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Increasing On-Task Behavior of Students with Autism using Classical Music

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California State University, Monterey Bay

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Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Education

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Abstract

On-task behavior is linked to higher achievement in school, but students with Autism Spectrum Disorders (ASD) often have difficulty staying on task. Effective interventions are needed to help students with ASD stay on task and be successful at school. This study provided classical music during independent student work to determine if playing classical music during independent learning activities would increase on-task behavior. This study utilized a single case AB design with three participants. During the baseline phase, no music was played while students worked independently. During the intervention phase, classical music was played while students completed their assignments. Results showed varied effectiveness, but all participants had increased on-task behavior during the intervention phase. This indicates that using classical music might be an effective strategy to increase on-task behaviors in for some students receiving special education services for ASD.

Keywords: on-task, Autism, ASD, music

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Table of Contents

Thesis Submitted in Partial Fulfillment of the Requirements for the
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Literature Review

When students are off-task their behavior impedes learning. Off-task behavior refers to all activities in the classroom where students have inappropriate interactions with others or attend to stimuli other than instruction (Randolph, 2007). According to Karweit and Slavin (1982) inattentiveness or off-task behavior is the biggest factor for loss of instructional time. For example, teachers must stop teaching to redirect off-task behavior or to regain students' attention. Research suggests that students spend between 10-50% of instructional time engaging in off-task behaviors (e.g., looking out a window, looking at their cell phones, engaging in off-topic conversations) while in the general education classroom (Karweit & Slavin, 1982; Lee et al., 1999; Lloyd & Loper, 1986). Furthermore, students engaging in off-task behavior may be distracting to teachers and other students and these distractions may lead to a loss of instructional time for all students in the class (McLane, 2016). As off-task classroom behaviors have been shown to have a negative impact on student success; on-task behaviors may be the key to improving academic achievement.

On-Task Behavior

On-task behavior is important to being successful at school (Holifield et al., 2010). Students who display on-task behavior engage in classroom activities, listen to speakers, and complete assignments. These on-task behaviors are linked to higher achievement (Karweit & Slavin, 1982). Furthermore, on-task behavior is helped by well-developed executive functioning skills. Executive functioning is the use of mental skills that help people plan, organize, and complete tasks. Skills include working memory, flexible thinking, and self-control. For example, executive functioning is used for time management, planning a project, completing homework,

and remembering instructions. These skills are critical for many daily life tasks, including time management, acquiring and comprehending new information, meeting deadlines or due dates, and performing multi-step tasks (Lee et al., 2007). While executive functioning skills develop naturally for most people, many students with Autism Spectrum Disorder (ASD) lack these skills (Bjorklund, 2012; Hume, Loftin, & Lantz, 2009).

Autism Spectrum Disorder (ASD)

ASD is characterized, in part, by repetitive behaviors, restricted interests, and difficulty with communication and social interactions (National Institute of Mental Health [NIMH], 2016). For example, people with ASD may not engage in conversation, make eye contact, or their face expressions may not match what they are saying (NIMH, 2016). ASD is a group of developmental, neurological disorders that ranges in symptoms and severity, from severely disabled to intellectually gifted, affects behavior, social interactions, communication, and learning (NIMH, 2016). As of 2016, about 1 in 68 children are diagnosed with ASD, and of those, boys are five times more likely to receive a diagnosis than girls (Centers for Disease Control and Prevention [CDC], 2016). Given the prevalence and the broad spectrum of abilities, special education teachers and general education teachers are having more students with ASD in their classrooms. Teachers must be prepared to meet the unique needs of their students. Furthermore, many individuals with ASD struggle in the academic setting because of the characteristics inherent to this disorder.

One reason school can be hard for students with ASD is a lack of independence. Students with ASD often rely on adults to complete activities (Stahmer & Schreibman, 1992). For example, many districts provide aides to assist in classrooms serving students with special education services, and some students are designated a one on one aide. This means that the

student has an adult with him or her at all times. Because these students are constantly around adults, student may not have opportunities to fail or be independent, both of which are necessary factors in learning. For example, an aide might catch a student hesitating or making a mistake, and instead of allowing the student to struggle through it, they might rescue the student through guided practice or even by giving them the correct answer. In time, this process teaches students to fear failure and give up when tasks become difficult. Since many students with ASD already tend to be perfectionists, this is especially detrimental. This can manifest in behaviors such as tantrums and task refusal. It is important that students receive the help and resources they need. However, aides and teachers should be careful not to hinder progress, by creating prompt dependency.

