fat percentage due to water content in the body, there can also be variations in one's performance on an IQ test. If you have ever taken a test and retaken a similar version of that test you may find that you did not get the exact same score as the first try. This is due to variation. Many factors can play a role in variation such as sleep and mood. I have taken exams where I have felt well-rested and confident and I have taken exams where I have felt the tired, sad, and exhausted. In which state do you think I would have performed better in? Most probably the state in which I felt the most energetic and confident. The last domain touches on the more concrete processes of the brain. Recall, recognition, and problem solving are all processes that can be improved through aerobic exercise, but there are instances where individuals already have a good sense of recall, recognition, and problem solving, and this is why we perform a test before we begin the training sessions so that we can see the individual's baseline.

For this study, I will be meeting with participants XH and WY two times a week for eight weeks. Those who write out a plan are more likely to achieve their goals in a timely manner compared to those who do not. Also, on top of that, those who are motivated and committed to achieving their goals will also be more likely to achieve their goals. Having a trainer like myself will help these individuals stay accountable. In order to achieve the best results physically and mentally, I have sat down with the both clients to create a monthly plan that will help them stay on track. I will be training individual XH on Mondays and Thursdays. On Tuesdays, individual XH will be taking a Zumba class. Also on track with that, she will be participating in a Body Combat group class on Wednesdays. On Friday, she plans on doing some type of cardio for at least an hour by herself. On Saturday, she has arranged to take another group class, Body Pump. On Sunday, she will be resting so that her body has time to regenerate and get ready for the next few days of working out. Individual WY has planned to train with me on Tuesdays and Thursdays for the next five weeks. On Mondays and Wednesdays, participant WY has agreed to try out a group fitness class. On Friday, he will be working on 60 minutes of cardio by himself and is planning to take two rest days, each on Saturday and Sunday.

Creating a monthly calendar helps map out when and how these two individuals will stay active throughout the next eight weeks. I know that on the two out of the seven

days of the week I can personally work with these individuals to put them on the right track, and get them working so that their brains are also staying engaged. The only concern that I have is their commitment to their plans. Now, I can stay on top of them when they come in to train with me but I cannot know for sure what they are doing on the other days. Some people may start off on the right track and then venture off because they lose sight of their goals. For this reason, I plan to sit them down for two minutes during each training session to ask them if they went to their group fitness class or if they completed their cardio session on their own, but since this is a self-report, if either one of these individuals are dishonest, the results of this study can be flawed.

The overall problem we can see in this case is motivation and commitment in individuals. Many individuals will start off exercising for a week and then become "too busy" or "too lazy" to continue. But the problem is not that people become too busy or too lazy, the problem lies within their motivation and commitment. I choose to tackle this obstacle by creating a visual plan, a calendar, like I did for participants XH and WY. Having a visual plan can help keep people accountable and help them stay on track. Having a workout partner can also help keep people motivated since both partners can push each other.

QUESTIONNAIRE

"Good checklists, on the other hand are precise. They are efficient, to the point, and easy to use even in the most difficult situations. They do not try to spell out everything--a checklist cannot fly a plane. Instead, they provide reminders of only the most critical and important steps--the ones that even the highly skilled professional using them could miss. Good checklists are, above all, practical. (Gawande, Atul)"

When beginning this research and engaging with my fellow clients, XH and WY, I decided to ask the both of them a few questions to get an idea of their lifestyles and how their lifestyle choices are affecting their cognitive performance. I asked both individuals the same exact questions to keep the variation of the results to a minimum. The questions were asked to obtain a deeper understanding of each individual's starting point. This develops a base to see how I, as a personal trainer, can help the both of them specifically based on their constraints as well as their needs. When creating an exercise program for any of my clients, I take into consideration their physical wellness (how active they are, their weight, body fat percentage, strengths, and weaknesses), nutrition, mindset, and recovery. Since the main goal of this study is to improve cognitive performance, I added onto those subjects and made sure to incorporate a method of testing to see how each client progresses.

Just to refresh, client XH is a 23 years old female and is currently studying as a graduate student. She is pretty new to exercising and has a goal to tone up, add a little bit of muscle mass to her body, and lose body fat. Client WY is a 43 year old male who

is an accountant. He just began exercising as well and has a primary goal of losing body fat.

The list of questions I asked both participants are:

1. How active are you daily? List all activities (i.e. walking, dancing, running, weight training, etc.)
    a. Intensity level
    b. Duration of activity
2. How long are you sitting during the day?
    a. Create a schedule
3. How would you describe your diet?
    a. Record 5 days
4. On a scale of 1-10 how committed do you feel towards your health and fitness goals?
5. How many hours of sleep do you normally get at night?
6. On a scale of 1-10, how do you feel about your memorization skills?
7. What is your go to learning style/strategy?
8. How is your social life?
    a. How often do you go out or meet with family/friends during the week?
9. Do you consume any alcohol or other drugs such as tobacco or marijuana?
    a. How often do you consume?
10. Do you get stressed a lot?
11. What recreational activities do you like participating in? What do you not enjoy?
12. Have you or anyone in your family experienced dementia, Alzheimer's disease, or depression?
13. Would you consider yourself right-brain dominant (creative) or left-brain dominant (logical)?

Client XH:

1. How active are you daily? List all activities (i.e. walking, dancing, running, weight training, etc.)
    a. "I walk a lot during the day. I walk from my apartment to the campus which takes about 20 minutes. Then I walk all around the campus to get to my classes. I like to walk instead of taking public transportation but only if it is close enough. When coming to the gym, I go run and do some light exercise for about an hour. I also began taking some of the group fitness classes."
2. How long are you sitting during the day?

a. “Hours at a time. Lectures range from one hour to three hours at a time. I have three classes on Monday, Thursday, and Friday. All of those classes combined come up to about six hours of sitting. I also sit when I am studying and I am normally studying for about three hours a day. I do not have any option but to stay seated for the majority of the day.”

3. How would you describe your diet? If you can, list what you normally eat for all of your meals.
    a. “Being a college student, I find it very difficult to eat healthy. Especially being in the city, I like to eat out a lot and go to parties with friends.”
        i. Monday, October 22nd
            1. Breakfast
                a. Plain bagel with cream cheese
                b. 2 cups coffee with half and half, & 2 tsp of sugar
            2. Lunch
                a. Roasted Turkey and Avocado BLT from Panera
                b. Lemonade
                c. Chips
            3. Snack
                a. Fig Bar (2)
            4. Dinner
                a. Wonton soup
                b. Vegetables
        ii. Tuesday, October 23rd
            1. Breakfast
                a. Plain bagel with cream cheese
                b. 2 cups coffee with half and half, & 2 tsp of sugar
            2. Lunch
                a. Chickpea salad with vegetables
                b. Banana
                c. Coffee with half and half, & 2 tsp of sugar
            3. Snack
                a. Pretzel sticks
                b. Grapes
            4. Dinner
                a. Pan fried chicken with broccoli, carrots, and corn
        iii. Wednesday, October 24th
            1. Breakfast
                a. Plain bagel with cream cheese
                b. 2 cups coffee with half and half, & 2 tsp of sugar
            2. Lunch
                a. 3 slices of cheese pizza
                b. Coke
            3. Snack
                a. Fig bar
            4. Dinner
                a. Chicken salad

4. On a scale of 1-10 how committed do you feel towards your health and fitness goals?
    a. “I would say that I am probably an 8 out of 10.”
5. How many hours of sleep do you normally get at night?
    a. “I make sure to get at least 7 hours of sleep minimum each night.”
6. On a scale of 1-10, how do you feel about your memorization skills?
    a. “Maybe a 7. I really don’t feel too confident.”
7. What is your go to learning style/strategy?
    a. “I use quizlet a lot and just practice over and over again.”
8. How is your social life?
    a. “I think my social life is good. I like to hang out with my friends over the weekend a lot. I go out with my friends at least once a week during the weekends. I don’t get to see my family though since they live in China but my mom is coming to stay with me next month, so I will get to see her then.”
9. Do you consume any alcohol or other drugs such as tobacco or marijuana?
    a. “I drink maybe once or twice a week, depending on when I go out. I only drink when am hanging out with my friends. I’ll drink 1 or 2 drinks.”
10. Do you get stressed a lot?
    a. “Sometimes. Mainly when I have exams and have to study a lot.”
11. What recreational activities do you like participating in? What do you not enjoy?
    a. “I like to go to events with friends. I don’t like to be alone.”
12. Have you or anyone in your family experienced dementia, Alzheimer’s disease, or depression?
    a. “No”
13. Would you consider yourself right-brain dominant (creative) or left-brain dominant (logical)?
    a. “Most definitely right-brain dominant.”

Client WY:

1. How active are you daily? List all activities (i.e. walking, dancing, running, weight training, etc.)
    a. “I only walk mainly. Just from work to back home. About a 15-20 minute walk”
2. How long are you sitting during the day?
    a. “I work almost 8 hours a day. I am usually sitting for the entire time. I don’t move around a lot. I don’t exercise, that’s why I am here right now.”
3. How would you describe your diet? If you can, list what you normally eat for all of your meals.
    a. “I try to eat healthy.”
        i. Wednesday, October 24th
            1. Breakfast
                a. 3 boiled eggs

        b. Mixed fruits
        c. 1 cup coffee
    2. Lunch
        a. Ceaser salad
    3. Snack
        a. Mixed nuts
    4. Dinner
        a. Tacos with beef, cheese, sour cream, vegetables
        b. Mexican rice

ii. Thursday, October 25th
    1. Breakfast
        a. Omelet with veggies
        b. 1 cup coffee
        c. Mixed fruits
    2. Lunch
        a. Chicken wrap
        b. Carrots with ranch
    3. Snack
        a. Whole wheat crackers with goat cheese
    4. Dinner
        a. Spaghetti and meatballs

iii. Friday, October 26th
    1. Breakfast
        a. 3 boiled eggs
        b. Mixed fruits
        c. 1 cup coffee
    2. Lunch
        a. Chicken, rice, and vegetables
    3. Snack
        a. Mixed nuts
    4. Dinner
        a. Steak
        b. Baked potatoes

4. On a scale of 1-10 how committed do you feel towards your health and fitness goals?
    a. “I’ll go with 6 because I am not really sure where to start and I just don’t know if I can actually do it.”
5. How many hours of sleep do you normally get at night?
    a. “I get maybe around 5-7 hours in a night.”
6. On a scale of 1-10, how do you feel about your memorization skills?
    a. “My memorization is alright, I feel like I am around a 6.”
7. What is your go to learning style/strategy?
    a. “I mainly just read things, take notes, and look over them.”
8. How is your social life?

   a. “My social life is so-so. I don’t get much time to see my friends since I am working and they are working, but I do spend a lot of time with family. I like to come home and help out with dinner and spend time playing and helping the kids out with their homework.”
9. Do you consume any alcohol or other drugs such as tobacco or marijuana?
   a. “No, I don’t drink or smoke at all.”
10. Do you get stressed a lot?
   a. “Yes, a bit. I’m concerned about my health and especially with our economy these days so everything comes together.”
11. What recreational activities do you like participating in? What do you not enjoy?
   a. “I like playing around with my kids. I don’t like to do anything that involves large crowds.”
12. Have you or anyone in your family experienced dementia, Alzheimer’s disease, or depression?
   a. “Not that I know of.”
13. Would you consider yourself right-brain dominant (creative) or left-brain dominant (logical)?
   a. “That’s an easy answer as an accountant. I see myself more of a left-brain person.”

