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Self-Monitoring to Increase On-Task Behavior Using the MotivAider ®

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A thesis

presented to

the faculty of the Department of Educational Foundations and Special Education

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Master of Education in Special Education

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by

Connie Summey

August 2018

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Keywords: ADHD, self-monitoring, Motivaider, On-Task Behavior, Off-Task Behavior

## ABSTRACT

Self-Monitoring to Increase On-Task Behavior Using the MotivAider ®

by

Connie Summey

Teachers often need simple ways to implement effective classroom interventions that reduce off-task behaviors for students with or without ADHD (Gaastra, Groen, Tucha, & Tucha, 2016). One intervention that is easy to use and can be implemented with minimal demand on teachers is self-monitoring (Amato-Zech, Hoff, & Doepke, 2006). One prompt that can be used in the classroom for self-monitoring is the MotivAider. The MotivAider is an electronic timer that vibrates to provide a tactile prompt to self-monitor (Amato-Zech et al., 2006). The purpose of this study was to examine the extent to which the MotivAider, a tactile self-monitoring device, could be used to increase on-task behavior of students identified with ADHD and/or behavior disorders. Results from this study indicated that overall the student use of the MotivAider resulted in higher amounts of time on task than teacher use.

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## CHAPTER 1

### INTRODUCTION

#### **Attention Deficit Disorder**

Attention Deficit Hyperactive Disorder (ADHD) affects students, parents, and teachers at home and even more in a classroom setting. ADHD is one of the most common neurobehavioral disorders of childhood, affecting 5-10% of school-aged children world-wide (Silva et al., 2015). Characteristics of ADHD include hyperactivity, inability to stay attentive, and having impulsive actions (Silva et al 2015). Other characteristics could include difficulty maintaining eye contact, infringing on personal space, and interrupting others (Biederman & Faraone, 2005). ADHD was first studied in 1937 and treatments were approved for children in the 1960s (Biederman & Faraone, 2005). In the 20th century, much controversy arose about ADHD. Fortunately, as we entered the 21st century, fierce opinion has begun to be replaced by data from empirical studies of ADHD's epidemiology, cause, pathophysiology, and treatment (Biederman & Faraone, 2005). ADHD is associated with weakened cognitive control as compared with typically developing individuals (Nigg, 2010). According to research, ADHD is caused by a problem with the dopamine D4 receptor of the brain. The diagnosis of ADHD requires the identification of specific behaviors that meet the criteria of the Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition, revised (McConaughy, Volpe, Antshel, Gorgon, & Eiraldi, 2011). In Tennessee, the state in which the current study was conducted, ADHD is evaluated as a specific type of Other Health Impairment ([OHI]; The Department of Education; 2018). While there is no "cure" for ADHD, there are many different treatments to mitigate the symptoms of ADHD, the most popular of which is use of stimulant medications that effect the neurotransmission of dopamine (Silva et al 2015).

Children with ADHD may have difficulties in the classroom that can cause poor peer-relations, low self-esteem, and low grades or test scores (McConaughy et al., 2011). Those affected by ADHD may eventually learn coping strategies to help them overcome the symptoms as they get older. Coping strategies are learned through interventions provided at home and/or in the classroom.

### **ADHD and On-Task Behavior**

Loss of instructional time due to off-task behavior is a well-established problem in educational settings (Godwin et al., 2016). Prior research estimates that elementary school students spend between 10% and 50% of their time off-task in regular education classrooms (Godwin et al., 2016). For a student to complete assignments and learn adequately in a classroom, they must be able to stay on-task. One part of on-task behavior consists of paying attention to teacher instruction and being able to use that instruction to complete assignments. Research shows that students are more likely to stay on-task in small groups and individual instruction where the teacher is more available to help the students stay on task (Imeraj et al., 2013). Students are more likely to be off-task when they are required to work on their own without close teacher supervision and during whole group instruction. Teachers often do not know how to help students with ADHD in their classroom. There are many interventions in research to help students stay on-task and succeed in the regular education classroom. Some of these interventions include weighted vests, white noise machines, token economy, and self-monitoring.