Prompting is an evidence-based practice (EBP) for working with learners who have ASD. Prompting includes verbal, gestural, or physical assistance given to students to help them acquire or engage in a behavior or task (Wong et al., 2014). For example, a teacher might prompt students to put their names on their assignment by saying, “What is the first thing you do when you get a paper?” and the students may respond by saying, “Put your name on it” and then putting their names on their papers. On the other hand, if used inappropriately, prompt dependence can be developed, which increases passivity and learned helplessness (Goodson, Sigafoos, O’Reilly, Cannella, & Lancioni, 2007). Prompt dependence is when students require a prompt in order to complete a task or skill they have already mastered. Prompt dependence impedes an individual’s ability to gain full independence with a task and have difficulty staying on task (Hume, Loftin, & Lantz, 2009). For example, many students know to put their name on assignments; however, teachers are quick to prompt students and so students become reliant on

these reminders. Therefore, it is important that teachers and aides be skilled in fading prompts or other supports that were once needed, but are no longer required.

Fading is a strategy of gradually decreasing supports until the student completes the task without prompting (Wong et al, 2014). Using the example of putting names on papers, a teacher may stop using a verbal prompt, and start tapping the paper to indicate where the student is expected to write his or her name. The teacher would then point to the paper instead of tapping, and finally, using time delay (TD), the teacher would begin waiting longer periods of time before pointing to the paper, until eventually, the students are independently writing their names on assignments. Using strategies like fading, can help develop independence among students with ASD (Wong et al., 2012). Therefore, teachers must explore which EBPs would be useful to increase independence. Prompting and TD are two evidence-based practices that have been proven to be beneficial for teaching students with ASD (Wong et al., 2012).).

Evidence-Based Practices (EBPs)

It is required that teachers use EBPs; therefore, strategies should be identified and researched, so that teachers have as many resources available to them as possible. The National Professional Development Center on Autism Spectrum Disorder (NPDC) determines whether or not an intervention is effective by reviewing peer reviewed research in scientific journals. Through this process, 27 evidence-based practices for teaching students who have ASD have been identified (Wong et al., 2012). Three such EBPs, include Reinforcement, Antecedent-based Intervention (ABI), and Visual Supports (VS).

Reinforcement is a common effective practice that is used in combination with other interventions, such as using a task analysis to complete a task, like washing hands. The teacher may reinforce that behavior with praise or a token that would later be traded in for a desired

reward. Reinforcement describes the connection between a student's behavior and a consequence for that behavior. The consequence is only considered reinforcing if it increases the chance that the student will engage in the behavior again in the future (Wong et al., 2014). An example of using reinforcement in the classroom is a teacher providing an attention-seeking student with a high-five when the student completes a task. In this example, the student likes the attention received when he or she completes the task, and therefore is more likely to continue completing tasks, in order to keep getting those high-fives. Reinforcement is used when the behavior is positive and the adult wants it to continue. Another example of using reinforcement could be when a teacher plays music as a reward for the students working diligently. Another technique used to encourage behavior is ABI.

ABI is a strategy that professionals use by modifying the environment in order to decrease maladaptive behaviors and increase engagement (Adcock & Cuvo, 2009). The goal is to set up events or situations to increase the likelihood of a student engaging in a positive behavior, or to prevent the student from engaging in the expected negative behavior. For example, a teacher might arrange for her class to have a picnic when the cafeteria serves hotdogs in order to prevent a student who has an aversion to the smell from having an outburst. In this example, the ABI enabled the student to engage in a positive behavior (eating lunch with his peers) while also preventing a negative behavior (having an outburst). In addition, a teacher may turn on music in order to modify the environment of the classroom. Students who are usually talkative may be quiet to hear the music, and enable a student who has difficulty focusing when students are talking, to participate. As shown in the examples, ABIs create an environment that allows the student to participate, rather than being distracted by external stimuli. Once the environment is

primed for learning or participating, teachers may choose to use VS to maximize learning opportunities.

VS allow students to process information easier and faster, by including visuals that enables the student to participate in a task, without needing prompts (Wong et al., 2014). For example, students with ASD who have low reading comprehension often benefit from reading books with illustrations. Having a written schedule is an example of providing a VS that helps students navigate through their school day without an adult telling them when an activity or event will take place. Other examples of VS are boundary lines, graphic organizers, and posted rules and expectations in a classroom. Art can also serve as a VS, and when playing music, a teacher may provide the lyrics or sheet music as a VS.

Music as an Intervention

Research consistently shows that arts integration is an effective teaching strategy for all students across subjects. Arts integration refers to incorporating visual and performing arts (i.e., dance, theater, and music) into the learning process. Students who are involved in the arts score up to 18 percent higher than other students on tests (Cornett, 2011). In 2011, the Mississippi State University Stennis Institute conduct a two-year study examining the impact arts integration has on academic performance of over five thousand students. Results indicated that schools participating had significantly higher test scores than non-participating schools statewide (TeachArts.org, 2013).