Looking at both client XH and client WY, I can immediately pick out some strengths and weaknesses that can play a role with their cognitive performance. For client XH, I can pick out a couple of strengths such as her activity level which is pretty decent for a starting point, level of commitment (mindset), the amount of sleep she gets at night (rest and recovery), and her feeling about her memorization skills is pretty high on the scale. A couple of her weaknesses lie in lack of movement, sitting for hours, and her diet. As for client WY, we can see that his diet is not too great as well. The other aspects of his lifestyle though need to be altered a bit too, to improve his cognitive performance.

For both clients, I have proposed and created an exercise plan for them to follow on a month to month basis while we work together. This takes care of the movement portion. In order to reach one’s fitness goals, one should calculate their Total Daily Energy Expenditure (TDEE) to see how many calories they burn in a day. This will help figure out how many calories in total they need to eat in order to reach their goals. Since client XH’s goal is to tone up and add muscle mass to her body, she needs to be eating slightly over her TDEE. In order for client WY to reach his goal to lose weight, he needs to eat below his TDEE. For this, I have asked both clients to download the “My Fitness Pal” app on their phones so that they can easily see how many calories they should be consuming on a given day and this will also give them a better way to track all of their meals. For both client XH and WY, I will continuously be checking on their progress by looking over their “My Fitness Pal” with them when they come in to train with me. Also, for client WY, I have asked him to make a daily schedule so that he can get all of his day time work done in time so that he can get a proper rest at night.

In order to perform better cognitively, it is important to find a balance between each and every aspect of one's lifestyle, physical, mental, and emotional. Exercising in general is a great way to feel good in all three foundations, but proper rest and recovery, nutrition, and mindset are all important factors as well. They supplement exercise and in turn can help build a stronger foundation for good physical, mental, and emotional wellness. By working, sitting down with my clients, figuring out their strengths and weaknesses, and helping them overcome those weaknesses by creating plans for them, providing them with some advice and guidance, I am pushing them to find a balance within their lifestyle so that they can finish their program strong and come back feeling cognitively stronger.

"ELEVATE" TESTING

I met with client XH for our very first session together and after our training session, we sat down and took an "Elevate" test to see where her cognitive starting point is. I chose to use the "Elevate" app to test both clients' cognitive performance because the app requires one to be attentive and focus on precise tasks that forces one to use his/her memorization skills, comprehension skills, and problem-solving skills. "Elevate" has its own scoring system called "Elevate Proficiency Quotient," otherwise known as "EPQ". This essentially tracks an individual's performance throughout the tests/games. The EPQ scores range from 0-5000. EPQ scores from 0-1250, indicate that one is a novice, 1250-2500 is intermediate, 2500-3750 is advanced, 3750-4250 is expert, 4250-4750 is elite, and 4750-5000 is master. After client XH's first test, she received "EPQ" scores in writing, listening, speaking, reading, and math. In writing she received a score of 3002, listening- 1613, speaking- 3090, reading- 2896, and math- 1870. On average, she received a score of 2455 which puts her in the intermediate range.

I ran the same test with client WY, and the following are his scores: writing- 2934, listening-1215, speaking- 3029, reading- 2835, math- 3051. On average, client WY's score is 2613, which puts him in the advanced category.

At the end of the eight weeks with both clients, I ran the "Elevate tests again to see how training specifically helped them improve their cognitive performance from when we first began. These were client XH's scores after eight weeks of cardiovascular and resistance training: writing- 4520, listening- 2730, speaking- 4729, reading- 3887, and math- 3280. Her average score after eight weeks was 3829, which pushes her up from intermediate to expert!

Client XY's scores are listed after eight weeks of his training program: writing- 3745, listening-1909, speaking- 3733, reading- 3167, math- 4131. On average, client WY's score is 3337, leaving him in the advanced category but with a better score than when he started.

From looking at the results of the tests taken by both clients, I can definitely see some improvement in cognitive performance even if it's not that big of a jump. A

comprehensive eight-week training program including cardiovascular and resistance training has helped these two individuals improve their mental health. During the first session and during the last session, I also took some time to measure both clients' physical achievements. Client XH began with a body fat percentage of 22%, falling in the ideal category. When we began, she told me that her goal is to tone up, build muscle, and reach a body fat percentage of 18%. At the end of eight weeks, she is at 20% body fat percentage, half way towards her goal. Client WY started off with a body fat percentage of 23.5%, at average for a 43 year old male. His fitness goal is to lose 3.5% body fat, to be placed in the ideal category. At, eight weeks after, client XY is almost at his goal, currently at 21.2% body fat.

HEALTH AND FITNESS PLANS

"We don't like checklists. They can be painstaking. They're not much fun. But I don't think the issue here is mere laziness…It somehow feels beneath us to use a checklist, an embarrassment. It runs counter to deeply held beliefs about how the truly great among us—those we aspire to be—handle situations of high stakes and complexity. The truly great are daring. They improvise. They do not have protocols and checklists. Maybe our idea of heroism needs updating (Gawande, Atul)."

People make checklists for when they are travelling to make sure that they have everything that they need. People also make trip itineraries with all of the excursions they will be partaking in and restaurant reservations that they have made for each night of their trip so that they can get the most out of their vacation. People make plans and checklists to stay on task, so why is it difficult for us to make plans and checklists for our everyday lives? Atul Gawande, in his quote, says that people feel like they are too good, too superior for checklists, but, we are humans. We are not perfect nor were we made to be perfect, but, without a solid structure, it is easier for us to fall apart. Having a structure, a workout plan, a meal plan, can make the journey towards one's fitness goals a lot easier by taking all the guess work out and having everything already laid out for him or her. Even I, being a personal trainer, have a workout plan and a meal plan set for myself every month. I have each and every day's exercise routine ready to go, with the exercises, sets and repetitions, and rest time between sets and exercises. Having a plan helps me flow through my workouts without having to stop and think about all the little details. Same goes for my meal plans. Just two days ago, I sat down to recreate my meal plan since my previous one was outdated and was not providing me the results that I wanted. But, even before I updated my meal plan, I went a few days without using a meal plan at all since I realized that my current meal plan was not working for me. It honestly was a terrible decision on my part to go without a plan, because I had to keep guessing and thinking about what I was supposed to eat and how much I was supposed to eat. It would take me almost an hour to decide what to eat for each meal. I could have used that time to do something else such as take a stroll outside or read a book. Even though creating a new meal plan took a lot of time and effort, it ended up saving

me more time in the long run. Instead of spending an hour three times a day, every day, to figure out my meals, I only had to spend only an hour or two on one day to figure out all of my meals for the next thirty days. Now I have more time to live my life and do the things that I enjoy doing.

When it comes to my clients, I do not do anything different. I want to make their lives easier, so the first thing I do when they come to me is make them a calendar, an exercise program, and offer them some advice when it comes to their eating habits. Since most of my clients are just beginners in their fitness journeys, I try not to overwhelm them with too much detail so I give them their workout plan for the days that we do not train together and then write down the exercises that we worked on when we do train together so that they can look over that as well. When it comes to their diet, I help them find out what their Total Daily Energy Expenditure (TDEE) is so that if their goal is to lose weight then they must consume less calories than what they use. If their goal is to put on muscle mass then they must consume more calories than what they expend daily. Where those calories come from are just as important as the calories themselves if not more. One can consume pizza all day and still meet his/her daily caloric needs, but we all know that eating pizza all day is not healthy for anyone. To give my clients a little more guidance, I help them calculate approximately how much of each macronutrient, protein, carbohydrates, and fats they should consume daily to meet their calorie goals. Especially in the beginning it is difficult to adhere to all of the small details so instead of telling them exactly what to eat, I provide each and every one of my clients with a grocery list, which I will share. They can pick and choose different food items off the list based on their needs. I provide all of this to my clients so that they do not have to sit around, thinking about all the small details.

Grocery List:

1. Veggies
    a. Brussels sprouts
    b. Kale
    c. Spinach
    d. Collard Greens
    e. Broccoli
    f. Asparagus
    g. Beets
    h. Squash
    i. Tomatoes
    j. Green Beans
    k. Cauliflower
    l. Snow Peas
    m. Cabbage
    n. Lettuce
    o. Mushrooms
    p. Onions
    q. Radish

    r. Peppers
    s. Carrots
    t. Cucumbers
    u. Celery
    v. Zucchini
2. Protein
    a. Boneless Skinless Chicken
    b. Turkey Breast
    c. Lean ground chicken, turkey
    d. Fresh Water Fish
    e. Wild Fish
    f. Eggs
    g. Greek Yogurt
    h. Tempeh
    i. Tofu
    j. Tuna
    k. Legumes
3. Carbohydrates
    a. Sweet Potatoes
    b. Quinoa
    c. Yams
    d. Rice
    e. Amaranth
    f. Millet
    g. Buckwheat
    h. Barley
    i. Steel cut Oats
    j. Sprouted Grains (Ezekiel bread)
    k. Fruits
        i. Berries, Oranges, Apples, etc.
4. Healthy Fats
    a. Avocado
    b. Nuts: Almond, Cashew, etc.
    c. Feta cheese, Goat cheese
5. Seasonings
    a. Extra Virgin Olive Oil
    b. Spices
    c. Garlic
    d. Herbs
6. Beverages
    a. Coconut Milk
    b. Almond Milk
    c. Rice Milk
    d. Hemp Milk
    e. Coconut Water
    f. Water

I have already shared both client's weekly program which includes about two to three days of cardio aside from training sessions. I will share specific exercise routines that I have worked through with both of my clients. These exercised are based on the individual's physical goals as well as mental goals, to help them better their cognitive performance.