## **Physical Interventions**

One physical intervention used with children with ADHD is a weighted vest. The student wears a vest that has many pockets with weights inside. The idea is that the weight will use pressure points to affect sensory functions in the nervous system (Lin, Chang, & Hong, 2014). The weighted vest is often used by students who see occupational therapists who suggest and monitor the use of the weighted vest. Adding sensory stimulation has been found to increase the attention ability and reduce the excessive movement of students with ADHD (Lin et al., 2014). Research is divided on whether weighted vests have helped students with ADHD. Other sensory interventions include fidget spinners and stability balls. The fidget spinner is a new device and not much research has been done on this as an intervention. Graziano, Garcia, and Landis, (2018) found that the students in their study that the fidget spinner was effective in reducing children with ADHD' hyperactivity in the classroom. The students could spin the device in their hands, on their desk, or on the carpet during their English Language Arts class (ELA). This device is often banned in many schools though due to concerns with it being a toy, distracting other students, and not used properly by the students (Graziano et al., 2018). Stability balls are a more widely accepted intervention in school settings. Teachers have reported that students are more attentive, have higher achievement outcomes, and are better able to concentrate, when using stability balls than when seated on chairs (Fedewa & Erwin, 2011).

Another researched intervention is the use of white noise in the classroom. White noise machines are used to change the environmental conditions and encourage student to stay on-task through sound. Research has shown that white noise has helped a variety of behaviors from crying infants to helping people sleep better in a hospital (Cook, Bradley-Johnson, Johnson, 2014). Some research has shown that students performed tasks more accurately with white noise

than without (Cook et al., 2014). During the study by Cook et al. (2014) a white noise generator by Brookstone Tranquil Moments was used with headphones with three male students diagnosed with ADHD. The volume was calibrated by an audiology technician and recalibrated during the study with a portable decibel reader. The results of the study showed that the boys displayed lower levels of off-task behavior while listening to white noise (Cook et al., 2014).

Using activity schedules also are a good way to help children with ADHD to stay on-task. Most of the time activity schedules are used for students with more severe disabilities such as Autism Spectrum Disorder than ADHD. An activity schedule is a set of picture words that cue a person to engage in a sequence of activities, thereby allowing a student to complete an activity without the direct prompting or guidance of an adult (Cirelli, Sidener, Reeve, & Reeve, 2016). Students with ADHD often get distracted before finishing an assignment. An activity schedule could help a student with ADHD by giving them specific steps to focus on helping them to stay on-task until the assignment was completed.

Behavioral interventions for students with ADHD include both antecedent and consequence-based strategies (DuPaul, Weyandt, & Janusis, 2011). Antecedent-based strategies include repeating directions along with posting rules and other information closer to the student. Adapting or Modifying the length of instructions, tasks, and assignments can also help students with ADHD. Consequence-based intervention is just as it sounds. Consequences are used to encourage appropriate behavior from the student. The consequences can include positive praise, rewards, and incentives or the opposite, taking away privileges or time-out (Schultz, Storer, Watabe, Sadler, & Evans, 2011). Individualized behavior modification techniques are well-established interventions for ADHD because they have been shown to be effective when compared to alternative interventions such as classroom wide behavior management or control

conditions across multiple studies (Schultz et al., 2011). These interventions include the Daily Report Card (DRC), token economy, and response-cost techniques. Behavioral modification, which uses reward and response-cost to change behavior, has been useful against symptoms and associated features of ADHD (Schultz et al., 2011). For example, if Peggy stays in her seat and completes her assignment, she receives a token. If she gets out of her seat and does not complete the assignment she must move her clip down on the behavior chart.

### **Self-Monitoring and On-task Behavior**

Teachers and researchers have described good students and effective learners as being self-directed, motivated, and active in constructing knowledge and acquiring skills in a deliberate and efficient manner (VanLeuvan & Wang, 1997). Students with ADHD need help learning self-management skills (e.g. staying in their seat & completing assignments). Self-management interventions encourage students with ADHD to monitor, evaluate, and/or reinforce their own behaviors, often in conjunction with or following the succession application of teacher-mediated behavior approaches (DuPaul et al., 2011). Self-regulation strategies have been used, primarily in school settings, to teach students to control their own behavior such as impulsivity and disorganization (Slattery, Crosland, & Iovannone 2015). The student is required to stay in his seat, complete the assignments given by the teacher and turn the assignments in to the appropriate place. Self-monitoring or self-assessing often requires the student to ask himself or herself if they are on-task or not on-task. Then the student must mark a chart with the answer.