Research regarding the effects of arts integration in the field of special education is positive as well. Deasy (2002) indicated that the arts may have an even bigger impact on students with special needs than the general population of students. This is important because often, arts are viewed as optional, or luxury activities in school, and are removed when schools lose

funding. Further, students receiving special education services sometimes don't have opportunities to take art classes because of remedial courses or interventions. However, this study shows that the arts are not just for fun, they help deepen learning in all subject areas. The fine arts provide visual aids and cross language barriers. In other words, people do not need to speak the same language, or speak at all, to understand art. Finally, the arts are multisensory. Strategies such as using visual aids and multisensory activities are effective when teaching students in special education.

Music appears to be a promising intervention. For example, listening to classical music has been shown to increase dopamine in all children, though more so for children with ADHD, and can be used to help children focus and improve overall academic performance (Nguyen, 2014). Because dopamine levels help people decide how strongly to work toward a goal, while also allowing themselves to learn from mistakes (Hamid & Berke, 2015), it is clear why this is beneficial to the learning process.

Further, a study in Lebanon was conducted to research the effects classical music had on the concentration and performance of students with mild intellectual disability (ID) and revealed that student concentration improved by 15 percent, and errors decreased (ElDaou & Hassaniyyeh, 2016). In other words, students' on-task behavior was improved when they listened to music in the classroom. Moreover, Coyne and colleagues (2000) conducted a study and found that playing background music decreased the time students with multiple and intellectual disabilities spent out of their seats. In-seat behavior is a necessary aspect of engaging in on-task behavior in a classroom environment. For example, a student who is wandering around the classroom might miss important information, have difficulty completing tasks, or disrupt the other students. Unfortunately, individuals with a variety of disabilities, including ASD

oftentimes have difficulty engaging in in-seat behavior. Therefore, students with ASD may see similar results with improved in-seat behavior when music is used as an intervention to improve in-seat behavior.

In addition to improving in-seat behavior, listening to classical music may enhance receptive language skills (Cornett, 2011), which is an area of need for many students with ASD and other communication disorders. Receptive language skills include listening and reading. Listening to classical music requires focus. Classical music is considered to be captivating to many people, which might make listening easier, or come more naturally. When working with students who have ASD, music is sometimes used to help students through Music Therapy (Geretsegger, Elefant, Mossler, & Gold, 2014). Music Therapy is a practice used by trained professionals, for intervention with students who have ASD. In a study researching the effects of music therapy in children with ASD, there was evidence that music therapy may help children improve their skills in social interaction, verbal communication, initiating behavior, and social-emotional reciprocity, as well as increase non-verbal communication skills, and increase social adaptation skills (Geretsegger, Elefant, Mossler, & Gold, 2014). Students with ASD face many obstacles, and the literature shows that music may be an effective tool in overcoming them.

There are two music based interventions (Music Intensity and Music Therapy) that are currently classified as focused interventions with some support; meaning, more research is warranted (Wong et al., 2014). More research is needed to determine if music is an effective practice for teaching students with ASD. There is a gap in research regarding specifically how music may impact on-task behavior of students with ASD. However, it could be argued that playing classical music in the background may fall under the evidence-based practices of reinforcement or ABI. For example, classical style music is often used to create mood in movies

and video games. Because students are frequently watching movies and playing video games, classical music may be familiar or motivating to them, which would make playing classical music a viable option to use as reinforcement for some students. In addition, playing classical music alters the learning environment. Therefore, it may be prove to be an effective ABI. Many interventions that have been deemed as EBPs are used in conjunction with other interventions, rather than as standalone solutions to complex problems (Wong et al., 2014). Playing background music in class might show to be an evidence-based practice in and of itself, or it may be a good strategy to use in conjunction with other practices. In any case, this study will focus on whether or not playing classical music in the background will increase the amount of time students with ASD spend on task while engaging in independent learning activities at school.

Method

Purpose

Students with ASD tend to lack independence (Goodson, Sigafoos, O'Reilly, Cannella, & Lancioni, 2007; Hume, Loftin, & Lantz, 2009; Stahmer & Schreibman, 1992), and this negatively impacts them at school and throughout life. For example, more than half of adults with ASD have a poor quality of life when based on values such as language, friendship, and independence (Eaves & Ho, 2008; Howlin, Goode, Hutton, & Rutter, 2004). In order to change future outcomes, individuals with ASD will need to learn to cope and function in society. As those in the autism community know, early intervention is important. Therefore, children with ASD need strategies and an effective learning environment to enable them to stay on-task when engaged in activities at school, so they can increase independence and maximize their learning opportunities. The purpose of this study is to determine whether or not playing classical music in a classroom setting will increase on-task behaviors of students with ASD.