Client XH: Female, 23

Client XH's goal is to tone up and gain lean muscle mass and lose body fat, so I created a program specifically tailored to her and her needs.

Workout:
Resistance Training (3 sets, 15 reps each)

1. Pistol Squat with eyes closed
2. Push up to side plank rotations
3. TRX Back Flys
4. Bosu Ball Side Lunge to Balance
5. Dead Bug (core exercise) on Bosu Ball
6. Deadlift to Row

Cardio (Rest 1 minute, then repeat 4-6 times)

1. 30 second squat jumps
2. 1 minute front kicks
3. 1 minute agility ladder-lateral high knees
4. 1 minute agility ladder-in, in, out, out
5. 15-minute stair master with lateral steps and kickbacks

Client WY: Male, 43

Client WY's goal is also to lose weight, but his plan is different than client XH's because their starting points are completely different, so I tailored a plan specific to his needs.

Workout:
Resistance Training (3 sets, 15 reps each)

1. One leg balance reach with one arm shoulder press
2. Back fly to row
3. Wood Chop
4. Kurtsy lunge
5. Stability ball pushup

6. Bird dog with eyes closed

Cardio (Rest 1 minute, then repeat 4-6 times)

1. 30 second box jump burpees
2. 1 minute speed skaters
3. 30 second jump squats
4. 1 minute mountain climbers

I have stated many times that to improve cognitive performance, one should participate in aerobic activity. The reason why my cardio training is so short while working with both of my clients is because the time I have with my clients is so short that I want to make the best of it. My clients can go for a run and enjoy aerobic fitness classes when they come into the gym by themselves. I use my time with them to incorporate exercises that will challenge their brains through neurobics. Since both clients are already coming in to do their aerobic exercises almost three times a week, I try to provide them with a unique experience when we are together. I do this by giving them exercises that will truly challenge them in a way they have never experienced before.

I have planned out a comprehensive exercise program for my clients to help them achieve their specific fitness goals and to help them achieve greater cognitive function. Just having a plan written down helps move things a lot smoother, especially when having multiple clients. It can be difficult to remember each and every little detail. Having a plan also does not mean that he/she has to adhere to hit 100%. Having flexibility can be just as important. The plan is there to provide stability, to keep one on the right track. Of course, one should not make a plan and not stick to it at all. The plan was made for a reason, in this case it is so that my clients can reach their fitness goals and reach higher levels of cognitive functioning.

AGING, CONDITIONS, AND COGNITION

Astonished by Don McKay

astounded, astonished, astunned, stopped short
and turned toward stone, the moment
filling with its slow
stratified time. Standing there, your face
cratered by its gawk,
you might be the symbol signifying eon.
What are you, empty or pregnant? Somewhere
sediments accumulate on seabeds, seabeds
rear up into mountains, ammonites
fossilize into gems. Are you thinking
or being thought? Cities
as sand dunes, epics
as e-mail. Astonished
you are famous and anonymous, the border
washed out by so soft a thing as weather. Someone
inside you steps from the forest and across the beach
toward the nameless all-dissolving ocean.

'pity this busy monster, manunkind' by e e cummings

pity this busy monster,manunkind,

not. Progress is a comfortable disease:
your victim(death and life safely beyond)

Plays with the bigness of his littleness
--electrons deify one razorblade
into a mountainrange;lenses extend

unwish through curving wherewhen till unwish
returns on its unself.
A world of made
is not a world of born—pity poor flesh

And trees, poor stars and stones,but never this
fine specimen of hypermagical

Ultraomnipotence. We doctors know

a hopeless case if—listen:there's a hell
of a good universe next door;let's go

As we age, our cognitive performance tends to dwindle and deteriorate. In fact, this is a very normal process of aging. This is why we see Alzheimer's disease, dementia, and depression in older adults. Fortunately, through moderate aerobic exercise one can prevent or reduce the effects of multiple diseases. In fact, "clinical evidence has demonstrated that exercise has a positive relationship with the outcome of different mental diseases, such as depression, Alzheimer's disease and Parkinson's disease, improving not only patients' quality of life but the disease itself" (Deslandes, Andréa). To give an idea of how these diseases affect cognition, "dementia is a general term for a decline in mental ability severe enough to interfere with daily life" (Dementia). Alzheimer's is a common form of dementia "that causes problems with memory, thinking and behavior" (Alzheimer's Disease & Dementia). Last but not least, "Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest. Also seen as major depressive disorder or clinical depression, it affects how you feel, think and behave and can lead to a variety of emotional and physical problems. You may have trouble doing normal day-to-day activities, and sometimes you may feel as if life isn't worth living" (Depression).

As discussed, dementia and depression interfere with proper cognitive function. This can become and is an issue with memory and thought process, but thanks to the benefits of exercise one can improve his/her lifestyle. Alzheimer's, "a neurodegenerative disease, is characterized by the formation of -amyloid plaques, neuronal loss in the hippocampus, reduced cholinergic function and cognitive deterioration" (Deslandes, Andréa). Not too many of us think too far into the future when we begin our exercise journey. We think more about where we want our bodies to be in the next month, not in the next few years or so. But even when not planning too far into the future, we indirectly are. We exercise to keep our brain's sharp and "exercise with reduced risk to develop Alzheimer's disease" (Deslandes, Andéa). I discussed earlier how moderate aerobic exercise creates neurogenesis, and an increase of blood flow to the brain. This in turn supports the function of the hippocampus, which is directly related to Alzheimer's, and improves cognitive performance.

Depression, being a mood disorder, affects our thought process. Just like any other aging brain disorder, depression also plays a role on our cognitive function. Those with depression experience "slowed information processing speed and possibly executive dysfunction and vascular risk factors underlie this" (Deslandes, Andéa). This is very common in individuals with depression because "depressed patients in general are less physically fit than the general population" (Exercise and Depression). Depression can also become much more serious, leading into other cognitive disorders. It itself can lead "to increased mild cognitive impairment as well as dementia" (Depression and Cognition in Older Adults). Since exercise helps improve cognition, it is proven through "several intervention studies [which] indicate that systematic exercise is associated with an antidepressant effect" (Exercise and Depression). Through exercise one can eliminate depression and in turn dementia as well. Some people may argue that exercise is a stressor itself though, so would it not do more harm than good? It is true that exercise is a stressor but the benefits of exercise outweigh the cons. Even though exercise is a stressor, it improves upon many other important and major

stressors. It releases different hormones to achieve a balance between our bodies and our brains.

Since both of my clients come from different families and backgrounds it is imperative that I ask them of any family history of depression, Alzheimer's, and dementia. Through this I can determine what each client needs and can help them both avoid or lessen the extent of any of these conditions in the future through a comprehensive and complex aerobic exercise program. Unfortunately, no one can tell what will happen in the future but exercising can help control and contain these conditions that can affect one in the future or even in the present.

I personally exercise for my own health. Sure, looking good feels nice, but it feels better knowing that I'm not only taking care of my body to benefit myself now but I am also doing this for my future self, so that I can live a long a prosperous life. For many people, time commitment is a big deal when it comes to exercise. This is mainly because they prioritize work, school, and social events over their own health. This eventually builds up and affects their future as well. Not taking care of one's health in the present can and will affect them later down on the line. I am not saying that all sedentary individuals will end up with dementia or depression but even high blood pressure and high cholesterol can impact one in the future. Individuals with a chance of developing dementia and depression should consider making exercise a priority to prevent and reduce the effects of these diseases. Again, people may argue that too much exercise can also be harmful towards your health. Too much of anything is bad for you. There always needs to be a limit. One's health should be a top priority along with school and/or work, and social events. Having a balance in your life is important, physically and mentally.

Too many times, doctors give us unnecessary amounts of medication when exercise and eating healthy can be enough to sustain our health. In a number of cases, exercise can be substituted for medicine. Exercising daily in place of taking medicine can help one overcome depression and prevent or reduce the effects of dementia. We need doctors to take initiative to stop selling us on expensive drugs and instead sell us on the cheapest form of medicine, exercising.

Aging comes with its own set of problems, ranging from physical to mental. Unfortunately, this is a normal process of life, but what is not normal is dementia, Alzheimer's, and depression. Exercise can either help overcome these health issues or reduce its effects for the future. Overall, I have discussed the potential harmful diseases that can occur through a sedentary lifestyle and how one can overcome these health concerns through daily, moderate-intensity aerobic exercise. Making one's health a priority, along with the other things in his/her daily life, can help one achieve balance which is most important in preventing any health issues.

ALTERNATIVE TO AEROBIC EXERCISE

III.
From birth to death time surrounds us
with its intangible walls.
We fall with the centuries, the years, the minutes.
Is time only a falling, only a wall?
For a moment, sometimes, we see
--not with our eyes but with our thoughts--
time resting in a pause.
The world half-opens and we glimpse
the immaculate kingdom,
The pure forms, presences
unmoving, floating
on the hour, a river stopped:
truth, beauty, numbers, ideas
--and goodness, a word buried
in our century.
A moment without weight or duration,
a moment outside the moment:
thought sees, our eyes think.

Triangles, cubes, the sphere, the pyramid
and the other geometrical figures
thought and drawn by mortal eye
but which have been here since the beginning,
are, still legible, the world, its secret writing,
the reason and the origin of the turning of things,
the axis of the changes, the unsupported pivot
that rests on itself, a reality without a shadow.
The poem, the piece of music, the theorem,
unpolluted presences born from the void,
are delicate structures
built over an abyss:
infinities fit into their finite forms,
and chaos too is ruled by their hidden symmetry.

