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The academic and behavioral benefits of auditory integration training in high school-aged students with attention deficit hyperactivity disorder

Jenny Lauterbach

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The Academic and Behavioral Benefits of Auditory Integration Training
in High School-Aged Students with Attention Deficit Hyperactivity Disorder

By

Jenny Lauterbach

Thesis

Submitted to the Department of Special Education

Eastern Michigan University

in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

In

Special Education with a concentration in Emotional Impairments

Thesis Chair: Gilbert Stiefel, Ph.D.

Carole Gorenflo, Ph.D.

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February 2008

Ypsilanti, MI

Table of Contents

Dedication.....	ii
Acknowledgements.....	iii
Abstract.....	iv
List of Tables.....	vii
Introduction and Background.....	1
Statement of the Problem.....	1
Research Question.....	1
Hypothesis.....	1
Purpose of the Study.....	1
Review of the Literature.....	2
Method.....	5
Participants.....	5
Instruments.....	6
Research Design.....	7
Procedure.....	8
Data Analysis.....	9
Results.....	14
Discussion.....	14
Conclusions.....	15
Limitations.....	17

Recommendations for Further Research Action.....	18
References.....	19
Appendices.....	21
Appendix A: Teacher Survey.....	22
Appendix B: Sample Consent/Assent Forms.....	23

DEDICATION

This thesis is dedicated to my husband

Jason,

without whose love, support, and late night dinners this research would not have been possible.

Acknowledgements

I would like to take this opportunity to acknowledge all of those who supported me in the completion of not only this research but also of my Master's degree from Eastern Michigan University.

I would first like to thank Dr. Gilbert Stiefel, my thesis chair, for his guidance and support throughout this tedious process. Not only has he been an intricate part of my education and course work, but his support has helped me to feel confident in my research.

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LIST OF TABLES

Table

1	Summary of TAPS Test Scores.....	9
2	Summary of Scores on Teacher Surveys.....	10
3	Average Control Group Score Improvement.....	13
4	Average Experimental Group Score Improvement.....	13
5	Comparison of Average Improvement and Significance of Scores.....	14

LIST OF FIGURES

Figure

1	Distribution of Control Group TAPS Scores.....	11
2	Distribution of Experimental Group TAPS Scores.....	11
3	Distribution of Control Group Teacher Survey Scores.....	12
4	Distribution of Experimental Group Teacher Survey Scores.....	12
5	Average Improvement of TAPS Scores.....	13
6	Average Improvement of Teacher Survey Scores.....	14

Abstract

This study is a double-blind experiment that assessed the effectiveness of auditory integration training (AIT) on the academic performance and behavior of 10 high school students between the ages of 15 and 17 years, all diagnosed as having attention deficit hyperactivity disorder (ADHD). The subjects were administered a standardized test of auditory processing skills (TAPS) (Gardner, 1996), after which they participated in 15-20 minute sessions of auditory integration training (AIT) once a day for a period of four weeks. Some participants were exposed to filtered music, whereas others were exposed to non-filtered music. At the end of the 4 weeks, the students were re-administered the auditory processing test in order to note any improvements in these skills. The instructors of each student were also invited to respond to a survey that asked them to comment on the overall behavior of each student before and after the 4-week music sessions. Although the results of this study were suggestive, no statistically significant increase in auditory processing skills or decrease in aberrant behaviors was demonstrated.

Introduction and Background

Statement of the Problem

In recent years, the number of students being identified as having attention deficit hyperactivity disorder (ADHD) has rapidly increased (NIMH, 2008). These students now face the academic and behavioral challenges that this disorder poses. The issue being examined in this study is the possible benefits that auditory integration training (AIT) sessions may provide in regards to helping the children identified with ADHD and corresponding behavioral problems.

Research Question

Does exposure to auditory integration improve academic achievement? In addition, does auditory integration decrease aberrant behaviors associated with attention deficit disorder?

Hypothesis

Auditory integration training exposure results in increased academic achievement and decreased behavioral problems in children with ADHD.

Purpose of the Study

The purpose of this study is to determine whether AIT is an effective tool in treating students with ADHD. The expected result of the study will show that there is a relationship between exposure to AIT and increased academic and behavior achievement. If the results of this study support this hypothesis, AIT could become an invaluable tool in regards to improving the auditory perceptual and processing skills of disabled students.

Review of the Literature

In his book, *Hearing Equals Behavior*, Guy Berard, the father of auditory integration training, claimed that problems with hearing and auditory processing often lead to other disorders due to a lack of understanding of perceived information (Berard, 1993). These disorders include autism spectrum disorders, learning disabilities, depression, and aggression, many of which are characteristics seen in children with ADHD (Tharpe, 1999). Auditory integration training is the use of modified music through sound-blocking headphones to treat these and other auditory processing disorders that may arise. The theory is that the device creates a “massage” for the ear and brain and helps to train the brain to filter out unwanted sound and stimuli, helping the individual to listen more accurately (Brockett, 2007).