Research Question

The research question for this study was: does playing classical music during independent learning activities, increase on-task behavior for students with ASD?

Hypothesis

Based on research (Campbell, 1996; Ferrell, 2012), it was hypothesized that playing classical music in a Special Day Class (SDC) would result in increased on-task behavior for students with ASD.

Research Design

The current study used a single-case AB design to measure the on-task behaviors of three students. Behavior was measured with and without the use of classical music in the classroom. This design allowed for the effect of the independent variable on the dependent variable to be measured for each participant (Barger-Anderson, Domaraki, Kearney-Vakulick, & Kubina, 2004). Each student's baseline acted as his or her own control. Students entered baseline together in phase A. The baseline data was taken until each student's individual performance stabilized. Data aimed to measure the amount of time students were on task. Data was considered stable when students had five consecutive data points of engaging in on-task behavior within a range of plus or minus three minutes. Once baseline was established, the intervention was introduced. Phase B, the intervention, included the use of classical music in the classroom. During the intervention phase of the study, classical music was played from a central location. The intervention continued for a minimum of five stabilized data points.

Independent variable. The independent variable in this study was the playing of classical music. Classical music primarily refers to instrumental music composed before the early 20th Century in Europe (Merriam-Webster, 2017). Music was played from a central

location, at a volume low enough to hear a conversation, but loud enough that all classmates could hear the music without the use of headphones or earbuds (Giles, 1991).

Dependent variable. The dependent variable was the students' on-task behavior, as measured by duration data, which measures how long a behavior occurs (Bicard & Bicard, 2012). For this study, on-task behavior meant that the student was paying attention to the task at hand, by looking at his assignment and engaging with his materials. On-task behavior was measured using 10-minute observations. Each time the student engaged in on-task behavior, the duration of time was recorded.

Setting & Participants

This study took place at a Central California Title I public elementary school that serves students from transitional kindergarten (TK) through fifth grade. At this school, 52% of students at this school are classified as English Language Learners. Eighty-five percent of students receive free or reduced lunch, and approximately 52% of the student population is male (California Department of Education [CDE], 2016).

The classroom used in this study was comprised of 14 students who have ASD or other language and communication disorders, ranging in severity from mild to moderate. While some students do not have a diagnosis of ASD, it was determined by each student's Individual Education Plan (IEP) team that their individual needs were best met within this setting. The study was conducted in a manner that did not disrupt their daily routine, or interfere with the learning of required subjects.

Of the 14 students in the class, three students comprised the study sample. Participants were selected utilizing purposive, convenience sampling, based on students meeting criteria and representing a wider range of abilities and behaviors. Participants of this study were three eight

to ten-year-old male students who qualify for special education services under the category of Autism, and who receive most of their instruction within an SDC class. Each participant was assigned a pseudonym to protect confidentiality and to provide anonymity.

Manuel. Manuel is a 10 year old Hispanic student who has difficulty staying on task. He often tips in his chair, makes noises, and gets distracted by toys and object at his desk. He sometimes leaves his seat to get a piece of paper, a book or a drink.

Jason. Jason is nine years old. He is a Caucasian student who is sensitive to certain noises, especially noises that are unexpected, such as a bird chirping, a dog barking, or a smoke alarm sounding. Jason has noise-canceling headphones available, and wearing them was an option for him during the study. When students are supposed to work independently, Jason often wanders around the classroom or sits against a wall at the back of the classroom. When he is in his seat to work independently, Jason tends to doodle in the margins of the paper or color the letters on the page, rather than complete his work.

Sam. Sam is a nine-year-old Japanese student who is sensitive to noise, especially loud noise, or when several different sources of noise can be heard at once. Similar to Jason, Sam will have the option of using noise-cancelling headphones during the study. This student remains in his seat when instructed to do so, but often reads non-instructional material or engages with staff instead of completing his work. He requires prompting to complete an independent learning task.

Measures

This study utilized duration recording data (Ramsey, Jolivette, Patterson, & Kennedy, 2010). Duration recording data measures how long a behavior occurs. It is beneficial to measure duration when recording behavior that has a distinct beginning and end, and for behaviors that happen so often that getting an accurate frequency count would be difficult (Bicard & Bicard,

2012). Data was collected using the Star Strategy Duration Recording Form, which was approved by the Office of Special Education Programs (OSEP), as a form to be used by educators whose purpose is to increase positive behaviors, such as on-task behavior (Bicard & Bicard, 2012). A sample form which was utilized to collect data can be found under Appendix A. One special education aide, one behavior technician, and the primary researcher make up the three data collectors who were used throughout this study. Each of these observers are trained in data collection and have also been trained to collect data for this particular study.