Because we know it, we are not an accident:
chance, redeemed, returns to order.
Tied to the earth and to time,
a light and weightless ether,
thought supports the worlds and their weight,
whirlwinds of suns turned
into a handful of signs
on a random piece of paper.
Wheeling swarms
of transparent evidence
where the eyes of understanding
drink a water simple as water.

The universe rhymes with itself,
it unfolds and is two and is many
without ceasing to be one.
Motion, a river that runs endlessly
with open eyes through the countries of vertigo
--there is no above nor below, what is near is far--
returns to itself
--without returning, now turned
into a fountain of stillness.
Tree of blood, man feels, thinks, flowers,
and bears strange fruits: words.
What is thought and what is felt entwine,
we touch ideas: they are bodies and they are numbers.

Many of us know at least someone who is too old to get up on their feet or even an individual who is physically disabled. In this case, these individuals would have a tough time participating in any moderate level aerobic activity, which means that they cannot receive all the physical and mental benefits that come from cardiovascular exercise. There have been many studies and researches that have "found that aerobic exercise such as walking and swimming can help keep people mentally sharp as they age, yet few have looked at the effects on brain health of weight training aimed at building and strengthening muscles and bone" (Weight-training may be panacea for aging brain). Resistance training, along with aerobic training, can also supplement one's cognitive function. Now, those with physical difficulties can see physical and mental benefits from performing strength training exercises.

Resistance training is a form of exercise training in that one's muscles are working against an opposite force. This includes an individual's own body weight, resistance bands, and weights. Performing resistance exercises twice a week and "working to at least 80% of their peak strength" is proven to benefit one's cognitive function (Increased muscle helps brain). Aerobic exercise, being difficult for everyone to participate in, is generally not an ideal form of physical training for those with physical disabilities. Incorporating resistance training through the use of resistance machines, resistance bands, and weights can be a perfect addition or substitution for aerobic exercise. Aerobic training requires one to get onto their feet and have decent mobility function, which not everyone has. Resistance training shows similar cognitive benefits to aerobic training. Those individuals who perform resistance training twice a week show an "improved ability to make accurate decisions quickly" (Weight training helps boost seniors' brain power). There is also a "significant improvement in selective attention and ... decision-making among those who participated in the resistance-training program versus" those who just participated in aerobic exercise (Weight training helps boost seniors' brain power). In fact, those who part took in "weight-training improved cognitive ability by up to 12.6 per cent" (Weight training helps boost seniors' brain power). These benefits were seen to last "even 12 months after the supervised exercise sessions ended" (Increasing muscle strength can improve brain function). Some may argue here that there is still not enough research to prove that resistance

training is a beneficial as aerobic training. Although this is true, if one digs deeper and sees how resistance training benefits our physical body, he/she can see that resistance training does in fact benefit our mental bodies just as aerobic training. Resistance training works “by strengthening the heart, improves blood flow to the brain generally, which is associated with better cognitive function” (REYNOLDS, By GRETCHEN). Resistance training “requires an upsurge in brain usage. The individual exercising has to think about "proper form and learning the technique," she said, "while there generally is less learning involved in aerobic training," like running” (REYNOLDS, By GRETCHEN). There are multiple ways in which resistance training plays with one’s cognitive function. Not only does it strengthen one’s muscles but it also challenges the brain to think while exercising, leading to the brain exercising itself.

Growing up with parents who are both physically disabled was an eye-opening experience for me. Exercise was never on their minds. Their inactivity influenced their thinking that it is not too important for me to go to the gym and exercise five days a week, so they tried to keep me home. One of the reasons I decided to become a personal trainer was to prove to my parents that exercise is extremely beneficial to the mind and body and to show them that even though they cannot run, they can still pick up some weights or hop on a machine and receive the physical and mental benefits that they need to live their everyday lives. Since then I have witnessed my parents more energized. My mom, being a stay at home mom, used to take multiple naps during the day until she started doing some resistance training. My dad would always end his day with a couple glasses of wine to help relieve some stress, which he still does sometimes but not to the same extent as before he began picking up some weights. Even though this does not exactly show how resistance training benefits cognitive function since no tests were taken to measure their cognitive abilities, it proves that people, including those who are physically challenged, can change their everyday lives through some form of daily exercise.

Creating an exercise program to one’s own individual needs is an important part of building not only a physical body but also a mental body. As a personal trainer, I zone in with my clients to see if they have any injuries. Once injuries and problem areas are identified, I work with them to create a personalized plan to help them reach their physical goals which in turn will also help them mentally. Client XY who is 43 years of age has a bit of trouble balancing and also has a shoulder injury as well as a couple of different muscular imbalances, excessive forward lean and knock knees (knees turning inwards). Working with these limitations, I need to create a program that will help client XY get over his limitations. I strive to incorporate complex exercises, not in that they are necessarily challenging resistance wise, but mainly challenging as in there are multiple movements through which one must go through. This works out multiple areas of his/her body. Multi-joint exercises help get an individual’s brain working and thinking. I do this because “while intense exercise will create brain cells, they are basically stem cells waiting to be put to use. Exercise doesn't create new knowledge; rather, it gives you the mental equivalent of a sharpened pencil and clean sheet of paper” (Get in running for brain cells).

Aerobic exercise is not for everyone but improving cognitive function is. Unfortunately, “if you can't stand and you can't walk, you're going to fall and you're not going to have the capacity to do cardiovascular exercise” (Weight training helps boost seniors' brain power). This can become a problem for those who are seniors and lack coordination and balance and for those who are physically challenged. Resistance and weight training is the perfect alternative to aerobic exercise for those who cannot get up and stay on their feet. Cognitively wise, it provides similar benefits to aerobic training and is ideal for staying physically and mentally fit.

CONCLUSION

Many factors come into play when figuring out how to improve one’s cognitive performance. One main factor discussed in this paper is how exercise, mainly aerobic exercise in particular, improves cognitive performance. Exercising, aerobically, about 45-60 minutes a day improves memory, planning, and reasoning, and shortens the amount of time needed to complete cognitive tests. This occurs because exercise increases the blood flow to the brain, feeding the brain. But, exercise alone does not do the trick. Having a well-balanced diet and getting enough rest at night in addition to aerobic exercise, are just a few other ways to improve your cognition. Just as there are many factors that can improve cognitive performance, there are also factors that can hurt one’s mental strength. This includes a poor diet, lack of sleep, dependence upon technology, and lack of exercise. Making sure to stay on top of these issues is important to stay physically and mentally fit and healthy. Staying consistent and disciplined is the key to achieving any goal. Without consistency and discipline it becomes much more difficult to stay on the right path.

From my personal study with client XH and WY, we can see how a training program that includes aerobic exercise and complex resistance exercises, using neurobics, can truly give a boost to one’s intellectual abilities. Both individuals were able to increase their “EPQ” score after eight weeks of training. Client XH’s score went up from 2455, intermediate, to 3829, elite, skipping the advanced level altogether. Client WY’s “EPQ” score also increased from 2613 to 3337. He still ended up in the advanced category but this score increase still shows some improvement in his cognitive abilities. The programs that I created for each individual were based on their personal goals as well as the overall goal of improving their cognitive performance. Implementing neurobics into the training program not only challenges the body but also the mind to stay attentive to the minor details during the workout. This helps keeps the body and the mind both in shape.

Finding a balance between exercise and the other factors, nutrition and rest, one can improve his/her cognitive function. With the right mindset, commitment, and the right training program, one can plant his/her own seeds. And with a diet that fuels the mind and the body, one will be able to build his/her own tree of wisdom.

Outline

I. INTRODUCTION
   a. Double Dutch Quote
   b. Personal Experience
      i. I did not just wake up one day feeling more intelligent than the day before. Instead, it was a gradual process, one that did not really seem to occur until after it occurred. The transition between being sedentary to being active played a quiet yet loud role in the process. Quiet in a way that I did not realize that being active was the reason behind my academic success in school. Loud in the sense that it played a major role in the process.

II. BACKGROUND INFORMATION
   a. Many studies in our time have shown that exercise has a major impact on our cognitive performance. Exercising is the operation being performed on the brain that manipulates the brain to perform efficiently. In almost all cases, “exercise is a subcategory of physical activity.
      i. “every operation on the brain is, by necessity, a manipulation of the substance of ourselves” (Kalanithi, Paul)
      ii. “exercise is a subcategory of physical activity. Exercise is a physical activity that is planned, structured, repetitive, and purposive in the sense that improvement or maintenance of one or more components of physical fitness is an objective” (Caspersen 128).
         1. Individuals, ranging from 18 and older, who are generally active daily execute cognitive tasks at a level higher than those who do not participate actively.
         2. Testing
            a. Physical fitness examinations such as checking someone’s weight on a weight scale, measuring one’s BMI, or by measuring one’s body composition through bioelectrical impedance.
            b. Intelligence is measured through a variety of tests including IQ tests or advanced placement exams, or a student’s grade point average
         3. Cognitive function definition

a. “broad term that covers many different aspects of mental functioning including thought process, memory, attention, concentration, and creativity” (Rasmussen).

iii. Exercise has been seen to affect the brain in multiple ways, directly and indirectly.
   1. Direct
      a. “a single 30-minute session of moderate-intensity exercise could improve memory, planning, and reasoning, and shorten the amount of time needed to complete cognitive tests” (Beatty, E. K).
      b. Staying physically active has a direct and grand impact on specific areas of the brain such as the “executive central command” (Kravitz, L). This so called ‘executive central command’ center includes “working memory, planning, scheduling, multitasking and dealing with ambiguity (e.g., such as doubt and uncertainty)” (Kravitz, L).
         i. Aging
            1. The 4 components begin to decline as we age
            2. Working out our main muscle, the brain, slows this aging process down. We actually “reduce both the biological and cognitive consequences of aging” (Study Finds Aerobic).
            3. As for the youth, “a youth's perceptual skills, intelligence quotient, achievement, verbal tests, mathematic tests, developmental level and academic readiness” (Kravitz, L).
   2. Indirect
      a. Improves “mood and sleep, and reduces stress and anxiety” (Godman, H).
      b. “students with a high level of exercise had better relationships (including greater intimacy and more frequent touching), were less depressed, spent more time involved in sports, used drugs less frequently, and had higher grade point averages than did students with a low level of exercise” (Field, T).

iv. Physical activity causes physical growth in the brain

1. There is an increase of size of the hippocampus, prefrontal and medial cortex, and basal ganglia. This increase in size is due to the fact that exercising stimulates growth factors in the brain, leading to an increase in blood flow and new formations.

    a. Hippocampus
        i. The hippocampus' primarily associated with memory. Regularly exercising, raising your heart rate, and sweating "appears to boost the size of the hippocampus, the brain area involved in verbal memory and learning," (Godman, H).
    b. Prefrontal and medial temporal cortex
        i. the portion of the brain that is responsible for controlling thinking and memory. Studies suggest, just as the hippocampus, that the prefrontal cortex and the medial temporal cortex have "greater volume in people who exercise versus people who don't" (Godman, H).
    c. Basal ganglia
        i. achieves some growth in size as well. According to Beatty, "fit children had much larger basal ganglia. This is the part of the brain that helps maintain attention and improves the ability to coordinate thoughts and actions" (Beatty, E. K).