Self-monitoring interventions in the past have had successes and limitations. Some limitations are a few are not portable and must only be used in the classroom while others can be disruptive or distracting to the student or rest of the class (Hoff & Doepke. 2006). These interventions include tape recorders or CD players with or without headphones, kitchen timers,

and verbal prompts by the teacher. Another intervention that is less distractive, portable, and less visible is the MotivAider Timer. The MotivAider Timer is an electronic device that vibrates to provide a tactile prompt to self-monitor (Amato-Zech, Hoff, & Doepke 2006). The MotivAider is a small device the size of a kitchen timer or a beeper. It can be set to vibrate at any interval from one minute to 24 hours. After it vibrates, it will automatically reset itself to the selected interval and begin counting down again. The teacher and student decide the length of the interval for the intervention. The device is worn on the waistband of the person's pants or in the pocket to allow for privacy (Levinson, 2017).

### **Purpose and Significance of Study**

The purpose of this study was to examine the extent to which the MotivAider, a tactile self-monitoring device, can be used to increase on-task behavior of students identified with ADHD and/or behavior disorders. Helping students with ADHD to learn to self-monitor will allow them to complete assignments, pay attention, learn more effectively in the classroom, and rely less on another person to remind them to stay on task. This skill also will benefit these students throughout their lives in many different areas. The research questions for the study were:

1. When used by target student, will the MotivAider timer increase the Academic Engaged Time (AET) of elementary aged students with Attention Deficit Hyperactivity Disorder?
2. When used by the target student's teachers, will the MotivAider timer increase the Academic Engaged Time (AET) of elementary aged students with Attention Deficit Hyperactivity Disorder?

3. Will there be a difference in the AET of students with Attention Deficit Hyperactivity Disorder when the student him/herself as opposed to use by his/her teacher uses the MotivAider?

## CHAPTER 2

### LITERATURE REVIEW

Over 6.4 million or 11% of children in the United States, have at some point, been diagnosed with ADHD by a healthcare provider (Lawrence, Estrada, & McCormick 2017). One assessment used to help physicians diagnose students with ADHD is The National Initiative for Children's Healthcare Quality Vanderbilt Assessment Scale (NICHQ) (Rapple, 2005). This assessment consists of checklists for teachers and parents to fill out about the student. According to the research by Lawrence et al. (2017), males are more likely than females to receive a diagnosis of ADHD. This study also states that more white children than Hispanic or black students are diagnosed with ADHD (Lawrence et al., 2017). Lawrence et al. (2017) also includes that ADHD is higher in eastern half of the United States and that it is unclear how socio-economic status is related to the development of ADHD. On the other hand, Biederman & Faraone (2005) states that more children in low socio-economic areas are diagnosed with ADHD. To help students with the symptoms of ADHD the most popular treatment has been stimulant drugs (e.g. Methylphenidate, Amphetamine, & Pemoline) (Biederman & Faraone, 2005). Students who take stimulants for ADHD often deal with appetite and weight loss (Biederman & Faraone, 2005). Students are referred for ADHD testing due to displaying developmentally inappropriate levels of inattention, hyperactivity, and impulsivity that begin in early childhood and cause impairment to school performance, intellectual functioning, social skills, and occupational functioning (Biederman & Faraone, 2005).

Often students diagnosed with ADHD have issues with behavior and difficulty with social interactions, which can cause them to be viewed negatively by their peers, teachers, and other adults (Lawrence et al., 2017). A study by Sciberras et al (2014) states that 25-50% of



children with ADHD also suffer from anxiety disorders including separation, social, and generalized anxiety as well as ADHD. Students with ADHD have been shown to be more rejected by their peers due to being overly aggressive or more passive (McConaughy et al., 2011). The distress resulting from social exclusion and increased victimization that peer rejected children often experience, coupled with lack of social support from peers, may over time translate into increased symptoms of anxiety (Mrug et al., 2012). Helping students with ADHD learn to socialize appropriately with others can help to counteract this problem (e.g. role modeling appropriate behavior, teaching students to take turns or to wait their turn). Staying on-task is another issue that children with ADHD face. This problem can cause frustration with teachers and adults in the lives of the child (Lawrence et al., 2017).