Validity. The measure was reviewed by educators and researchers, and funded by the U.S. Department of Education's OSEP. It is used for professional development and teacher preparation programs (The Iris Center, 2018). To address internal validity, all data was collected during 10-minute independent warm-up activities (e.g., maze, word search, or coloring sheet) at the same times five days out of the week. All raters were trained on how to collect data and had a data sheet that clearly defined on-task behavior (see Appendix A) which was defined as the student being seated in his/her seat, having his/her hands on his/her pencil and paper, and not talking unless he/she is asking a question regarding the assignment (Christle & Schuster, 2003). All raters had practice collecting data before the study began, in order to compare and to establish inter-rater reliability (i.e., measuring the behavior the same way, resulting in the same duration of time recorded). To address external validity, the researcher only used students that met the criteria of third to fourth grade students who qualify for special education under the category of Autism and received instruction in an SDC class.

Reliability. To ensure reliability, duration data of the time participants spent engaged in on-task behavior, was collected until a minimum of five data points were obtained for each participant during the baseline and intervention periods. Each participant was rated by observers

trained in data collection (Hallgren, 2012; Lammers & Badia, 2005). Outside of the study, all observers took data of on-task behavior of a student simultaneously in order to maintain interobserver agreement. Data was compared among interobservers for 20% of all trials to make sure that inter-rater agreement of at least 80% was maintained (Graham, Milanowski, & Westat, 2012). The inter-rater agreement of this study was measured at 90%.

Intervention

The instruments used for this intervention were a lap-top with speaker, and classical music played loud enough to hear, but quiet enough that students could hear the teacher when speaking (Giles, 1991). Each observer used a stopwatch and timer to aid in collection of duration data (Lammers & Badia, 2005), which was collected using the Star Strategy Duration Recording Form (see Appendix A).

On each intervention condition day, background music was provided for the duration of a 10-minute independent learning activity. Learning activities included warm-ups (e.g., maze, word search, or coloring sheet) at the current independent level of each participant, as prepared by the classroom teacher. During the baseline and intervention periods, the teacher gave students instructions to work at their desks on the assignment, keep a low voice, and ask for help when needed. In order to ensure that results were not skewed, students were not told that music was going to be played, or that they were being observed.

Data collection. Duration data was collected for this study because it provided a record of the length of time students stayed on-task (Bicard & Bicard, 2012; Lammers & Badia, 2005). Data was collected using the Star Strategy Duration Recording Form (see Appendix A; Bicard & Bicard, 2012). When on-task behavior began, the stopwatch was started. When the behavior ended, the stopwatch was stopped. The length of time the on-task behaviors occurred was

recorded, and the process was repeated until the end of the 10-minute observation periods. The total duration of on-task behavior was calculated. Data was collected by one trained coder for each participant. Baseline data was collected until data stabilized and five data points were obtained. The intervention period lasted until data was stabilized and five data points were obtained.

Fidelity. To ensure control and intervention conditions were implemented as intended, there was an additional observer present during 100% of the study to verify fidelity using the fidelity checklist (see Appendix B). There were two observers in addition to the primary researcher in the classroom each day of the study, to ensure data collection procedures were adhered to, and to make sure that background music was only be played during the intervention condition (Lammers & Badia 2005).

Ethical Considerations

Ethical considerations were made to ensure that no harm would be brought to participants. Professional competence and honesty was expected, keeping respect for the rights and dignity of the sample at the forefront of the study (McMillan, 2016). Each participant was given a pseudonym to maintain anonymity and confidentiality. In order to maintain the normal routine, students earned and lost points during the course of the study, based on behavior. In addition, staff continued to provide redirection and prompting in keeping with the normal class routine. Finally, given that some people with ASD experience a sensitivity to noise, noise-canceling headphones were available to all participants during the intervention (Ben-Sasson et al., 2009).

Validity threats. Because the researcher is also the classroom teacher, the possibility of bias could have been a threat to validity. Therefore, there was always other observers present at

the study to ensure fidelity of the study (Lammers & Badia, 2005). Adverse reaction to the music could have also threatened the validity of the study. However, students had not shown an adverse reaction to classical music during past exposure, such as attendance at a symphony concert.

Data Analyses

Data was analyzed using trend line analysis to determine if duration of time engaged in on-task behavior changed when moving from baseline to intervention conditions for each participant. Data was graphed for each student's performance by displaying the sessions on the horizontal x-axis, and duration of on-task behavior shown on the y-axis. Analysis included trends in the data and percentage of non-overlapping data (PND) points. The number of non-overlapping intervention points was divided by the total number of intervention data points to determine the PND. Scores above 90% represent a very effective treatment and scores from 70 to 90 represent effective treatments. Effectiveness of data with scores from 50 to 70 was considered questionable, and scores below 50 was considered ineffective (Scruggs & Mastropieri, 1998).