Although auditory integration training is not currently being used in public schools as a research-based tool to treat those students identified with ADHD, the following studies have shown it to be an effective treatment method when used with children with specific disorders such as ADHD and Autism Spectrum Disorders. Rimland and Edelson (1995) explained the method and research findings of a study they conducted. The pilot study was a single-blind experiment conducted in order to determine the effectiveness of AIT in a group of 17 autistic children and young adults ages 4-21 years. The study used a matched-pairs design in which eight subjects received filtered or modified music for a period of 2 months, one hour a day, broken into two sessions. During the administration of music, although the subjects did not know their individual group assignment, either control or experimental, Rimland and Edelson were aware of which students were receiving modified music and which were exposed to

unfiltered music. This design of the study places limitation on the reliability of the study as the outcome of the research could have been influenced by examiner bias. Based on questionnaires of adaptive behaviors completed by the examiners, which could be considered an unreliable method as well due to bias, the authors concluded that the experimental group exhibited fewer maladaptive behaviors even 3 months after the AIT sessions had terminated. In a double-blind follow-up of the pilot, Edelson (1999) conducted a similar study in which nineteen individuals, ages 4-39, were randomly assigned to listen to either filtered or non-filtered music. After a three-month checkup, the experimental group showed a significant decrease in aberrant behaviors while the placebo group showed no change. Even though the pilot of this study demonstrated suggestive results, the outcome of the follow-up study could be considered more reliable due to the double-blind design of the study. In the latter, both subject and examiner were unaware of group assignment, which increases the reliability of the results. The success of this study generated interest among many others to investigate this procedure. In a case study of siblings, a private practice audiologist in Ireland administered AIT to two autistic children, ages 5 and 3 (Brown, 1999). His observations reported noticeable improvements in balance, sensory modulation, speech and language, eye contact, and attention. Gillberg (1997) explained his findings of a follow-up empirical study conducted on 9 autistic children ages 3-16. His study, which eliminated a control group by exposing all 9 subjects to filtered music, included the administration of AIT for one-half-hour sessions during a 10-day period. No significant change in overall behavior improvements could be documented 9 months later; however, a significant reduction of sensory problems, such as sensitivity to loud noises, was noted up to 18 months after treatment was given. In a statistical review of Gillberg's study 1 year later, Rimland and

Edelson (1998) concluded that Gillberg's conclusions from his study were incorrect. The authors agreed that there was a decrease in sensory problems; however, they concluded that both the analysis and visual inspection of Gillberg's original study clearly show positive effects as well. They attributed his miscalculations to unfamiliarity with the treatment method and findings, meaning that he was expecting more of an improvement in behavior and autistic symptoms than was achieved. Rimland and Edelson also noted that the elimination of a control group in the design of the study makes it impossible to make any comparisons between groups. It would have been difficult for Gillberg to note any improvements in the subjects without a placebo group with which to compare outcomes.

One argument made by researchers is that the results of these studies are skewed due to the fact that some people act differently when they know that they are being observed (Creaghead, 1999). Researchers also note that people behave differently when they know that they are being videotaped or recorded. Researchers may believe that either the subjects, or those evaluating them post-treatment had a biased view of the situation because they were expecting to see results. In any experimental study such as those mentioned above, the most ideal research design would be a double-blind study. Under these circumstances, researcher bias would not play as large a role.

AIT is still considered to be in its infancy and one of the more controversial topics in the area of communicative disorders. This is mainly due to the fact that it is not well understood. Madell (1999) believes that in order to learn more about this potentially very beneficial treatment, there must be an increase in the number of practitioners as well as high quality published articles on the topic. She also believes that those who do practice AIT must become

more selective with who receives the treatment, such as children with language processing or behavior disorders. Administering AIT for extensive periods of time to those who do not need it is a waste of time and money.

According to the research in the area of AIT, there are many studies that have shown it ineffective and, in some cases, dangerous (Musiek, 2006). Often, in these cases, music was administered for too long at too high a decibel level and the recipients were left with permanent hearing damage. However, experts in the area explain that these studies were conducted by unlicensed practitioners (Musiek, 2006). Licensed audiologists and researchers believe that when administered at the proper decibel levels and for an appropriate amount of time, AIT can provide many benefits: improved attention and auditory processing, decreased irritability, reduced lethargy, and improved expressive language and auditory comprehension (Musiek, 2006).

Method

Participants

This study consisted of 10 high school students, 3 female and 7 male, ages 15 to 17 years, all diagnosed as having ADHD. All of the subjects were enrolled in restricted curriculum (special education) courses at Woodhaven High School in Woodhaven, Michigan. Since the high school enrolls nearly 3,000 students and serves a large district, the sample used in the study was diverse in regards to ethnicity, religion, and socio-economic background. The subjects' ethnic backgrounds consisted of the following: 3 African-American males; 1 Indian/Asian female; and 6 Caucasians, 2 females and 4 males. Of the 10 participants, 1 student is a member of the Muslim faith, 6 are Catholic, and 3 stated that they belong to a Protestant religion or non-denominational church. Out of the 10 students, only 3 qualified for free or

reduced lunch or government assistance. Only 3 of the students are still living with both biological parents, while 3 live with stepparents and 4 come from single-parent homes. In order to avoid singling out any one particular group of students for this study, any student, whether diagnosed with ADHD or not, was encouraged to volunteer for this study. However, due to the nature of the research, only the results of the students identified as ADHD were included for data analysis. The original sample size was 17 students, 9 experimental and 8 control; however, only 5 students from each group were included in the final analysis because the other students involved in the study did not meet the ADHD criterion.