According to Lawrence et al. (2017) positive school-based interactions and relationships with invested adults have the potential to mitigate long-term negative outcomes. To provide positive school based relationships teachers must find ways to help students with symptoms of ADHD in the classroom stay on-task beyond taking medicine. Prior research estimates that elementary school students spend between 10% and 50% of their time off-task in regular education classrooms (Godwin et al., 2016). Often children who are frequently off-task also are diagnosed with Attention Deficit Hyperactive Disorder (ADHD). These children often struggle to sustain attention to tasks and instruction, frequently talk to classmates at inappropriate times, and may call out and leave their seat without permission causing them to be at risk of academic difficulties (Gaastra, Groen, Tucha, & Tucha, 2016). Teachers often need simple ways to implement effective classroom interventions that reduce off-task behaviors for students with or without ADHD (Gaastra et al., 2016). There are many research based interventions for teachers

to use in their classrooms. Some interventions include the Daily Report Card, token economy, and response-cost techniques (Schultz et al., 2011).

The Daily Report Card uses an individualized behavior plan to reward positive behavior (Schultz et al., 2011). This plan involves selecting target behaviors for the student and rating them daily. The student takes the note home and is rewarded by the parent if the goals are met that day (Schultz et al., 2011). A few examples of target behaviors provided by Schultz et al, (2011), are (a) stay in seat with three or fewer reminders, (b) complete at least 75% of schoolwork, and (c) raise hand to speak with three or fewer reminders. Token economy also mentioned by Schultz et al, (2011), rewards positive behavior with tangible objects (tokens) that can be redeemed for a special activity or desirable object like a small toy. Response-cost approaches are often implemented in conjunction with an existing token economy system and involve the removal of previously earned tokens for unwanted behavior (Schultz et al., 2011). Other interventions mentioned in the previous chapter are weighted vests, white noise machines, and activity schedules.

An intervention that is easy to use and can be implemented with minimal demand on teachers is self-monitoring (Amato-Zech, Hoff, & Doepke, 2006). Self-monitoring teaches the student to use self-observation and self-recording to check if they are paying attention or not in response to a prompt (Amato-Zech et al., 2006). There are many different prompts that can be used for self-monitoring, but some can be distracting in the classroom and not as beneficial as others are (e.g., pre-recorded sound played at specific intervals, a kitchen timer, or teacher redirection) (Amato-Zech et al., 2006). Other prompts or devices used for self-monitoring may embarrass or be stigmatizing to the student for example wearing headphones (Amato-Zech et al., 2006).

One prompt that is not stigmatizing that can be used in the classroom for self-monitoring is the MotivAider. The MotivAider is an electronic device that vibrates to provide a tactile prompt to self-monitor (Amato-Zech, et al., 2006). This device can be worn, out of view, under the shirt on the waistline of the student's pants. In this study by Amato-Zech et al. (2006), 3 fifth grade students from an elementary school in the Midwest United States used the MotivAider as a cue to stay on-task during Reasoning and Writing instruction. In this study, the MotivAider was set on 1-minute intervals the first week and later changed to 3 minutes as the study progressed. All 3 students had similar results. When the intervention was implemented, the students' on-task behavior increased over 90% and decreased when the MotivAider was removed (Amato-Zech, et al., 2006). The teachers and students rated the intervention highly on a survey at the end of the study. Their responses indicated that the MotivAider was beneficial to the student, was easy to implement, and they would be willing to use the device in a classroom setting (Amato-Zech et al., 2006).

In one study by Boswell, Knight, and Spriggs, (2013), a middle school student used the MotivAider to stay on task during a Math lesson. In this study, the student and an assistant each used a MotivAider to check if the student was working. Both marked a card by circling yes or no and checking to make sure their answers matched (Boswell, et al., 2013). The MotivAider was set to 3-minute intervals for this student and each session was 15 minutes long. The student's on-task behavior increased to 88% when using the MotivAider and decreased to 33% when the intervention was removed (Boswell, et al., 2013). Not only was the time on task monitored, but additionally math fluency was measured. By the end of the study the student's math fluency had increased 100%.

