

# Attention Improvement Through Exercise

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**Abstract****Attention Improvement Through Exercise****Kevin Yohannan****Nyack High School, Nyack, NY****Teacher, Kirsten Kleinman, Nyack High School****Mentor, Dr. Vincent D'Amico, Private Practitioner**

Attention Deficit Hyperactivity Disorder (ADHD) is a very common yet unfamiliar mental disorder seen in about 9% of children in the United States. A learning disorder is defined as such when it affects the productivity of learning in an academic setting or social setting. Attention Deficit Hyperactivity Disorder has played a key role in the academic attainment of children, and specific side effects of using stimulants have been noted. ADHD has become characterized as a neurobehavioral disorder that is distinguished by the inability to sustain attention. This is a response to the incapability of controlling impulses that regulate activity levels. The purpose of this study was to further determine if exercise would lead to improvement in attention. The implications of a positive correlation could then be used to make inferences related to ADHD. Further studies will need to be conducted to determine the extent to which exercise can help treat the symptoms of ADHD.

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## Research Paper

### Introduction

A school day for a child without Attention Deficit Hyperactivity Disorder (ADHD) is a typical day where rules are expected to be obeyed and class work to be completed. The child must maintain the ability to control himself/herself, exhibit good behavior, and pay attention in class. These expectations are easily met as long as the child is willing and able to do what he or she is asked. For a child that has ADHD, who is unable to sustain attention, this normal day of school becomes a challenge. ADHD affects approximately nine percent of children in the U.S.A. (Reinberg, 2007).

Attention Deficit Hyperactivity Disorder is a neurobehavioral disorder that occurs as a result of the inability to control impulses that regulate activity levels. Activity levels in a normal child are defined as being high when activity is needed, such as during class participation, and being low when times of activity isn't needed, as when taking an exam. In ADHD, the regulation of activity levels in accordance to the child's surroundings is impaired. When an adult expects a young child to pay attention without any objection, the child with ADHD is in a difficult position. He or she may not be able to express or understand the reason or symptoms they experience which cause his/her lack of attention. This experience can be very traumatizing for the child with ADHD.

A low level of the neurotransmitter dopamine in the brain causes ADHD. In the frontal cortex of the brain, neurotransmitters are used for proper communication throughout the brain. A neuron transmits nerve impulses, and neurotransmitters travel between the neurons which allow them to communicate. Attention Deficit Hyperactivity Disorder has many symptoms, but the most noted symptom is inattention. Individuals who have ADHD have trouble focusing on tasks

and easily lose their ability to pay attention. The other accompanying symptoms are hyperactivity, or impulsivity. Hyperactivity is formally noted as having trouble using motoric behavior, such as when a child has sudden urges to move around and has trouble staying still. Impulsivity is defined as when a child can't control his/her impulses. This means that a child will often act out and not think about the repercussions that will follow. Altogether there are three different types of ADHD, including: a combined type – which is a combination of the inattentive type and the hyperactive-impulsive type, an inattentive – type which is known to have impaired attention and concentration, and a hyperactive-impulsive type – which is known to have hyperactivity without inattentiveness.

Along with the specific types of ADHD a child can have, another aspect that deserves consideration is co-morbidity. Co-morbidity occurs when a person has two or more disorders at the same time. Studies show that a child who suffers from comorbid disorders tends to have more stress-related impulsiveness. (Ter-Stepanian, et al., 2010) The stress-related impulsiveness results in the child reacting with aggressive behavior. The National Institute of Mental Health reported that between 34% and 68.2% of children with ADHD have comorbid disorders. (Ter-Stepanian, e. al., 2010)

Historically, many cases of ADHD have been treated with stimulants. There are advantages and disadvantages to using stimulants to treat ADHD. Each stimulant has different effects on each individual. An advantage noted with taking stimulants is the blocking of the re-uptake of dopamine in the affected individual. This relates to how the low levels of dopamine in the brain, which serves as the main cause of ADHD, can be addressed. By increasing the level of dopamine, the impulsivity in the affected child is counteracted, giving the child a calm feeling. Disadvantages of using stimulants included many health risks such as: loss of appetite, body

aches, insomnia, tics, weight gain, jitteriness, and cardiovascular risks that include, but are not limited to, increased heart rates or cardiac arrest leading to sudden death. Mental health risks can also emerge such as anxiety, irritability, stress, and depression. The most notable side effect of stimulant use involved with children with ADHD has been excessive aggression and restrictions within sleep and appetite. (Edmund Sonuga-Barke, et al., 2009) In addition, consideration must be given to the subcategory of ADHD affecting the patient and the existence of co-morbidities. Use of stimulants to treat ADHD must be closely monitored as each individual will react differently.