III. Growth factors
    a. Growth factors are "chemicals in the brain that affect the health of brain cells, the growth of new blood vessels in the brain, and even the abundance and survival of new brain cells" (Godman, H).
        i. Exercise stimulates growth factors, which set out to form new blood vessels and new brain cells.
        ii. The formation of new blood vessels goes hand in hand with the increased blood flow.
        iii. The abundance of blood vessels allows blood to travel more efficiently to the brain, especially in times of need such as during and after a workout, "improving brain circulation (for oxygen and nutrient delivery), function and health" (Kravitz, L).
        iv. An increase in blood flow has proven to be extremely beneficial to certain areas of the brain such as the

hippocampus, “the key brain region affected by Alzheimer’s disease” (Beatty, E. K).

1. Along with the hippocampus, the anterior cingulate is another key region “where we saw increase in brain blood flow,...indicating higher neuronal activity and metabolic rate.” (Study Finds Aerobic).

v. Growth factors influence neurogenesis, also known as generation of new brain cells, as well.
vi. Neurogenesis in the brain “improves the microstructures of white matter in the brain,” leading to “faster conduction between brain regions and cognitive performance” (Beatty, E. K).

b. Unseen changes in the brain
   i. It is easy to see that exercising on a daily basis can transform our bodies. Unlike our exterior, the brain is not exactly visible unless we have a scalpel ready to cut it open.
   ii. We can see the muscular bulges in our bodies.
      1. We can readily measure our circumferences with a simple measuring tape.
      2. Unfortunately, the same cannot be done with the brain.
         a. We cannot just easily see a measurable difference in our brains after we exercise, but, through experiments involving MRI scans we have done just that.

c. Consistency
   i. Just as one’s strength, endurance, and power declines with inactivity, an individual’s cognitive function also tends to deteriorate.

IV. CONSISTENCY THROUGH AEROBIC EXERCISE

a. The most beneficial form of exercise for developing cognitive function
   i. “aerobic exercise, resistance training and flexibility are quite effective for cognitive function improvement” (Kravitz, L).
      1. Aerobic exercise is the only one of the three exercises that really elevates your heart rate.
         a. Elevating your heart rate is most important to increasing blood flow to the brain, feeding the brain.
         b. Performing aerobic exercise on a daily basis can improve an individual’s cognitive performance. In fact, studies show that “fine and gross motor skills are positively correlated with several aspects of cognitive functions and with academic performance” (Geertsen, S).

b. Staying consistent

i. If you stop, the blood flow to your brain will decrease, and you will return to a sedentary state.
ii. Counter claim: Some people may also argue that exercising has harmful effects as well, physically and mentally.
    1. Physically, people become more injured through exercising, and mentally, people perform poorly at school or work because they are spending more time at the gym than studying or working. This can be true in extreme cases. Working at a gym as a trainer, I notice some people who physically perform past their abilities. They pick up heavy weights that their bodies are not ready to endure and they perform with poor form which eventually can lead to injuries. Very few people I have noticed, come in and spend hours at the gym, making me wonder when they get work done or when they even go home to sleep to rest up.
    2. In general though, physical activity can be very beneficial, physically and mentally, but too much of anything is not good. To exercise enough to stimulate the body and the brain, an individual should know the limits of their body, know proper form, stop when he/she feel like they have aggravated something in their body, workout for 45 to 60 minutes, and make sure that he/she is getting enough rest so that his/her brain and body can recover.

c. Different preferences
    i. Someone may only perform cardiovascular exercise every time he/she workouts, another person may only lift weights, someone else may only take group fitness classes, yoga, or Pilates.
        1. No one likes to do something that they do not enjoy, but making sure to find a balance and incorporating some form of aerobic exercise into their workout regime is important in strengthening the brain.
        2. Like in any area in our lives, it is imperative that we find balance.
        3. Since some people are so far deep into their daily workout regime, they may neglect to understand why this balance is so important since they are set into their ways, but by educating them and providing them with the knowledge and all the resources that they need to truly understand why the balance is important, we can help change their ways.
d. Personal Experience
    i. After I figured out that being active and exercising daily had benefited my performance in school and my energy level, I

began going for morning runs before school, especially on those days when I had exams. Sticking to this plan and being consistent, was one of most important key aspects in this situation.

ii. The article “Brain Benefits of Exercise Diminish After Short Rest” shows that being inactive or sedentary for even just ten days can cause “striking changes in blood flow now.
    1. Much less blood streamed to most of the areas in the runners’ brains, and the flow declined significantly to both the left and right lobes of the hippocampus” (Reynolds, G).
        a. The hippocampus is an important structure of the brain that is associated with “verbal memory and learning” (Godman, H).
            i. Forgetting things tends to become more of a serious problem as we age. Unfortunately, we cannot stop our bodies from aging but we can manipulate and change our mental age by taking care of our brains through daily aerobic exercise.

V. GUIDANCE AND NEUROBICS
    a. Personal story about how I began my fitness journey and how difficult it was without any real guidance
        i. Personal Training
            1. Making an exercise program based on an individual’s wants and needs is an important part of guiding him/her and putting him/her on the right track.
            2. Finding a balance with all aspects, work, activity, nutrition, mindset, and rest & recovery, of an individual’s life style is important to consider when creating a workout plan.
        ii. Tailoring a specific workout plan towards a client’s wants and needs using neurobics
            1. . Neurobics is the science of brain exercise. Our brains are stimulated through constant changes and challenges in our daily lives, so providing ourselves with new opportunities and setting new patters every day helps strengthen our minds.
            2. Three different ways in which neurobics can be used
                a. The first condition is to “involve one or more of your senses in a novel context (Katz, Lawrence).”
                    i. This is done through engaging different senses for certain tasks. For example, putting on pants with your eyes closed.

   b. The second condition is to “engage your attention (Katz, Lawrence).” In order to stimulate your brain, you need to participate in activities that “engage your emotion (Katz, Lawrence).”
   c. The third condition is to “break your routine in an unexpected, nontrivial way (Katz, Lawrence).”
      i. This can be simply done, for example, by taking a different route to school or work.
3. Not all tasks can incorporate all three conditions, same goes for exercising. Exercise is mainly physical, and for that reason there is not really a way to engage one or more of your senses during an exercise.
   a. Challenge their sensorimotor control through the use of balancing techniques using bosu balls, stability balls, balance pads, stability discs, and indo balance boards.
      i. This will not only help posture but since sensorimotor control involves “visual, vestibular, and proprioceptive inputs from the Human Movement System (Clark, Mike),” it will also strengthen the brain over time.
   b. Reactive training is another way to train the brain and the body together, through enhancing the speed at which motor units are activated.
      i. This teaches the body “how to react, adapt, and respond quickly to demands placed on it (Clark, Mike).”
      ii. As we have seen, reacting, adapting, and responding all involve the nervous system and the physical body. So, to improve motor behavior and neuromuscular efficiency with my clients, I will incorporate plyometric training into their workout programs.
   c. I must engage my clients’ attentions at the very beginning of our program.
      i. I do this through connecting my clients to their goals by asking them personal questions so that they can really dig deep and tell me why it is that they have a fitness goal, how they have tried to

attempt to reach that goal in the past, what has hindered them from reaching that goal before, etc.

ii. During each and every session, I continue to engage them by asking them how they feel about a certain exercise, what they would like to see, and how they feel overall after a workout.

d. Lastly, to break their routine and keep things fresh, I make each and every workout different from the previous ones.

i. This will challenge the mind and the body because performing different movements will require the body and the brain to work in new ways.

ii. Instead of just performing single joint exercises, performing complex, multi-joint exercises will further challenge the body and the brain.

iii. Conclusion

1. In order to challenge yourself, you must be willing to try new things. These changes do not have to be life changing, but even small changes can make a difference.
2. In context with physical training, small changes in your everyday workout can force the engagement of your brain. Doing the same workouts every day or even every week can just cause your brain to sit back and relax.
3. Example: When you are walking or driving to school or work every day using the same path, do you really have to think about it?
4. Example: When eating something new you have to think about how you are supposed to eat it and when it is finally in your mouth, your brain has to make out whether it likes it or not. The next time you try something new, try to pay attention to how much your brain actually has to work.