In another study by McDougall, Morrison, & Blaine, (2012), 2 students who were trained to use the Motivaider for self-monitoring also saw improvement in their school work. One of the students was in 10th grade and has been diagnosed with ADHD. Using the MotivAider the percentage of Algebra work he completed increased from 21% to 66% (McDougall et al., 2012). The second student in this study was a 7th grade boy who was struggling to finish English assignments in an adequate timeframe. This student saw the time it took to complete his assignments decreased from 30 minutes to 11 minutes using the MotivAider device (McDougall et al., 2012).

A study by Legge, DeBar, & Alber-Morgan, (2010) included 3 students: 2 students diagnosed with Autism and ADHD and 1 with cerebral palsy. The study found the MotivAider increased the time each student stayed on task. The percentages of these students on-task time increased from 26% to 91% for the first student, 53% to 98% for the second student, and 77% to 97% for the third student (Legge et al., 2010). Initially the timer was set for 2 minutes and gradually increased to 4 and later 10 minutes to help fade out the intervention and allow the students to self-monitor without prompting.

Some benefits of using the MotivAider Method are that it helps students to have ownership of their behavior, it is consistent, and it private (Levinson, Kopari, & Fredstrom, 2017). Taking ownership of behavior can help a student make better decisions and willingly change problem behavior to acceptable behavior (Levinson et al., 2017). Often in a classroom, teachers have a hard time being consistent with cues or reminders to students to stay on-task. The MotivAider helps to keep the cues consistent for the student. Many interventions are not kept private from the peers of the student receiving the intervention. This can cause embarrassment, teasing, and other negative factors to impact the effectiveness of the

intervention. While there have been studies showing the positive use of the MotivAider, more research needs to be done to show that the MotivAider is an effective intervention for students who have trouble staying on-task during a school day.

## CHAPTER 3

### METHOD

#### **Participants**

The participants in this study were a second-grade elementary teacher, Ms. Waters, and an elementary student, John, from her classroom who was identified with ADHD. Ms. Waters, reported that John was off-task more often than his/her fellow students. Ms. Waters noted that John plays with items such as pencils and erasers at his desk. He also would look around the room to see what others are doing or just “stares into space”. Sometimes the John left his seat and walked around the room instead of doing his work. To further define child participant characteristics the *Functional Analysis Screening Tool (FAST)* (Iwata, DeLeon, & Roscoe, 2013) was administered to the teacher to estimate the possible function of the student’s behavior. The FAST is composed to 2 major sections. The initial section seeks information about the role of the informant vis a vis the child (teacher, parent, caregiver etc.). The second portion is a series of 27 statements about the specific contextual features in which the challenging behavior might occur. The informant is asked to give a Yes/No response to each of these statement in terms of whether the behavior occurs in that specific situation (e.g. the behavior often occurs when he/she has not had attention, the behavior occurs when you tell the child he/she cannot have a specific item, & He/she often engages in other annoying behavior that produce access to preferred items or activities). The cluster of statements that receives the most Yes responses is predicted to be the primary function of the behavior challenge. For John the teacher’s responses on the FAST indicated that Social Reinforcement or escape was the function of his challenging behavior. The IOA was done in 4 fifteen-minute time sessions with 80% agreement.

## **Setting**

The setting for this study was a Title 1 elementary school in a rural, community located in Southeastern Tennessee. The school consists of two administrators, 29 regular education teachers and 2 special education teachers. Grades taught ranged from Pre-K through 2<sup>nd</sup> grade. The school serves over 500 students. The school system includes many ethnicities including 86% white, 5.8% Hispanic, and 5.4% African American. There are 88 students enrolled with special needs which constitutes 17% of the school enrollment. The percentage of students receiving free and reduced meals is 80%.

The study took place in the regular 2<sup>nd</sup> grade classroom of the participant. There were 20 students in the classroom, 11 boys and 9 girls. Six students typically met with the teacher for small group reading instruction while the rest were to complete seatwork on their own. The students' seats are grouped in groups of four students with varied abilities for peer tutoring. At this John, the student participating in the study, was in the group at their seats working on their own. During the John's independent study time, he was responsible for reading a book, completing language arts assignments, math, and spelling assignments. The independent study time was 20 minutes long.