Social validity. At the completion of the study, classroom staff and students completed a four-point Likert scale (i.e., *1 = strongly disagree to 4 = strongly agree*) social validity questionnaire (see Appendix C). The questionnaire, adapted from Berger, Manston and Ingersoll (2016), consisted of nine questions designed to understand the perceived usefulness, significance, and satisfaction with the implemented intervention (Kennedy, 2005). Participant responses were kept confidential and descriptive statistics were conducted to gain insights regarding the intervention. Results revealed that 100% of staff and 85% of students perceived the intervention as effective.

Results

Data were graphed for each study participant and are presented in Figures 1, 2, and 3. The horizontal x-axis displays the sessions and the y-axis displays the time in minutes and seconds that participants displayed on-task behavior.

Manuel

The results for Manuel are presented in Figure 1 and show the time in minutes and seconds that he displayed on-task behavior during baseline and intervention. Manuel's average time of on-task behavior during the baseline was 1 minute and 10 seconds with a range of 2 minutes and 15 seconds, with the low being zero minutes and the high being 2 minutes and 15 seconds. In the intervention phase, Manuel's average time of on-task behavior was 8 minutes and 41.5 seconds, with a range of 1 minute and 41 seconds, with the low being 8 minutes and the high being 9 minutes and 7 seconds. Manuel's trend in data from baseline to intervention was positive, with an average increase of 7 minutes and 31 seconds. The percent non-overlapping data (PND) for this participant was 100%.

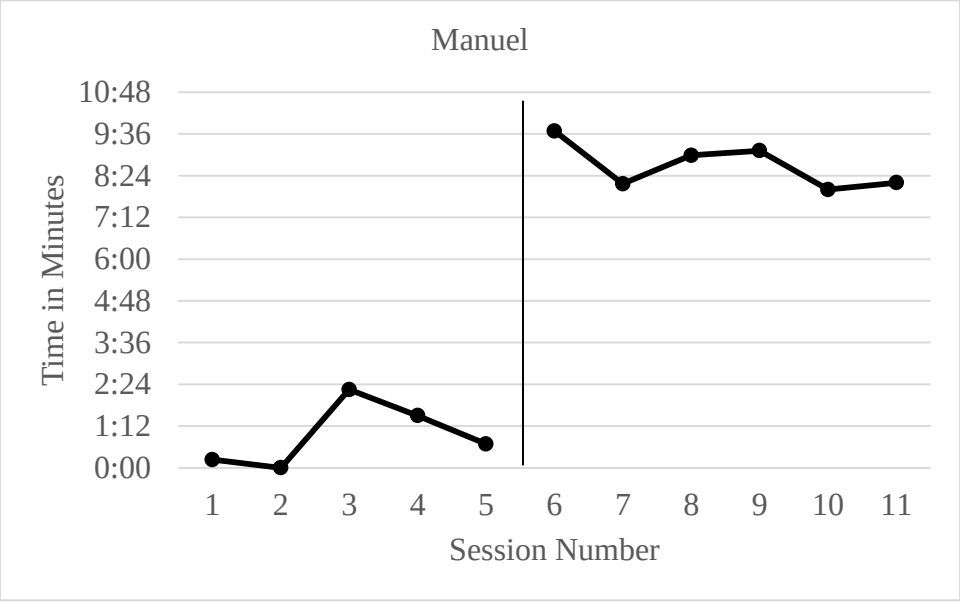

Figure 1. Manuel's duration of on-task behavior per session across baseline and intervention.

Sam

The results for Sam are presented in Figure 2 and show the duration of time in minutes and seconds that he displayed on-task during the baseline and intervention. Sam's average time of on-task behavior during the baseline was 4 minutes and 40 seconds with a range of 2 minutes and 34 seconds, with the low being 3 minutes and 38 seconds, and the high being 6 minutes and 12 seconds. In the intervention phase, Sam had an average on-task behavior of 7 minutes and 8 seconds, with a range of 3 minutes and 55 seconds. The low was 5 minutes and 8 seconds and the high was 9 minutes and 3 seconds. Sam's trend in data from baseline to intervention was positive, with an average increase of 2 minutes and 28 seconds. The PND for this participant was 83.3%.