VI. DISCIPLINE

a. Opening quote: “What is needed, however, isn't just that people working together be nice to each other. It is discipline. Discipline is hard--harder than trustworthiness and skill and perhaps even than selflessness. We are by nature flawed and inconstant creatures. We can't even keep from snacking between meals. We are not built for discipline. We are built for novelty and excitement, not for

careful attention to detail. Discipline is something we have to work at (Gawande, Atul)."

b. Introduction
    i. With any goal or dream we have, we need discipline. Without discipline there is no consistency, and without consistency there is no achieving one's goals or dreams.
    ii. Personal experience
        1. When I went to boot camp the summer before the fifth grade, I had no discipline. I was forced to exercise when I went to the boot camp, so that stayed consistent. I was also told to write down everything thing that I ate during the day in a journal.
            a. I was only hurting myself when I chose to lie in my food journal
c. How I am more disciplined now
    i. I finally have a specific goal.
        1. Having a specific goal is one of the first and most important steps of becoming disciplined. A goal with specific numbers and a time frame are more likely to be achieved than broad goals
        2. When my clients tell me that they want to lose weight, I ask them how much are they looking to lose, and if they do not know then I try to help them out by measuring their body fat percentage.
d. Educating to become more disciplined
    i. By educating people, you give them more of a chance to understand what they are getting into and what they will go through.
    ii. Personal experience: I did not really know where I was. My pediatrician just kept telling me how much I weighed and that I needed to lose weight. No other information was given to me at all, which made it extremely difficult to even find a starting point.
    iii. Being informed and educated helps you stay more disciplined because you have the information that you need to make educated decisions based on your goals.
    iv. Personal experience: My disciplined fitness journey began only about a year ago when I came across a personal trainer, Michael Morelli Jr., who is now my role model. Even now that I am a personal trainer, I look up to him for advice and new information so that I myself can set myself up on the right path and so that I can also spread that information to my clients as well.
e. Claim of Policy

i. I think the main concern with staying disciplined is knowing exactly what you are doing. You won't know where you are going unless you know what you are doing.
ii. Social media is an easy way to connect with people across the world and find new information. What I like to do is, study up a bit, or use my personal experiences to help out others. I try to educate my followers on social media as much as I can so that they can truly understand what they are doing.
iii. I have been working on creating a blog so that I can put a lot more information out there, a platform where people can check in once in a while to learn new information, find great workouts, and recipes that they themselves can share with others as well.
1. With this I hope to create a special platform for my clients so that they can really interact with me when they are not with me. Somewhere where they can easily find their workouts, workout videos to take them through just in case they have forgotten what we have done together, and etc.

f. Conclusion
i. Discipline will come through hard work, planning, and knowledge. Knowing what path to take, how to set yourself up on that path, etc. will keep you focused on your goals. But, in order to reach any goal, one must have the commitment, the mindset, to conquer that goal. Without a strong mind set it is difficult to do anything. You are less likely to achieve any goal that you make if you do not have the commitment.

VII. PROMOTING EXERCISE AT SCHOOL AND WORK

a. Children are not being educated on why it is so important to participate in some sort of cardiovascular exercise every day.
i. Physical Education time in grade school is being defunded, meaning that this time to be active is being taken away from the students.
1. This is due to the fact that educators see this course as unnecessary and a waste of time, yet these same educators expect students to perform on an honor roll level (receiving only As and Bs on report cards),
2. It has been proven that academic "performance improved after 10 minutes of classroom exercise breaks compared to the sedentary condition" (Howie, E).
3. Implementing physical activity during the school day allows students to concentrate and focus.

b. School is not the only area of concern though, exercise breaks during work can prove just as beneficial.

i. Reducing work hours and incorporating a fitness break into the work schedule has shown “significant increases in self-rated productivity, that is, increased quantity of work and work-ability and decreased sickness absence” (Schwarz, Thiele).

c. Personal Experience
    i. Think about learning how to play a new sport.
        1. During my sophomore year of high school, I decided to join the field hockey team. That year I played for the junior varsity team and had high hopes and dreams of moving on to varsity the following year. While on the junior varsity team, I did not get much field time because most of the girls on the team were more experienced than I was, so, that summer I practiced every day. The varsity coach held three to four hour practices six times a week and I was the only player that showed up to each and every practice because I knew that in order to develop my skills I needed to practice over and over again.
        2. Just as an athlete continues to practice to become a better player, we must continue to practice to improve our cognitive performance.
            a. Aerobic activity everyday
                i. Staying active in what we call zone three, otherwise known as Aerobic Heart Rate Zone where one is exerting 70-80% of their maximum heart rate, is where one will see the most benefit to the functioning of the brain.
                ii. On top of that, it is found that more complex movements in aerobic activity such as kickboxing truly challenge our brains while we are exercising to grow it.
                iii. The more we ask our bodies to move, the more neural impulses the brain will have to fire to get our muscles moving. This ultimately challenges our brains and challenge is needed to create any type of change.

VIII. SELF-STUDY

a. Two clients of mine have agreed to participate in my study to see how their daily activities add up to affect their cognitive functioning.
b. Asking clients questions about their current lifestyle and determining how they can improve in all sectors to help benefit their cognitive performance

i. One individual is a female who is 23 years old and has recently began studying at Columbia University for graduate school. We will label this individual as XH.
ii. The second participant is a male who is of 43 years of age and works in accounting. We will call this individual WY.
iii. Neither one of these individuals have participated in much physical activity during the past year and are looking to become more active and lead a healthier lifestyle by exercising on a consistent basis.
iv. I will be following with XH and WY for eight weeks, monitoring their physical activity. Before our very first session, I will be administering an IQ test which we will repeat at the end of the eight weeks.

c. Variables that play a factor in cognitive performance.
    i. Cognitive function can be split up into four different domains
        1. “(1) the characteristics of the individual, such as, age, skills, knowledge, health, and other resources;
        2. (2) cognitive strategies;
        3. (3) the nature of the material;
        4. (4) criterion tasks such as recognition, recall, problem solving, and others”.
    ii. Differences between the two participants, XH and WY, that can contribute to their cognitive functioning.
        1. First, there is a twenty-year difference between the two. This gap includes twenty years of experience and knowledge that cannot be transferred.
            a. Experience can provide a lot more intellectual ability because this means that an individual has seen and done many things that could potentially have changed the way he/she thinks and how he/she behaves.
        2. When looking at health we can compare body fat percentages and see that XH has a 22% body fat percentage meaning that for a 23-year-old female she falls in the ideal range. For individual WY, his body fat percentage is 23.5% which is average for a 43-year-old male.
        3. Testing material can become an issue.
            a. Examinations are not 100% accurate in calculating one’s cognitive efficiency. Just like there can be variations in an individual’s weight or body fat percentage due to water content in the body, there can also be variations in one’s performance on an IQ test.
                i. Many factors can play a role in variation such as sleep and mood.

4. Concrete processes of the brain
    a. Recall, recognition, and problem solving are all processes that can be improved through aerobic exercise, but there are instances where individuals already have a good sense of recall, recognition, and problem solving, and this is why we perform an IQ test before we begin the training sessions so that we can see the individual's baseline.
5.

d. Commitment plan
    i. I will be meeting with participants XH and WY two times a week for eight weeks.
    ii. Those who write out a plan are more likely to achieve their goals in a timely manner compared to those who do not.
    iii. Those who are motivated and committed to achieving their goals will also be more likely to achieve their goals. Having a trainer like myself will help the individuals stay accountable.
        1. In order to achieve the best results physically and mentally I have sat down with the both of them to create a monthly plan that will help them stay on track.
            a. XH
                i. Monday- personal training session
                ii. Tuesday- Zumba class
                iii. Wednesday- Body combat
                iv. Thursday- personal training session
                v. Friday- Cardio
                vi. Saturday- Body pump
                vii. Sunday- Rest day
            b. WY
                i. Monday- Group fitness
                ii. Tuesday- Personal training session
                iii. Wednesday- Group fitness
                iv. Thursday- Personal training session
                v. Friday- Cardio
                vi. Saturday- Rest Day
                vii. Sunday- Rest
        2. Creating a monthly calendar helps map out when and how these two individuals will stay active throughout the next five weeks.
            a. I know that on the two out of the seven days of the week I can personally work with these individuals to put them on the right track
            b. The only concern that I have is their commitment to their plans. Now I can stay on

top of them when they come to train with me but I cannot know for sure what they are doing on the other days.

c. For this reason, I plan to sit them down for two minutes during each training session to ask them if they went to their group fitness class or if they completed their cardio session on their own, but since this is a self-report, if either one of these individuals are dishonest, the results of this study can be altered.
d. The overall problem we can see in this case is motivation and commitment in individuals. Many individuals will start off exercising for a week and then become "too busy" or "too lazy" to continue. But the problem is not that people become too busy or too lazy, the problem lies within their motivation and commitment.
    i. I choose to tackle this obstacle by creating a visual plan, a calendar, like I did for participants XH and WY. Having a visual plan can help keep people accountable and help them stay on track.
    ii. Having a workout partner can also help keep people motivated since both partners can push each other.

e. Questions asked of the clients
    i. How active are you daily? List all activities (i.e. walking, dancing, running, weight training, etc.)
        1. XH
            a. "I walk a lot during the day. I walk from my apartment to the campus, and then I walk all around the campus to get to my classes. I like to walk instead of taking public transportation but only if it is close enough. When coming to the gym, I go run and do some light exercise. I also began taking some of the group fitness classes."
        2. WY
            a. "I only walk mainly. Just from work to back home."
    ii. How long are you sitting during the day?
        1. XH
            a. "Hours at a time. Lectures range from one hour to three hours at a time. I do not have any option but to stay seated for the majority of the day."
        2. WY

a. “I work almost 8 hours a day. I am usually sitting for the entire time. I don’t move around a lot. I don’t exercise, that’s why I am here right now.”

iii. How would you describe your diet? If you can, list what you normally eat for all of your meals.
   1. XH
      a. “Being a college student, I find it very difficult to eat healthy. Especially being in the city, I like to eat out a lot and go to parties with friends. On a regular day I start off with a bagel with cream cheese for breakfast and two cups of coffee. For lunch I like to eat a sandwich with chips and juice on the side. I’ll also have snacks during the day such as a bar or two. For dinner, I try to cook in my apartment so I will make Chinese food.”
   2. WY
      a. “I try to eat healthy. I’ll have eggs and some fruit in the morning for breakfast. I like to have a salad during lunch and for dinner I try to mix it up and have something different each night.”

iv. On a scale of 1-10 how committed do you feel towards your health and fitness goals?
   1. XH
      a. “I would say that I am probably an 8 out of 10.”
   2. WY
      a. “I’ll go with 6.”

v. How many hours of sleep do you normally get at night?
   1. XH
      a. “I make sure to get at least 7 hours of sleep minimum each night.”
   2. WY
      a. “I get maybe around 5-7 hours in a night.”

vi. On a scale of 1-10, how do you feel about your memorization skills?
   1. XH
      a. “Maybe a 7. I really don’t feel too confident.”
   2. WY
      a. “My memorization is alright, I feel like I am around a 6.”

vii. What is your go to learning style/strategy?
   1. XH
      a. “I use quizlet a lot and just practice over and over again.”
   2. WY

a. “I mainly just read things, take notes, and look over them.”