## **Measures**

### **Dependent Variable Measure**

The amount of time the student was on-task was measured as the dependent variable. On-task behavior is defined as sitting in seat, looking at work, and asking for help, when needed (Boswell et al., 2013). Off-task behavior was defined as walking, standing, looking around, or talking to other students (Boswell et al., 2013). Duration recording was used to directly assess the target student's on and off-task behavior. When an observer saw the student engaged in on-

task behavior per the preceding definition, she tapped the stopwatch button, which then began cumulating on-task time. If the target student was observed to engage in off-task behavior, then the observer tapped the record button again to stop the device from accumulating on-task time. When the observer saw the target child's behavior returned to on-task, then the observer again tapped on the "On" button, continuing repeatedly until the end of the observation time. The observer noted the actual beginning and ending clock time (e.g., 9:00 to 9:30 am) for each observation, allowing the calculation of the percentage of class time spent actively engaged. This percentage measured Academic Engagement Time (AET) of the student. Observations lasted a maximum of 20 minutes or the natural length of the instructional activity that day.

### **Interobserver Agreement (IOA)**

Interobserver Agreement checks were conducted for 4 out of 16 of the observation sessions (i.e., Student MotivAider use). During these checks the primary observer (the principal investigator of this study) and Ms. Waters simultaneously but interpedently conducted duration recording of John's on task behavior using their respective smartphones and stopwatch application as described in the preceding paragraph. At the end of the IOA observation their agreement was calculated in each experimental condition (i.e. student MotivAider use vs Teacher MotivAider use). Interobserver agreement was calculated by comparing the total amount of on-task time recorded by each observer for the subject and using the formula:  $(\text{smaller total on task time} / \text{largest total on task time}) \times 100 = \% \text{ of Agreement}$ .

### **Independent Variable Measure**

The independent measure assessed the use of the MotivAider device. The device was set to vibrate at 2-minute intervals of time to remind the student to stay on-task or remind the



teacher to check if the student is on-task. John and the Ms. Waters used a check sheet (see Appendix A) to mark whether John was on-task or off-task at the end of each interval. At the end of each session, the observer completed a brief checklist of the essential steps in the use of the MotivAider, this checklist consisted of the following steps that were answered on a Yes/No basis: 1) Did the student/teacher wear the MotivAider Yes/No; 2) Did the student/teacher mark the On Task/Off Task data sheet at the end of each interval Yes/No.

### **Social Validity**

Elliot & Treuting, (1991), found that consumer attitude, or social validity, concerning different treatments need to be assessed. Therefore, they developed an instrument to measure teachers' perceptions of treatment acceptability and treatment effectiveness. The teacher and student forms address similar concepts but differ of course in terms of specific questions, number of questions and reading levels. The student form consists of 7 statements, four of which are phrased in terms of any negative aspects of the intervention (e.g., "I think my teacher was too harsh on me) and 3 positively stated statements (e.g., "I like the program we used"). Students rate each of the 7 statements on a 7-point rating scale of agree/disagree, with the endpoint anchors being illustrated by a frowning face (&) and a smiling face (1). The teacher version of the scale consists of 15 positive statements about the intervention [give an example or two]. The teacher rates the statements on a 6-point scale of Strongly Agree to Strongly Disagree. Both versions of the *Behavior Intervention Rating Scale (BIRS)* included in Appendix B

## **Procedures**

### **Teacher/Student Training**

The researcher trained the teacher how to use the MotivAider device. During a short introduction the researcher demonstrated how to set the timing intervals, use the on-task/off-task check sheets, and how to teach the student to use the device. Additionally, the researcher and teacher reviewed the definition of on-task and off-task behavior, and how to record the participant student's behavior at the end of each interval. This training occurred by verbal instruction, modeling and rehearsal of the procedures by the teacher and researcher (See Appendix C). The researcher used the same steps to train the student as the teacher.

### **Intervention 1: Student Use of MotivAider**

During the student use of the MotivAider John was instructed to: 1) turn on the MotivAider for the initial standard time interval of 2 minutes, 2) wear the MotivAider on his/her belt, waistband, etc. each day during independent study time; 3) when the vibratory signal occurred, to rate his on-task behavior during the preceding interval, by placing a check mark on the sheet provided, 4) return to his work and await the next signal. At the end of the activity, John was to return the completed on-task/off task recording sheet and the MotivAider to the teacher. The teacher then gave verbal praise, "Great job!", when the student turned in the recording sheet with 8 out of 10 check marks in the on-task column. The teacher only gave verbal praise when the student paper showed that he was on-task 80% of the time.