Instruments

In this research design, two different instruments were used in order to collect data. The first was a questionnaire consisting of 15 questions regarding the behavior of each participant (e.g. preparedness, cooperation) that the instructors of each student were asked to complete (See Appendix A). Eight of the students have 5 teachers who filled out the surveys. The other 2 subjects participate in a morning vocational education program for 3 hours of the day; therefore, only 2 teachers completed surveys on those students. The teachers were asked to complete the survey before and after the music sessions were conducted; however, they were not aware of the nature of this research or which students belonged to the experimental group. This design was put in place in order to reduce teacher bias.

The second instrument used in this study was the Test of Auditory-Perceptual Skills, otherwise known as TAPS (Gardner, 1996). This is a standardized test that assesses auditory processing skills based on several different sub-tests. The first subtest, auditory number memory, consists of a series of numbers read by the examiner that the student must repeat

forward as well as backwards. The second and fourth subtests were similar, requiring the student to repeat a sentence after it was stated only once. The sentences consisted of anywhere between 4 and 24 words. The third subtest, auditory word memory, required subjects to repeat, in order, a list of 2 to 6 words. The fifth subtest, word discrimination, required the student to listen to 2 words. He or she then had to determine whether or not the 2 words were the same or different. The last subtest, auditory processing, required the examinee to answer a series of questions such as “what shape is a starfish?” and “what is the color of the gray pony?” The combination of these subtests allowed the examiner to determine a standard score, an auditory perceptual quotient and a percentile ranking. This test was taken and scored before AIT was administered and again after the 4 week session had expired. Those scores were then compared in order to note if any improvements had been made.

Research Design

This study was a double blind experimental design. The study consisted of a control group, which was exposed to non-filtered music, and an experimental group, which was exposed to filtered music. A student research assistant was used in order to keep both student and examiner unaware of group assignments. It was the assistant’s job to make sure that group members were listening to the same type of music everyday. The assistant placed the compact discs into the players before students came to listen each day and then made sure that the subjects were listening to the correct music. After the second TAPS had been administered, the assistant then gave the examiner a list of the group assignments in order to analyze the data. This design helped to minimize examiner bias during the second administration of the TAPS test. The baseline data of this experiment was the behavior surveys collected from the students’

teachers prior to AIT as well as the first set of scores on the TAPS test. Any improvements made in regards to auditory processing skills were determined by comparing the scores of the preliminary TAPS test to the second administration of the exam. Any improvements in aberrant behaviors were noted by comparing the results of the surveys that the teachers filled out prior to and after the administration of AIT.

Procedure

This study was conducted over a 5 1/2 week period. The first step was to collect baseline data on the students with ADHD who had volunteered for the research. After the students received parental consent, the students were asked to have each of their teachers fill out the teacher questionnaire. During the time that it took for each teacher to return surveys on each student, each student was administered the TAPS test. After baseline data had been gathered on each participant, they were then randomly assigned to a group using a statistical software program. This program, otherwise known as SPSS, randomly divided the participants into two equal (5 each) groups, either control or experimental. After the groups had been divided, the students began their music sessions. Each student had to participate in no less than 20 sessions of 15 to 20 minutes. If a student was absent, he or she was asked, if possible, to participate in 2 sessions the following day, one in the morning and one in the afternoon. This make-up session kept the study from exceeding the 4-week time period. Once the participants had completed 20 sessions of AIT, they were then asked to obtain a second set of surveys from their classroom teachers (5 weeks after first survey had been completed) and were re-administered the TAPS test. Due to the volume of students and the fact that they could only participate in the study for 30 minutes a day, at the most, it took approximately 1 1/2 weeks to test the students and obtain

teacher surveys. This accounts for the 4-week AIT period and a week and one half allowed for testing and data collection.

Data Analysis

For the purposes of subject confidentiality in the following results, each subject in the study has been assigned a number 1 through 10. The first 5 participants were the subjects in the control group, which consisted of sessions of unmodified music. The experimental group, those exposed to modified music, are numbers 6 through 10. The following are summary tables of the baseline and posttest scores on the TAPS test.

Table 1.