IX. INDIRECT FACTORS AFFECTING COGNITION

a. Indirect variables are enhanced when exercising, further benefiting cognitive function.
    i. Exercise tends to improve sleep, nutrition, mood, and reduces stress and anxiety.
        1. These in turn enhance “cognition through its effects on mediator variables such as depression, sleep, appetite (diet), and energy levels and by postponing or preventing age-related disease (e.g., diabetes, hypertension) known to affect cognition.” (Spirduso)
b. As of right now, our societies sleeping and eating habits are extremely poor.
    i. On average, we should be getting 7-8 hours of sleep
        1. Sleep is important for rest and recovery for our physical and mental bodies.
        2. Through sleep we digest a day’s worth of information and events.
        3. Sleep influences our cognitive performance every day. Sleep is directly correlated with memory retention.
            a. When we go to bed, our brains stay up to organize everything we have learned and done that day, so that when we wake up we can refer back to such information and events without too much difficulty.
        4. Other than memory, there are other problems that are prevalent when we do not receive enough sleep.
            a. One obvious issue we see is that “measures of response speed are extremely sensitive to sleep loss” (Kerkhof).
                i. Lagging occurs when our bodies do not rest enough through the night.
            b. If lack of sleep becomes a consistent issue, occurring almost every day, overtime we will see our “cognitive performance functions such as attention, working memory, and cognitive throughput deteriorate” (Kerkhof).
    ii. Aerobic exercise and weight bearing, resistance, exercise improves sleep quality.
        1. Most reports and articles have their test groups self-report individual sleep quality using the Pittsburgh Sleep Quality Index.

2. Many physicians advise those individuals with sleep issues such as insomnia to participate in moderate-vigorous to ease those problems.

c. America has experienced a non-stop growing rate of obesity throughout the country.
    i. We already know that a lack of physical activity can not only take a toll on your body physically but it can also take a toll on your brain mentally. Unfortunately, nutrition goes hand in hand with this situation.
        1. But, overeating is not the only concern, undereating is also an issue associated with cognition.
        2. Consuming a balanced meal is just as important as exercising daily to keep your brain mentally sharp.
        3. Nutrition, the food we eat on a day to day basis, can fuel our brains, either positively or negatively.
        4. We can see that nutrition begins to affect cognition as early as pregnancy. What mothers consume during their pregnancy can actually affect their child's brain development.
            a. We hear a lot about how alcohol during pregnancy can cause Fetal Alcohol Spectrum Disorders, but our focus falters from seeing how other nutritional aspects in our diet can become an issue.
            b. The early years of life are the most important time to make sure a child's nutrition is monitored because the "the first few years of development had a marked, positive impact on measures of language, memory, and perception" (Burkhalter).
            c. More specifically, through research, we see that "cognitive performance was higher for those children whose mother consumed the protein-energy supplement during pregnancy and lactation" (Burkhalter).
            d. But, protein is not the only macronutrient that is necessary for the betterment of cognition. All of the macronutrients, complex carbohydrates and unsaturated fats, are needed in moderation.
        5. Other than what to eat, how much we eat is also an important question.
            a. Many people I come across on a daily basis as a trainer make excuses for missing breakfast almost every morning before work or school.

i. The next time you decide to fast in the morning, remember that “early morning fasting is associated with a decreased ability to problem solve” (Burkhalter).

b. Consuming three to five meals daily is not only important in ensuring that our muscles have enough energy to function but also for our brains to act efficiently.

c. Having a “balanced meal has been related to marked, positive changes in disposition, attentiveness, and motivation among individuals 19–33 y of age” (Burkhalter).

d. Personal experience

i. Leading a healthy life style is a goal for many people including myself. As a personal trainer, I strive to lead by example through exercise, nutrition, mindset, and regeneration.

1. I value balance between these four areas. I exercise six times a week for about an hour to two hours. I follow a meal plan made specifically for me with all of my macronutrients counted out to help me reach my goals. I am extremely committed to leading a healthy and fit way of life. And, I strive for at least 7 hours of sleep each night. I personally value each and every one of these aspects because I understand how important it is to implement a balance between them in my life.
2. Many people assume that it is only important to just get in a workout at the gym, but that is not true. Finding harmony between these four, exercise, nutrition, mindset, and regeneration, is extremely vital not only for your physical body but also for your cognition.
3. For my research, I will have my two clients write down what their sleep schedule is every night. I will also have them write down every meal that they eat and we will go over these habits every session that we train so that I can make sure that they are progressing on the right track.
4. Unfortunately, no one can lead a perfect life. From work to school, stress keeps us up at night sometimes and eating straight through the stress. Sometimes a full 7-8 hours of sleep is not enough. And sometimes healthier options are not so affordable. How we choose to live our daily lives coincides with many factors such as our values, budget, and time. In fact,

these factors are usually the most challenging to get past. Even though on most nights I get enough sleep or most days I eat according to my meal plan, there are days and nights where I end up slacking off and that is okay until the slacking off once in a while becomes a daily habit.

5. For my clients who are looking to make some physical changes to their bodies are also interested in improving their cognitive function.
    a. I will ask them to write down what they are eating for each meal and how many hours of sleep they are receiving.
    b. Since this is a self-report for my clients, there can be inaccurate write-ups. They may report their sleep schedule and/or their eating habits inaccurately which can play a factor in their end results.

e. Educating the public
    i. Educating the public about the important of exercising and how it relates to sleep, nutrition, mood, and stress, and how those in turn affect cognitive functioning is a priority.
    ii. Right now, media is the most prevalent method of distribution for information.
        1. Through the use of blog posts we can inform the public about the knowledge that we currently have regarding exercise and academics. Also, using events to present information can also be a method of distribution.
    iii. Educating my clients is also one of my priorities and another method to disseminate knowledge.

X. Aging, conditions, and cognition
    a. As we age, our cognitive performance tends to dwindle and decline. In fact this is a very normal process of aging. This is why we see Alzheimer's disease, dementia, and depression in older adults. But, through moderate aerobic exercise we can prevent or reduce the effects of multiple diseases. In fact, "clinical evidence has demonstrated that exercise has a positive relationship with the outcome of different mental diseases, such as depression, Alzheimer's disease and Parkinson's disease, improving not only patients' quality of life but the disease itself" (Deslandes, Andréa).
        i. Dementia
            1. Dementia is a general term for a decline in mental ability severe enough to interfere with daily life" (Dementia).
        ii. Alzheimer's

1. Alzheimer's is a type of dementia that causes problems with memory, thinking and behavior" (Alzheimer's Disease & Dementia).
2. Most common form of dementia

iii. Depression

1. Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest. Also called major depressive disorder or clinical depression, it affects how you feel, think and behave and can lead to a variety of emotional and physical problems. You may have trouble doing normal day-to-day activities, and sometimes you may feel as if life isn't worth living"(Depression).

b. CLAIM OF FACT

i. As discussed, dementia and depression interfere with proper cognitive function. This can become and is an issue with memory and thought process, but thanks to the benefits of exercise we can improve our lifestyles.

ii. Alzheimer's, "a neurodegenerative disease, is characterized by the formation of -amyloid plaques, neuronal loss in the hippocampus, reduced cholinergic function and cognitive deterioration" (Deslandes, Andréa).

1. Not too many of us think too far into the future when we start exercise. We think more about where we want our bodies to be in the next month and not in the next few years or so. But even when not planning too far into the future, we indirectly are. We exercise to keep our brain's sharp and "exercise with reduced risk to develop Alzheimer's disease" (Deslandes, Andéa).
2. We discussed earlier how moderate aerobic exercise creates neurogenesis, and an increase of blood flow to the brain. This in turn supports the function of the hippocampus, which is directly related to Alzheimer's, and improves cognitive performance.

iii. Depression

1. Depression, being a mood disorder, affects our thought process. Just like any other aging brain disorder, depression also plays a role on our cognitive function.
    a. "Slowed information processing speed and possibly executive dysfunction and vascular risk factors underlie this"(Deslandes, Andéa).

b. Depressed patients in general are less physically fit than the general population"(Exercise and Depression).
c. Several intervention studies indicate that systematic exercise is associated with an antidepressant effect"(Exercise and Depression).
d. Most studies suggest that this neurocognitive impairment in turn leads to increased mild cognitive impairment as well as dementia" (Depression and Cognition in Older Adults).

iv. Counterclaim
1. Exercise is a stressor itself.
a. Benefits of exercise outweigh cons. Even though exercise is a stressor, it improves upon many other important and major stressors.

c. CLAIM OF VALUE
i. I personally exercise for my own health. Sure, looking good feels nice, but it feels better knowing that I'm not only taking care of my body to benefit myself now but I am also doing this for my future self so that I can live a long a prosperous life.
1. For many people, time commitment is a big deal when it comes to exercise. This is mainly because they prioritize work, school, and social events over their own health. This eventually builds up and affects their future as well. Not taking care of one's health in the present can and will affect them later down on the line. I am not saying that all sedentary individuals will end up with dementia or depression but even high blood pressure and high cholesterol can impact one in the future.
2. People with a chance of developing dementia and depression should consider making exercise a priority to prevent and reduce the effects of these diseases.
ii. Counterclaim
1. Too much exercise can also be bad for your health.
a. Too much of anything is bad for you. There always needs to be a limit. Your health should be a top priority for you along with school, work, and social events. Having a balance in your life is important, physically and mentally.

d. CLAIM OF POLICY
i. Too many times, doctors give us unnecessary amounts of medication when exercise and eating healthy can be enough to sustain our health. In many cases we have seen exercise as an

equal to medicine, which means that exercising daily in place of taking medicine can help one overcome depression and prevent or reduce the effects of dementia.

1. We need doctors to take initiative to stop selling expensive drugs instead to sell the cheapest for of medicine, exercising.

CONCLUSION

ii. Aging comes with its own set of problems, ranging from physical to mental. Unfortunately, this is a normal process of life, but what is not normal is dementia, Alzheimer's, and depression. Exercise can either help overcome these health issues or reduce its effects for the future.