### **Intervention 2: Teacher Use of MotivAider**

During the teacher use of the MotivAider, the procedures were identical to those of student use with the following exceptions. Ms. Waters set and wore the MotivAider. At the end

of each interval when the vibratory signal occurred, the teacher verbally prompted the student to get back on-task by saying, “Back to work”, she then indicated with a check mark whether the student was on or off-task during the preceding interval on the check sheet. This continued until the designated end of the targeted academic activity, which was 20 minutes.

### **Experimental Design**

Using the alternating treatment design (Kennedy, 2005), John’s on-task and off-task behavior was measured under the two intervention conditions Teacher Use of the MotivAider and Student Use of the MotivAider. In this design the application of two interventions are rapidly alternated with each other, and their effects on the behavior are observed. For this study, the alternation of the student vs teacher MotivAider use was randomly alternated across the days of the study. The effects of these two parameters of the intervention were evaluated in terms of differences in the target student’s percentage of time on task.

Two activities were selected, reading and math, for evaluating the use of the MotivAider. Selecting two different academic tasks allowed an analysis of the relation between academic instructional topic and increased time on task resulting from application of the MotivAider.

## CHAPTER 4

### RESULTS

#### **Interobserver Agreement**

Interobserver agreement was calculated for four of the 16 total sessions (25%) of the study. Using the total session IOA formula (smaller/larger total on task time X 100), IOA ranged from 85% - 91% agreement with a mean of 89.5% IOA. These data exceeded 80% on each agreement session.

#### **Student On-Task Behavior**

The total number of minutes of on-task behavior for the target student recorded by the primary observer was analyzed since each session did last the entire 20 minutes. Figure 1 presents these data combined for both reading and math sessions under the two interventions conditions. The data indicate that, overall, student use of the MotivAider typically produced a greater number of minutes of on-task behavior (Mean 17.25, range 14 – 20 minutes) than did teacher use of the MotivAider (Mean 13, range 8 – 18 minutes). Further analyses showed that 80% of the student observation session overlapped with those of the student use condition. Using the quickie, split middle method of trend line estimation indicated that across the session there was a slight decreasing trend in On Task minutes under the student use condition and a slight increasing trend in On Task minutes,

Figures 2 and 3 present similar analyses of On-Task minutes for Reading and Math respectively. Again, visual analysis of these data indicates that, overall, Student Use of the MotivAider resulted in a greater number of minutes of On-Task than did Teacher Use during Reading (Student Use Range 14 – 28 minutes, Mean 17.5 minutes; Teacher Use Range 8 – 14

minutes, Mean 10.3) and during Math (Student Use Range 14 – 18 minutes, Mean 16.4; Teacher Use Range 10 – 14 minutes, Mean 12). Overlap Student with Teacher Use On-Task minutes was 25% (1 of 4 data points) during Reading and 25% (1 of 4) during Math. Trend analysis of the Reading On-Task minutes showed a very slight increasing trend during Student Use and a decreasing trend during Teacher Use. Trend analysis of On-Task during Math showed a decreasing trend during Student Use and an increasing trend during Teacher Use. (See Tables 1 & 2 and Figures 1-3)

Table 1.

*On Task Behavior (Minutes) During Student Use and Teacher Use of MotivAider Sessions*

	<i>Mean</i>	<i>Median</i>	<i>Min</i>	<i>Max</i>	<i>Range</i>	<i>Overlap<sup>1</sup></i>	<i>Trend</i>
<i>Student Use</i>	17.25	18.00	14.00	20.00	6.00	4 of 8 data points (50%)	Decreasing
<i>Teacher Use</i>	13.00	13.00	8.00	18.00	10.00		Increasing

<sup>1</sup> Percentage On-Task behavior data points during student use that overlapped with teacher use data points.

Table 2.