Summary of Participant Scores on TAPS Test Using Standard Scores (M=100, SD=15)

Control Group	Pre-TAPS SS	Percentile Rank	Post-TAPS SS	Percentile Rank
1	79	6 th	81	9 th
2	101	53 rd	100	50 th
3	69	2 nd	72	4 th
4	52	1 st	57	1 st
5	76	5 th	74	4 th
Experimental Group				
6	133	99 th	130	98 th
7	68	2 nd	78	8 th
8	55	1 st	64	1 st
9	69	2 nd	81	12 th
10	95	39 th	101	51 st

The teacher surveys that were administered to the instructors of each student were based on 15 questions involving student behavior. Each question was scored on a ranking of 1 through 4, 4 being the best behavior and 1 meaning that improvement was needed. Therefore in the following summary tables, with a total possible score of 60, the higher number means positive student behaviors. The scores are based on an average from all surveys submitted.

Table 2.

Summary of Participant Average Scores on Teacher Surveys

Control Group	Pre-Survey	Post-Survey	Experimental Group	Pre-Survey	Post-Survey
1	48/60	47/60	6	40/60	40/60
2	39/60	42/60	7	57/60	59/60
3	39/60	37/60	8	45/60	49/60
4	46/60	45/60	9	40/60	45/60
5	23/60	25/60	10	35/60	34/60

The following tables represent the analysis of the data that was derived from the study. The graphs and tables below include distribution and mean improvements for both control and experimental groups in regards to pre- and posttest scores on the TAPS as well as the pre- and post teacher surveys. The results were derived using a MANOVA statistical test (multivariate analysis of variance).