XI. TECHNOLOGY AND ITS ROLE ON COGNITION

a. Throughout the day we are constantly sitting on our butts for hours, reading, writing, working, and learning. How often do we get up onto our feet? Exercise has unfortunately become an option these days because we sit in our chairs all day and all night, reluctant to move. Even those who attend the gym on a daily basis, still spend most of their lives sitting in a chair at a desk. But, not only has sitting become a problem, so has technology. Our lack of interaction with nature has inhibited our cognitive development and performance. Our hesitation to go out and explore contributes to the issue of a steady decline in cognitive performance. Today, we have found that sitting is the equivalent to our health as is smoking for many reasons. But, I can argue that technology is to sitting as sitting is to smoking. We already know that a lack of movement, daily aerobic exercise in particular, can derail our cognition, but what we have not discussed is how overworking and technology can both also be factors in this case, and to what extent.

b. CLAIM OF FACT

i. In our world today, we are surrounded by an unlimited supply of technology. New inventions and innovations are coming out every day to make our lives easier but are these new products and services truly a service or a disservice to our brains' cognitive function?

1. How many times have you pulled out your phone's calculator to simplify a fairly uncomplicated math problem, something you could have solved in your head or at least by pulling out a piece of paper? To be completely honest, I know that I have done this on more than just once occasion, and I thought to myself afterwards, "Wow, I feel so stupid for pulling out my calculator. I should have been able to do that in my head!"

2. Not only is it becoming more difficult to complete even simple tasks, but it is also noticed that our attention span is now equivalent to that of a fish. Meaning that we are only "able to concentrate" for about eight seconds at a time. The decline in our attention span is due to our increased usage of technology. We believe that we do not need to work as hard anymore since we have technology to back us up.

ii. Counterclaim

a. Not all technology is bad for cognitive function

i. That is true. Just like not all food is bad for your health, not all technology is bad for one's cognition. It all depends and differs on the type of technology being used.

ii. Some TV shows for example, "Gossip Girl" can be considered as "complete nonsense" because they do not provide any educational value. On the other hand, though, watching documentaries such as "Forks Over Knives" can be of great value towards one's cognitive development.

iii. But, sitting in front of a television in general can have negative affects on the brain. That period of time spent in front of the television stands for inactivity, physically and mentally. That time can be spent at the gym working out both your mind and your body.

c. CLAIM OF VALUE

i. Working out is not the only way to engage your brain especially after a long day at work or school sitting at a desk for hours at a time, overworking your brain. Getting outside, away from all the machines is just as important as exercising. Rest and recovery is a major process in the development and the function of the brain. How do you expect your brain to function when it does not have time to recover? You cannot!

1. Fortunately, my work as a personal trainer requires me to be on my feet for the majority of the day. Unfortunately, being a student full time, being a trainer full time, and being an active member in clubs as well as other organizations has taken a toll on my body mentally. I do not get any time to myself because I am working such long hours. Not to my surprise, I came back from my mini, solo

vacation to Seattle feeling rested and ready to take over. Why? Because I put my phone away, I went hiking and actually interacted with other people without a device in my hands. I explored the city, educated myself through the culture surrounding me, coming back to New York with a fresh mindset. I feel like now I am able to focus much better in class and work with much more energy than I did before my trip.

2. It is crucial to get away from the technology for even an hour of our waking lives. It will give our brains a time to relax and rejuvenate. Going outside for a walk or being active outside the walls of buildings is also another way to engage with nature and its surroundings.

ii. Counterclaim

a. No one has the time to "connect" with the world.

i. If you have time to "connect" with friends on Facebook for hours at a time than you have more than enough time to go explore your city at least once a week.

d. CLAIM OF POLICY

i. Getting away from technology and the confinements of a building can be difficult as most of our lives consist of using technology and staying inside buildings. One big thing I do when I meet new potential clients is that I sit with them for a good five minutes and create a calendar with them. At least one day a week I schedule a time for them to go outside for a walk to the park or complete some kind of activity that they can do outside in the city. I hold them accountable for their calendars by checking in with them once a week or once every two weeks, if they are not training with me, to see if they are completing all the tasks that they have committed themselves to.

CONCLUSION

ii. We are stuck in a time where our world revolves around technology and technological advances. We also are a group of overworking individuals who sit in chairs all day. Taking time off to get up out of a chair, get active in the city and explore gives our brain's the rest we need. We are constantly on our phones and working and learning that our brains do not get a break until we hit our beds. Resting is just as important to our cognitive function when we are awake as when we are asleep.

XII. ALTERNATIVE TO AEROBIC EXERCISE

a. Many of us know at least someone who is too old to get up on their feet or even an individual who is physically disabled. In this case, these individuals would have a rough time participating in any

moderate aerobic activity, which means that they cannot receive all the physical and mental benefits that come from cardiovascular exercise. There have been many studies and researches that have "found that aerobic exercise such as walking and swimming can help keep people mentally sharp as they age, yet few have looked at the effects on brain health of weight training aimed at building and strengthening muscles and bone" (Weight-training may be panacea for aging brain). Resistance training, along with aerobic training, can also supplement one's cognitive function. Now, those with physical difficulties can see physical and mental benefits from performing strength training exercise.

b. Resistance training is a form of exercise training in that one is working against an opposite force. This includes body weight, resistance bands, and dumbbells. Performing resistance exercises twice a week and "working to at least 80% of their peak strength" is proven to benefit one's cognitive function (Increased muscle helps brain).
    i. Aerobic exercise, being difficult for everyone to participate, is generally not an ideal form of physical training for those with physical disabilities. Incorporating resistance training through the use of resistance machines, resistance bands, and weights can be a perfect addition or substitution for aerobic exercise. Aerobic training requires one to get onto their feet and have decent mobility function, which not everyone has.
    ii. Resistance training shows similar cognitive benefits to aerobic training. Those individuals who perform resistance training twice a week show an "improved ability to make accurate decisions quickly" (Weight training helps boost seniors' brain power). There is also a "significant improvement in selective attention and ... decision-making among those who participated in the resistance-training program versus" those who just participated in aerobic exercise (Weight training helps boost seniors' brain power). In fact, those who part took in "weight-training improved cognitive ability by up to 12.6 per cent" (Weight training helps boost seniors' brain power). These benefits were seen to last "even 12 months after the supervised exercise sessions ended" (Increasing muscle strength can improve brain function).
    iii.

c. Counterclaim
    1. Some may argue here that there is still not enough research to prove that resistance training is a beneficial as aerobic training.
        a. Although this is true, if we dig deeper and see how resistance training benefits our physical body, we

can show that resistance training does in fact benefit our mental bodies just as aerobic training.

b. Resistance training works "by strengthening the heart, improves blood flow to the brain generally, which is associated with better cognitive function" (REYNOLDS, By GRETCHEN). Resistance training "requires an upsurge in brain usage. You have to think about ''proper form and learning the technique,'' she said, ''while there generally is less learning involved in aerobic training,'' like running" (REYNOLDS, By GRETCHEN). We can see multiple ways in which resistance training plays with our cognitive function. Not only does it actually strengthen our muscles but it also challenges our brain to think while we are exercising, causing our brains to exercise itself.

d. Growing up with parents who are both physically disabled was an eye opening experience for me. Exercise was never on their minds. In fact they did not think it was important for me to go to the gym and exercise five days a week and tried to keep me home. One of the reasons I decided to become a personal trainer was to prove to my parents that exercise is extremely beneficial to the mind and body and to show them that even though they cannot run, they can still pick up some weights or hop on a machine and receive the physical and mental benefits that they need to live their everyday lives. Since then I have witnessed my parents more energized. My mom being a stay at home mom, took multiple naps during the day, until she started doing some resistance training. My dad would always end his day with a couple glasses of wine to help relieve some stress, which he still does sometimes but not to the same extent as before he began picking up some weights. Even though this does not exactly show how resistance training benefits cognitive function since no tests were taken to measure their cognitive abilities, it takes away from the fact that people, including those who are physically challenged, believe that they cannot participate in any physical activity because their body is not capable of doing so.
    i. Creating an exercise program to one's own individual needs is an important part of building not only a physical body but also a mental body. As a personal trainer, I zone in with my clients to see if they have any injuries. Once injuries and problem areas are identified, I work with them to create a personalized plan to help them reach their physical goals which in turn will also help them mentally. I strive to incorporate complex exercises, not in that they are necessarily challenging resistance wise, but mainly challenging as in they have to go through multiple movements,

working out multiple areas of their body through one exercise which will help get their brain's working and thinking. I do this because "while intense exercise will create brain cells, they are basically stem cells waiting to be put to use. Exercise doesn't create new knowledge; rather, it gives you the mental equivalent of a sharpened pencil and clean sheet of paper" (Get in running for brain cells).

e. CONCLUSION
    i. Aerobic exercise is not for everyone but improving cognitive function is. Unfortunately, "if you can't stand and you can't walk, you're going to fall and you're not going to have the capacity to do cardiovascular exercise" (Weight training helps boost seniors' brain power). This can become a problem for those who are seniors and lack coordination and balance and for those who are physically disabled. Resistance and weight training is the perfect alternative to aerobic exercise for those who cannot get up and stay on their feet. Cognitive wise, it provides similar benefits to aerobic training and is ideal for staying physically and mentally fit.

XIII. CONCLUSION
a. In conclusion, aerobic exercise is a main component in improving one's cognitive function. But along with it are many other factors that play a role as well in the development of one's cognition. Nutrition, rest, and recovery are all indirect measures through which an individual can better his or her cognitive function. With aging also comes many problems that can affect memory, problem solving, and organizational skills. But with the right prescription of exercise, even those who are older and have Alzheimer's or Dementia can partake in exercise, cardiovascular or strength, to help them overcome this issue. In our time, technology has become our lives and so it is very difficult to just eliminate it from out lifestyles, but this is another factor that can deteriorate one's cognition. Even though anaerobic exercise is the main form of exercise that helps develop one's cognition, resistance training also follows up on the same roles to have similar effects on the brain, being a great alternative to aerobic exercise for the elderly and the disabled.

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