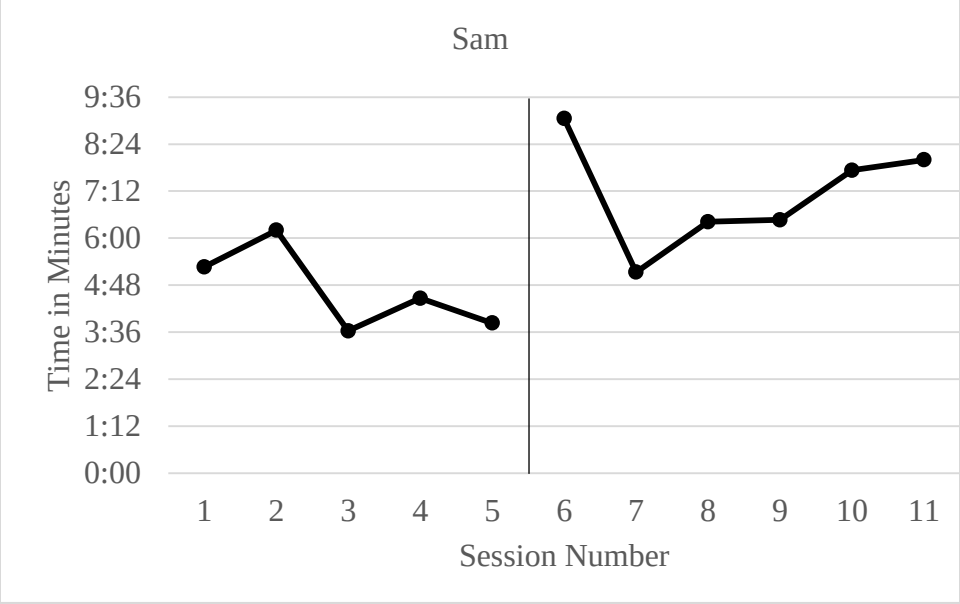

Figure 2. Sam's duration of on-task behavior per session across baseline and intervention.

Jason

The results for Jason are presented in Figure 3 and shows the duration of time he displayed on-task behavior during the baseline and intervention. Jason's average time of on-task behavior during the baseline phase was 7 minutes and 9 seconds with a range of 8 minutes and 10 seconds. The low was zero minutes and the high was 8 minutes and 10 seconds. In the intervention phase, Jason had an average on-task behavior of 8 minutes and 28 seconds, with a range of ten minutes, with the low being zero minutes and the high being ten minutes. Jason's trend in data from baseline to intervention was positive, with an average increase of 1 minute and 19 seconds. The PND for this participant was 66%.

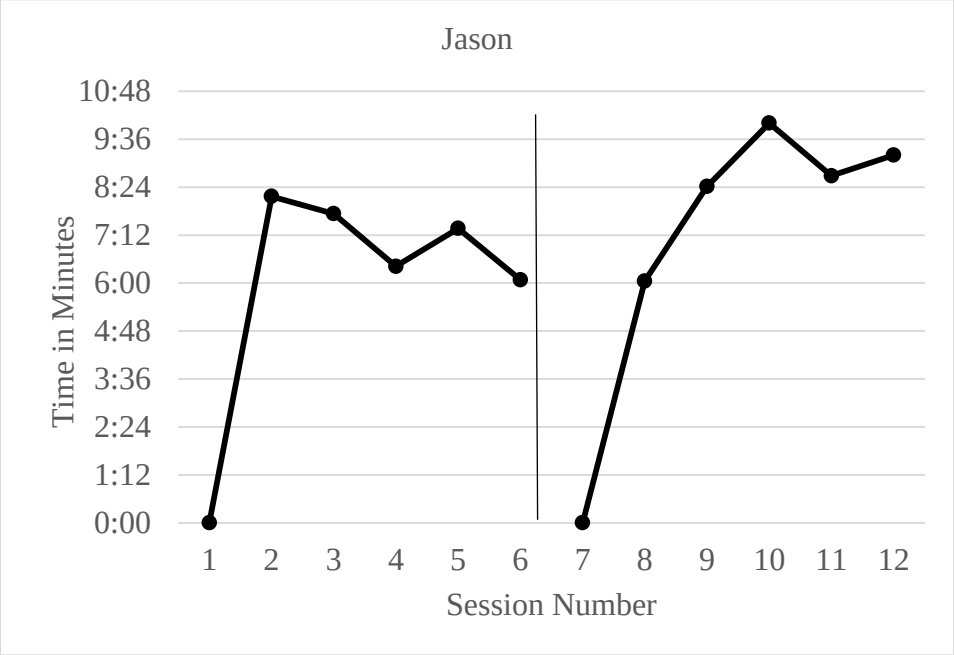

Figure 3. Jason's duration of on-task behavior per session across baseline and intervention.