Control Group Test Scores

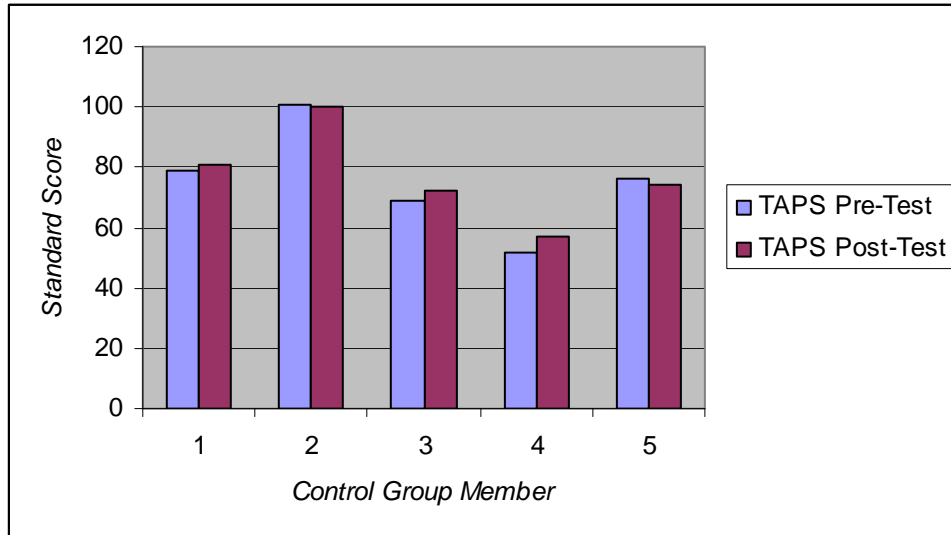


Figure 1. Distribution of Control Group Test Scores

Experimental Group Test Scores

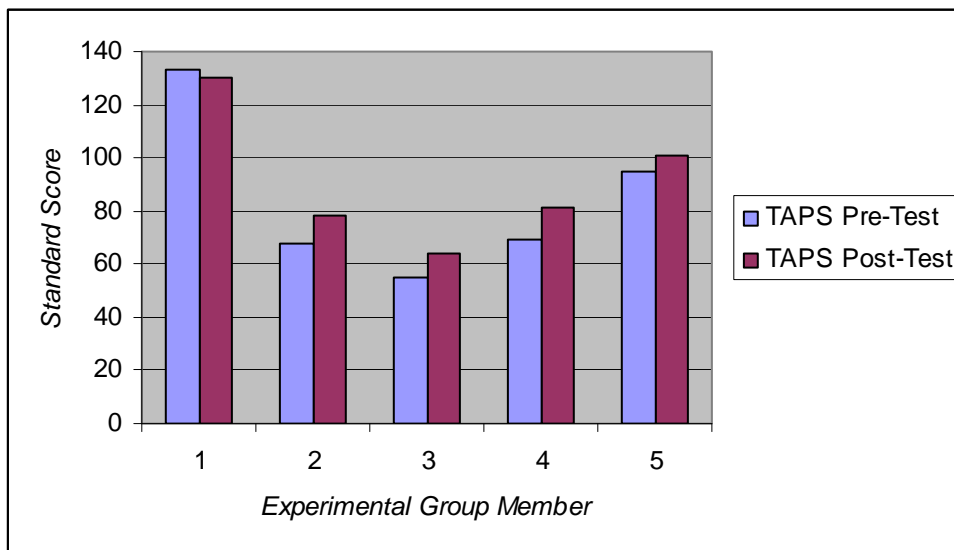


Figure 2. Distribution of Experimental Group Test Scores

Control Group Survey Results

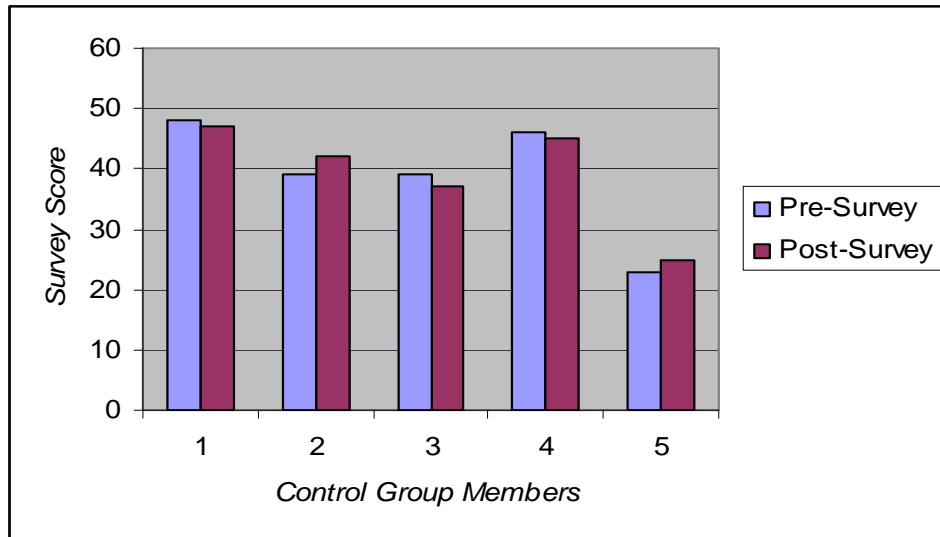


Figure 3. Distribution of Control Group Teacher Survey Results

Experimental Group Survey Results

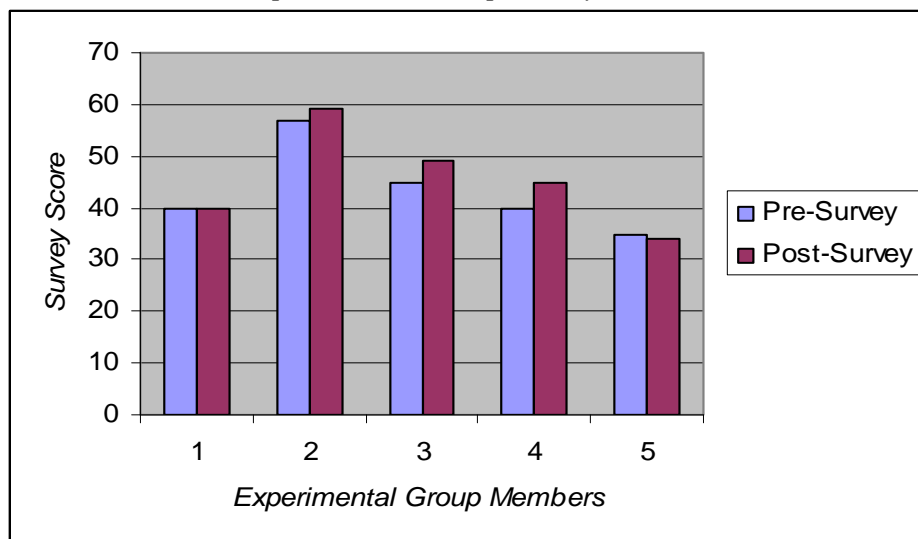


Figure 4. Distribution of Experimental Group Teacher Survey Results

Table 3.
Average Control Group Score Improvement

Control Group	TAPS Improvement	Survey Improvement
Student 1	2.00	-1.00
Student 2	-1.00	3.00
Student 3	3.00	-2.00
Student 4	5.00	-1.00
Student 5	-2.00	2.00
Average Improvement	1.40	.20

Table 4.
Average Experimental Group Score Improvement

Experimental Group	TAPS Improvement	Survey Improvement
Student 6	-3.00	0.00
Student 7	10.00	2.00
Student 8	9.00	4.00
Student 9	12.00	5.00
Student 10	6.00	-1.00
Average Improvement	6.80	2.00