Current studies show that there is a correlation between increase in exercise and improvements in the symptoms of ADHD. When a person is required to move around and do physical work, he/she is increasing the blood flow throughout his/her body. This increase of blood flow throughout the body further increases the transportation of oxygen rich blood containing nutrients as well as neurotransmitters. In turn, this leads to the increased creation and presence of the neurotransmitter dopamine which allows further brain growth. The brain growth that occurs then helps to develop better cognitive processes and produces an overall change in behavioral symptoms of ADHD. (Wendt, 2001).

Attention Deficit Hyperactivity Disorder can have detrimental effects. The symptoms of this disorder are what often trouble many children, including parents. Remedies provided to patients diagnosed with ADHD often involve stimulants. The use of stimulants can temporarily relieve the hyperactivity, and/or impulsiveness of a patient to a certain limit. When initially taking the stimulant, a dosage of Ritalin can be given starting at, for example, 5mg. Eventually, the symptoms will subside but then gradually reappear, leading to an increased dosage. This

increase in dosage will occur to a point where there is a leveling off known as a “cut-off point.” When this cut-off point is achieved the patient is then forced to take a different regime of stimulant often succumbing to a new prescription.

The use of exercise to treat ADHD in place of a drug regimen offers many advantages; exercise treatment would not carry the side effects and would, in fact, improve the child’s overall health. This study sought to determine if children provided with an additional 30 minutes or more of exercise during a school day, they would display improvement in their ability to sustain attention.



## Methodology

### Part I

During the spring of 2012, participants were gathered from a self-contained class of approximately 12 first, second, and third graders. The class was from an elementary school in a suburban New York neighborhood. A letter of introduction and consent form was sent to each parent. Due to a lack of responses from parents and time constraints, a full study was not possible. However, during initial observations, the students in the classroom were given an opportunity to get some movement/exercise through using the gaming station WiiFit. This system provided the students with a chance to play games that involved concentration such as bowling, tennis, and boxing. The students were provided with the standing platform and were given remotes in order to obtain accuracy while playing.

### Part II

A total of 20 participants were gathered through a summer sports camp that was being held during July and August of 2012. The participants were mostly from suburban, New York neighborhoods. An initial introduction was given to the participants and an opt-out form was handed out to consent with participation. The participants spent one hour each day for five days completing activities that involved focus, and attention. The games included: Simon says, freeze tag, memory, a game of tag, and activities that involved teams such as soccer. After the completion of five days, participants were given a survey which they completed at home and returned the following day.

The survey was meant to mirror the criteria used in the DSM-IV diagnosis of ADHD. The survey contained a total of twenty questions, and participants responded using the Likert Scale see. (Fig. 1). The ratings of the Likert Scale were as follows: 1-Never, 2-Sometimes, 3-Average, 4-Often, and 5-Very Often. The survey essentially contained three categories: one category was the severity of existing attention problems prior to exercising, if any, the second category was the amount of exercise the participant already did. The third category was noted improvement in attention after participating in the activities. The conclusions to be drawn from using the survey was to identify if there was any significant correlation between exercise and an increase in attention.

Question	Never	Sometimes	Average	Often	Very Often
1. Are you easily distracted by other things (stimuli)?	1	2	3	4	5
2. Do you have trouble staying on task?	1	2	3	4	5
3. Do you find that you often leave tasks incomplete?	1	2	3	4	5
4. Do you have trouble staying still for long periods of time?	1	2	3	4	5
5. Do you feel that you constantly need to be busy/occupied?	1	2	3	4	5
6. Do you have trouble staying organized?	1	2	3	4	5
7. Do you pay attention to detail?	1	2	3	4	5
8. Do you daydream during classes/activities?	1	2	3	4	5
9. Do you have difficulty staying quiet?	1	2	3	4	5
10. Do you exercise often?	1	2	3	4	5
11. Do you exercise for at least 30 minutes during any given time?	1	2	3	4	5
12. Do you often exercise with activities that require a lot of concentration?	1	2	3	4	5

Fig. 1 Example of part of the survey & survey questions.

## Results

### Part I

Observations by participating teachers indicated that there was some degree of attention needs by most of the students. It was noted that the students exhibited some factors that fall under the category of ADHD. These factors, for example, included the inability to stay on task during certain activities such as group readings. Certain students had one-on-one teachers that helped to aid them in staying on task. The incorporation of the WiiFit provided students with the opportunity to do something creative and to their liking. It did provide them with some exercise and movement rather than sitting in a classroom in their seats constantly doing work. The incorporation of this activity allowed students time to move around instead of fidgeting during school work. There is a set structure that is used for each school day so that students get a chance to develop reading skills, comprehension skills, and writing skills. But by incorporating some time to get up and move around, a small and an important break is provided for students to expend their energy.