Discussion

Students with ASD often have difficulty maintaining on-task behavior in school and few studies have explored the use of music to increase on-task behavior. Therefore, this study was conducted to determine whether or not listening to classical music while working independently

would increase on-task behavior of students who have ASD. Based on the literature, it was hypothesized that classical music would increase the duration of time students spent on-task. The results of this study suggest varying levels of response to the intervention and more research is needed in this area.

Manuel responded to the intervention immediately and had 100% PND indicating the intervention was highly effective. This suggests a functional relationship between the intervention and Manuel's time on task. During class, Manuel tends to be loud and restless. It is possible that he responded so well to the intervention because the classical music provided the sensory input he requires. This is in line with research that shows ABI's can be effective in decreasing negative behaviors of students with ASD and increasing their positive behaviors (Adcock & Cuvo, 2009). Further, Nguyen (2014) stated that music helped students with ADHD to focus. Given Manuel's hyperactive temperament, it would be expected he would benefit more from this intervention than students who are typically less energetic.

Sam responded to the intervention with 83.3% PND, suggesting a moderately effective intervention. During Session seven, Sam displayed less on-task behavior, because he stood up and began dancing to the music. Therefore, songs with low tempos appeared to be more effective for Sam, but it can be inferred that listening to classical music was engaging for him. Similarly, Wong and colleagues (2014) state that an intervention may be considered reinforcing if the consequence increases the likelihood that the behavior will occur again. Sam's data reveals a positive trend line and on one occasion, it was noted that Sam requested listening to music, indicating that music may reinforce his on-task behavior.

Jason's baseline and intervention behavior were unstable resulting with 66% PND indicating the intervention was minimally effective. For both of the initial data points for

baseline and intervention, Jason did not demonstrate any on-task behavior. Aside from the first day of intervention the positive trend line indicates that Jason did respond to the intervention and increased his on-task behavior by ten minutes within the first four sessions.

Sam and Jason responded to the intervention with less PND than Manuel. These students are both sensitive to noise. On one hand, the intervention was an introduction of a source of noise to the classroom. On the other hand, Manuel's disruptive behavior decreased. This may have allowed Sam and Jason to concentrate more than during baseline, because of the type of noise present. In other words, because Manuel was quieter, Sam and Jason may have been able to stay on task more often, even though they might respond better to silence rather than either student disruptions or music interventions.

One commonality all students shared was the tendency to get out of their seats. Positive trend lines for all participants during the intervention phase is in line with research. Findings from the current study are similar to that of previous research that found listening to classical music may increase in-seat behavior of students (Cornett, 2011; Coyne et al., 2000). Because in-seat behavior is necessary to completing independent work (Cornett, 2011), this study suggests that increased on-task behavior may be, in part, due to an increase of in-seat behavior.

Limitations and Future Research

One limitation of this study was the limited time-frame as the study needed to be completed within one academic semester. Therefore, future research should be done using a longer time-frame to account for participants that may take longer to stabilize or respond to the intervention. For example, two participants were dropped from this study because stable baseline data was not achievable in the timeframe. Furthermore, the sample size was small and not random; therefore, the results of this study should not be used to make general statements about

the effectiveness of classical music on the on-task behavior of students with ASD. Instead, this study should add to the growing body of research surrounding the use of classical music as an intervention for students with disabilities. In addition, it may provide teachers with reason to try this intervention with their students, as an inexpensive strategy that is easy to implement and has shown to be effective for some students.

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Appendix A

Duration Recording Form

STAR Strategy
Duration Recording Form

Student: _____ Date: _____

Class/ Teacher: _____ Observer: _____

Time/ Length of Observation: _____

Behavior: _____

Time Start	Time End	Duration
Example (digital stopwatch) 00:00	*04:27*	*4 minutes, 27 seconds*
Example (wall clock) 8:30	*08:57*	*7 minutes*
	TOTAL/ AVERAGE	

Additional comments:

Appendix B

Fidelity Checklist

Music On/ Off	**Redirections**	**Utilizing Stopwatch**	**Utilizing Data form?**	**Observer's Initials**	**Date:**
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		
Music On/ Off	Y / N	Y / N	Y / N		

Appendix C

Social Validity Questionnaire

Questions:		1 Strongly disagree	2 Disagree	3 Agree	4 Strongly Agree
1	This treatment was effective				
2	I found this treatment acceptable for increasing the student's skills				
3	Using the treatment improved skills across multiple contexts (home, classroom, community)				
4	I think the student's skills would remain at an improved level even after the treatment ends				
5	This treatment improved family functioning				
6	This treatment quickly improved the student's skills				
7	I would be willing to carry out this treatment myself if I wanted to increase the student's skills				
8	I would suggest the use of this treatment to other individuals				
9	This treatment decreased the level of stress experienced by the student's family				