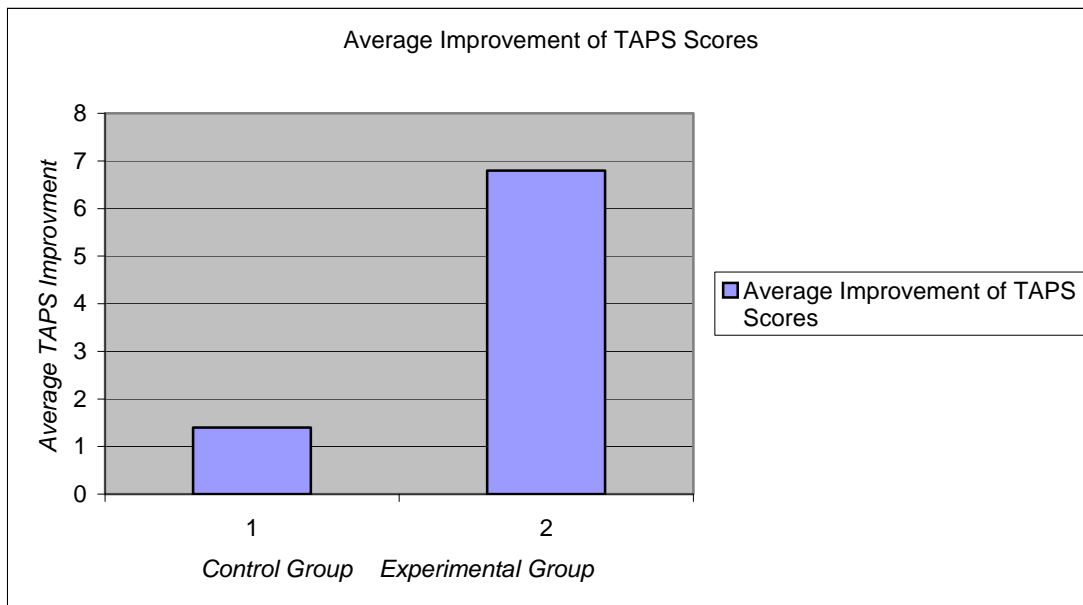


Figure 5. Average Improvement of Scores on TAPS Test

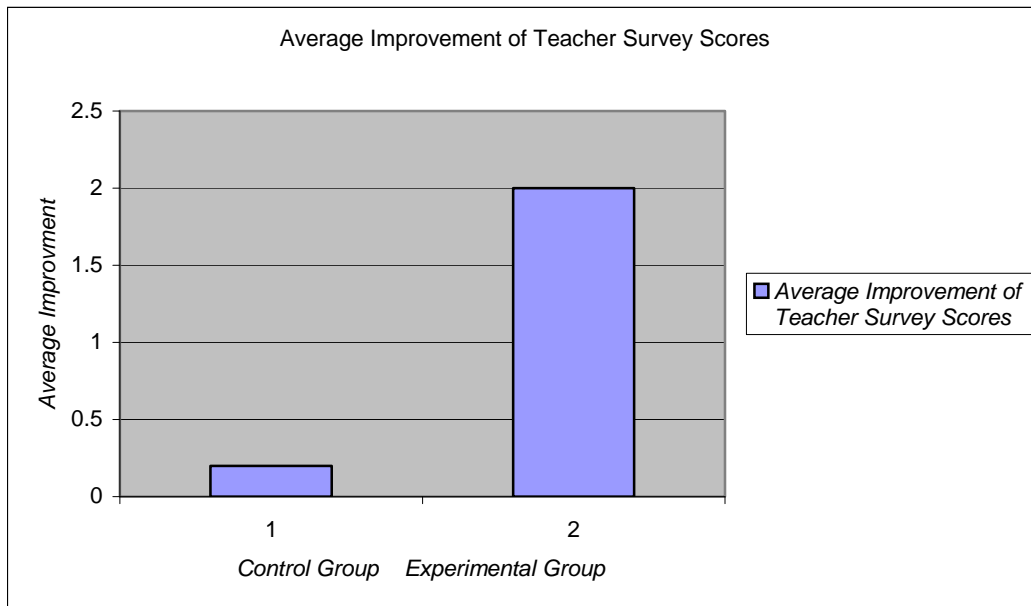


Figure 6. Average of Improvement of Scores on Teacher Survey

Table 5.

Comparison of Average Improvement and Significance of Scores Between Groups using MANOVA

Control Group TAPS Improvement	1.40	Control Group Survey Improvement	.20
Experimental Group TAPS Improvement	6.80	Experimental Group Survey Improvement	2.00
Difference of Improvement (Ex-Con)	+5.40	Difference of Improvement	+1.80
Probability	.113* NS	Probability	.263* NS

*Not significant at .05 level

Results

Discussion

The data collected show a difference between the score improvements between the control and experimental group. On the TAPS test, the control group showed an average

improvement of one standard score as opposed to the experimental group's average improvement of +6.80 standard scores. These scores show a difference of +5.40 standards scores in favor of the experimental group. This means that on average, the experimental group scored .33 standard deviations higher than the control group on the second TAPS test. The teacher survey does not show as large a discrepancy between group scores, but still the experimental group performed better. On average, the control group improved their scores by +.20 points; the experimental group +2.00. This is a difference of +1.80 in favor of the experimental group. This means that, on average, the experimental group scored 1.80 points higher on the second teacher survey than did the control group. However, in light of the slight disparities of the scores between the control and experimental groups after AIT was administered, a statistical significance using MANOVA could not be demonstrated. In regards to the TAPS test scores, there was a between group probability of .113., which is not statistically significant ($p < .05$). In terms of the survey scores, there was a between group probability of .263. Again, based on $p < .05$, this score is not statistically significant. By analyzing the data collected and the average score improvements between groups in regards to both the TAPS scores and survey scores, one can see that even though a statistical significance could not be shown in this research, which may be attributable to the relatively small sample size, the scores are suggestive. This means that the experimental group, although not a statistically significant difference, did score higher on both the TAPS and teacher survey after AIT was administered.