## Part II

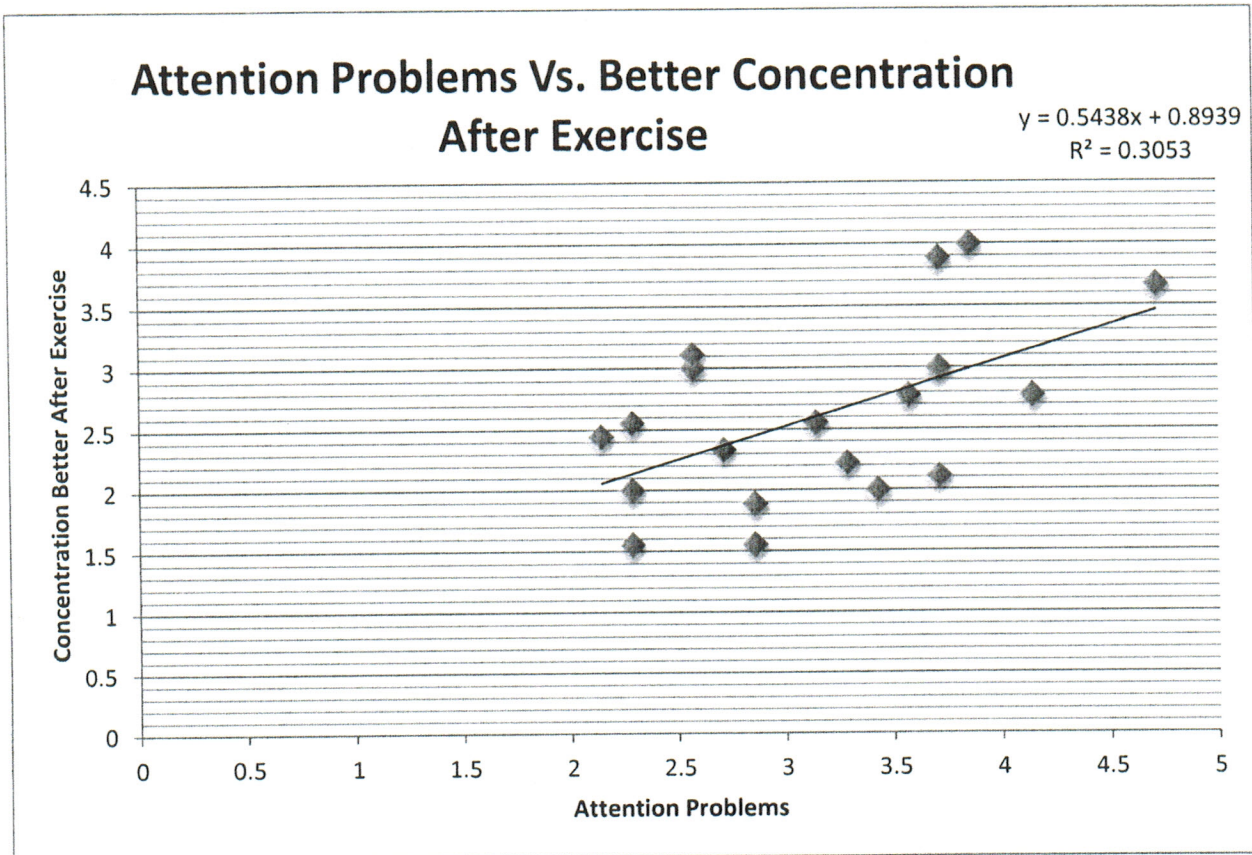


Fig. 2 This graph shows the relation between participants that already have perceived attention problems and better concentration after exercising.

## Discussion

Figures 2 & 3 were developed by dividing the survey into three categories. The first category was the severity of existing attention problems prior to exercising, if any. The second category was the amount of exercise the participant already does. The third category was noted improvement in attention after participating in the activities. The questions were grouped into the established categories. The responses from each of the twenty participants were recorded for each category per question. The average was then calculated per participant in each category. The values obtained were then graphed through comparing the categories to each other.

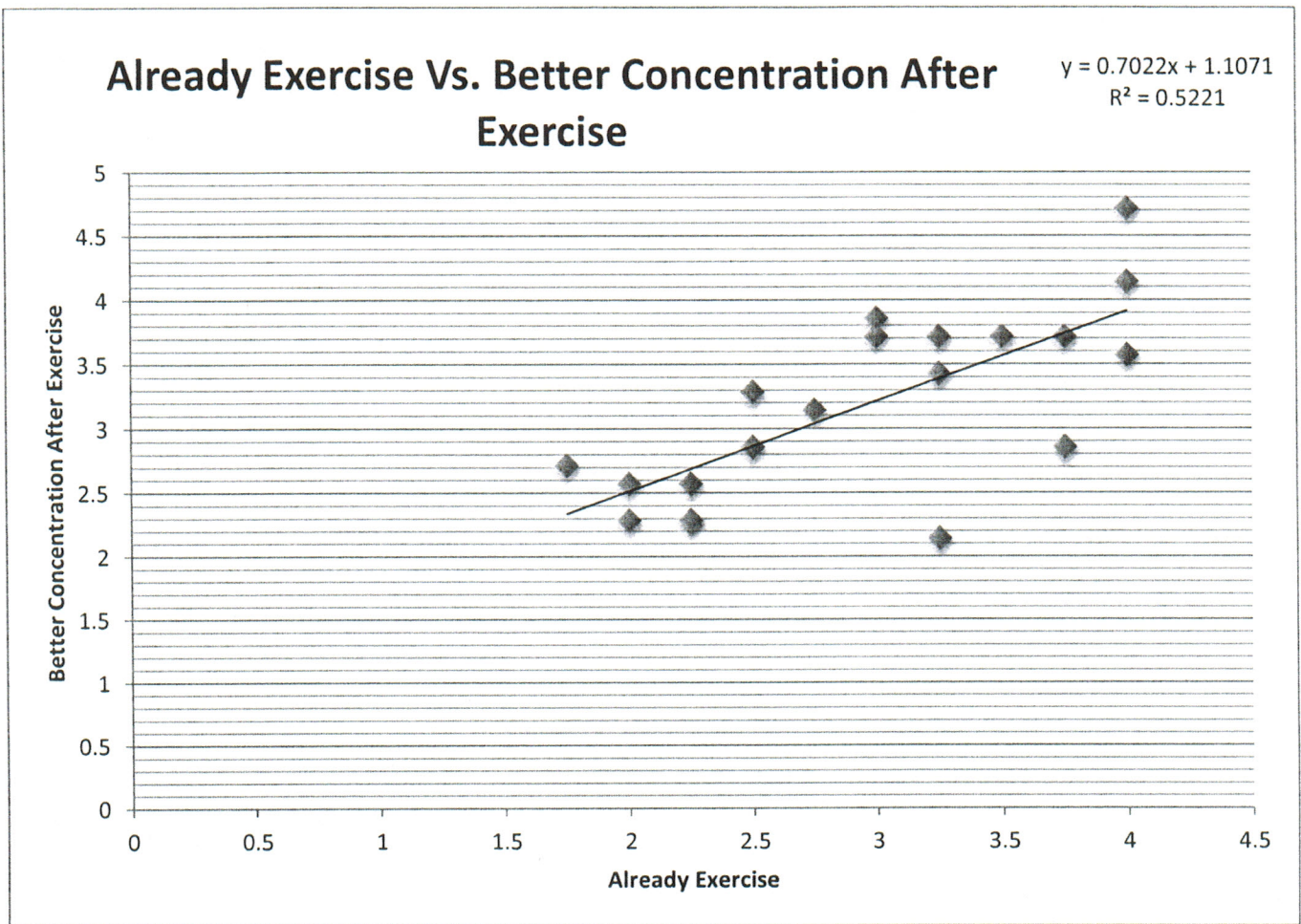


Fig. 3 This graph shows the relation between participants that already exercised and better concentration after exercising.

Discussion Cont.

Figure 2 indicates that people with attention problems were found to have a positive correlation with better concentration after exercise. The regression showed a  $R^2 = 0.3056$ , this indicates a positive correlation but it isn't a strong one. Figure 3 indicates that people who already exercise do concentrate better after exercise. The regression showed a  $R^2 = 0.5221$ , this indicates a favorable positive correlation.

## Conclusion

The purpose of this study was to determine the relationship between exercise and improved attention in relation to ADHD. ADHD is caused by low levels of the neurotransmitter dopamine in the brain, and dopamine is responsible for carrying signals from brain cells. Common symptoms of ADHD include: difficulty paying attention, easily distracted, inability to sustain attention, and incomplete tasks which can inhibit a student's ability to achieve. This study sought out to see if an increase in exercise would lead to an improve attention, hopefully through an increased blood flow to the brain. This study was a success in part. A general conclusion was reached in that there is some positive correlation between exercising and attention improvement. Unlike medication, exercising has no foreseeable negative side effects or consequences, but rather can be beneficial even if attention isn't improved as expected.

In relating to the purpose of this study, there was the ability to make initial observations and conclusions about the topic, however the sample size was relatively small. For further research it would be advised to repeat the study with a much larger sample size. It would also be beneficial to have a control group with participants that do not have ADHD and an experimental group of participants with ADHD. Both groups would be able to complete surveys to determine improvement in attention through exercise. It would be important to compare both groups to see if there is a greater statistical significance and to determine a stronger relationship between exercise and attention improvement.

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