Conclusions

The results of this study are suggestive although not statistically significant. By examining the pre-TAPS scores of both groups, we see that the control and experimental groups

delivered average scores of 50 and 47, respectively.

The large disparity of post-test averages can be accounted for by the large increase in scores of students 8 and 9, who increased their scores by 11 points. It should be noted that these two students scored lower on the pre-TAPS than did the other students; therefore, this score increase might be attributed to regression towards the mean. In both the control and experimental groups, the students who increased their scores the most were the students who scored much lower on the pre-TAPS. Simply put, it was easier for these students to increase their scores because they were low to begin with. It would have been much more difficult for students who scored higher on the pre-TAPS, although still below the mean, to increase their scores any more. Based on the results of this study, it cannot be generalized that there is a positive relationship between AIT and increased auditory processing skills and improved behavior in students with ADHD. It can be noted however, that in a few instances in this particular study, the lower the student's present level of functioning in regards to auditory processing and behavior, the better the student performed after AIT was administered.

Although it cannot be generalized based on this study alone that there is a statistically significant relationship between academic and behavioral performance and AIT, it should be noted that there is a degree of practical and educational significance to the study. Even several weeks after the participants had completed the mandatory music and testing sessions, many students from the experimental group, who had been exposed to filtered music, requested that they be allowed to spend some time listening to those same music selections each day. This would lead an educator to believe that although the research in this case did not indicate a statistical benefit of AIT, the students did gain something from their participation in this study.

Limitations

The design of this study did account for and attempt to control researcher bias; however, there were still a few threats to validity that could not be eliminated. Due to limited access to a population of students with ADHD, subjects from within the same district had to be used. This decreased the external validity due to the fact that there was not a broader range of students from different grade levels, ages, religions, and socio-economic backgrounds involved in the research. Another threat to external validity in the study was the time frame in which the students were expected to participate in their music sessions. Some students were only able to participate in the morning, whereas others participated at lunch or in the afternoon. The times of the sessions could have had an effect on not only the students' abilities to process music, but also on their TAPS scores as well. The greatest threat to external validity in the research is the number of subjects who were able to participate. Ideally, in an experimental study such as this, the more subjects who participate, the more reliable your results will be; however, with a limited population to choose from, a convenience sample had to be used. Due to this limited population, even though there was an improvement in scores in the experimental group, statistical significance of this improvement could not be demonstrated.

Any time results are obtained by observation and without a scientific instrument, human error is always going to be a factor and in turn a threat to internal validity. Therefore, the results of the teacher surveys are unknown. In order to reduce bias, the teachers were not aware of the nature of the research that was being conducted or what group each student belonged to; however, they probably noted that there was some expectation of improvement being that they were asked to fill out the survey twice. In order to further reduce bias, a student research

assistant was used, making it unknown to the examiner and to the student to which group each subject was assigned. Since some questions on the TAPS test could be considered subjective, knowing the group assignments of the students could have skewed the results of the second administration of the TAPS test.

Further attempts to increase the internal validity of this study involved the use of the same music within groups. The entire control group could choose among four selections of music. The experimental group listened to four other selections of modified music.

There was one threat to internal validity in this study that was difficult to control. Some of the participants of this study suffer from learning disabilities as well as ADHD. Therefore, the threat to validity is the capability of improvement. Since some are students with learning disabilities, the music may have actually improved their auditory processing skills, yet they still might perform poorly on the TAPS test due to other factors, such as language processing disorders or dyslexia.

Recommendations for Further Research Action

One common element of any conclusive research study is a large sample base. In order for any research study be considered accurate, reliable, and valid, it must be representative of the general population. If one were to replicate this research, it is recommended that a larger sample be used. A larger sample would not only yield more reliable results, but it would increase the researcher's chances of being able to prove a statistical significance in the improvement of scores between the control and experimental groups. Due to the fact this was a convenience ADHD sample, the generalizability of this research could be limited.

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APPENDICES

TEACHER SURVEY AND CONSENT FORMS

Appendix A

TEACHER SURVEY

PLEASE COMPLETE THE FOLLOWING SURVEY FOR:

(STUDENT NAME)

1-STRONGLY DISAGREE

2-DISAGREE

3-SOMEWHAT AGREE

4-STRONGLY AGREE

STUDENT BRINGS MATERIALS NEEDED FOR CLASS, SUCH AS PAPER, PEN, PENCIL 1 2
3 4

STUDENT TURNS IN HOMEWORK WHEN IT IS DUE 1 2 3 4

STUDENT COMES TO CLASS IN THE PROPER FRAME OF MIND 1 2 3 4

STUDENT TALKS AT APPROPRIATE TIMES 1 2 3 4

STUDENT DOES NOT DISTRACT OTHERS FROM COMPLETING WORK (TALKING TO CLASSMATES)
1 2 3 4

STUDENT DOES NOT MAKE DISTRACTING NOISES (TAPPING PENCIL, FOOT, ETC) 1 2
3 4

STUDENT PARTICIPATES IN CLASS DISCUSSIONS 1 2 3 4

STUDENT HAS NEVER BEEN ASKED TO LEAVE CLASS DUE TO DISRUPTIVE BEHAVIORS 1
2 3 4

STUDENT IS RESPECTFUL TOWARD TEACHER 1 2 3 4

STUDENT IS RESPECTFUL TOWARD CLASSMATES 1 2 3 4

STUDENT HAS NEVER BEEN SUSPENDED 1 2 3 4

STUDENT SPEAKS IN A SOFT VOICE WHEN APPROPRIATE
1 2 3 4

STUDENT PERFORMS WELL ON TESTS 1 2 3 4

STUDENT PERFORMS WELL ON HOMEWORK 1 2 3 4

STUDENT'S OVERALL PERFORMANCE IN CLASS IS SATISFACTORY
1 2 3 4

Appendix B

Dear Student,

You have been selected to participate in a research study affiliated with Eastern Michigan University in order to fulfill the requirement of a master's thesis. The purpose of the research is to determine whether or not different types of music have an effect on your listening and attention skills. If you agree to participate in this research, you will be given a short test in order to determine how you listen now. You will then be asked to listen to one of two types of music for 20-30 minutes a day for the entire eight week card marking period. After this time, you will be given the same test again to determine if your listening/attention skills have improved. Please understand that your participation in this research is strictly voluntary and you may decline to participate at any time without any consequences. **THIS RESEARCH WILL NOT AFFECT YOUR GRADE.** It is important for you to know as well that there are no foreseeable risks or harmful effects involved in the testing. You may however benefit greatly from the process. Also, your test scores will be confidential. Only you, I and your parents will see them (under 18). It will be your decision whether or not you want to share your scores with anyone else. Your scores will be used for the purpose of a master's thesis, but at no time will your individual name be mentioned in the results of the research. If you have any further questions about the research, please feel free to contact the following people: Mrs. Jenny Lauterbach at Woodhaven High School or jknight1@emich.edu , Dr. Michael Bretting, College of Education, Human Subjects Research Chair at michael.bretting@emich.edu or 734-487-0496 or Dr. Gilbert Steifel, special education department at gsteifel@emich.edu.

Sincerely,

Mrs. Lauterbach

 PLEASE DETACH BOTTOM PORTION AND RETURN

Consent to Participate: I have read or had read to me all of the above information about this research study, including research procedures, possible risks, side effects, and the likelihood of any benefit to me. The content and meaning of this information has been explained and I understand. All my questions, at this time, have been answered. I hereby consent to follow the study requirements and take part in this research.

Print name of Participant

Signature of Participant

Print name of Investigator

Signature of Investigator

Dear Parents,

Your son/daughter has been asked to participate in a research study affiliated with Eastern Michigan University in order to fulfill the requirement of a master's thesis. The study will determine the effects of music on attention and/or listening skills. Your son/daughter will be given a test in order to note his or her present listening/attention skills. Your child will then be exposed to one of two types of music, filtered or non-filtered for 20-30 minutes daily for an eight-week period. After the eight weeks, your child will then be retested in order to note any improvements in his or her listening/attention skills. Please be aware that participating in this research is strictly voluntary and you and your child may decline to participate at any time with no penalties or questions asked. It should also be noted that the results of this study will be used in a master's thesis in order to report the usefulness of the intervention, however at no time will individual names be disclosed. The test scores will only be reviewed by the examiner, you and your child. Whether or not you would like to disclose the results to a fourth party decision. Please understand that there are no foreseeable risks or harmful effects associated with this study and that your child may benefit greatly from this intervention and the results of this research. If you have any further questions about this study or the use of subjects to conduct research, you may contact Mrs. Jenny Lauterbach at Woodhaven High School or jknight1@emich.edu , Dr. Michael Bretting, College of Education, Human Subjects Research Chair at michael.bretting@emich.edu or 734-487-0496 or Dr. Gilbert Steifel, special education department at gsteifel@emich.edu.

Sincerely,

Jenny Lauterbach
Woodhaven High School

PLEASE DETACH BOTTOM PORTION AND RETURN

Consent to Participate: I have read or had read to me all of the above information about this research study, including research procedures, possible risks, side effects, and the likelihood of any benefit to me. The content and meaning of this information has been explained and I understand. All my questions, at this time, have been answered. I hereby give my son/daughter consent to voluntarily follow the study requirements and take part in the study.

Print name of parent/guardian

Signature of parent/guardian

Print name of Principal Investigator

Signature of Principal Investigator

THESIS APPROVAL FORM

THE BENEFITS OF AUDITORY INTEGRATION

Jenny Rebecca Lauterbach

APPROVED:

Gilbert Stiefel, Ph.D.
Thesis Chair

Date

Carole Gorenflo, Ph.D.

Date

Kyung-Hee Kim, Ph.D.

Date

Date

Date