*On Task Behavior (minutes) in Reading and in Math during Student Use and Teacher Use of MotivAider conditions*

	Mean	Median	Minimum	Maximum	Range	Overlap <sup>1</sup>	Trend
Reading							
Student Use	17.5	18	14	20	6	25%	decreasing
Teacher Use	11.33	12	8	14	6		increasing
Math							
Student Use	16.4	16	14	18	4	20%	decreasing
Teacher Use	12	12	10	14	4		Increasing

<sup>1</sup> Percentage On Task behavior data points during student use that overlapped with teacher use data points.

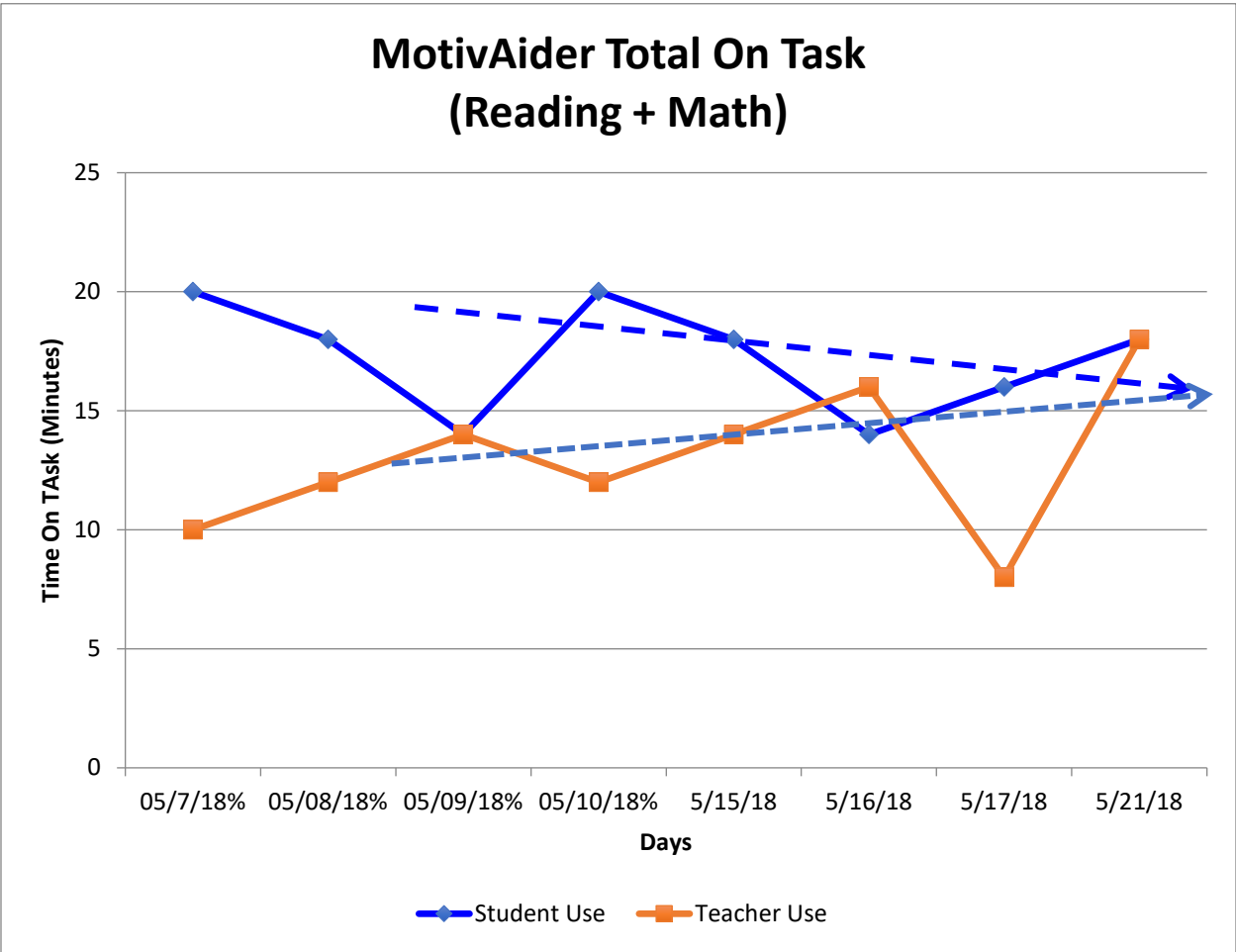


Figure 1. Total on-task time measured for each session the MotivAider was used



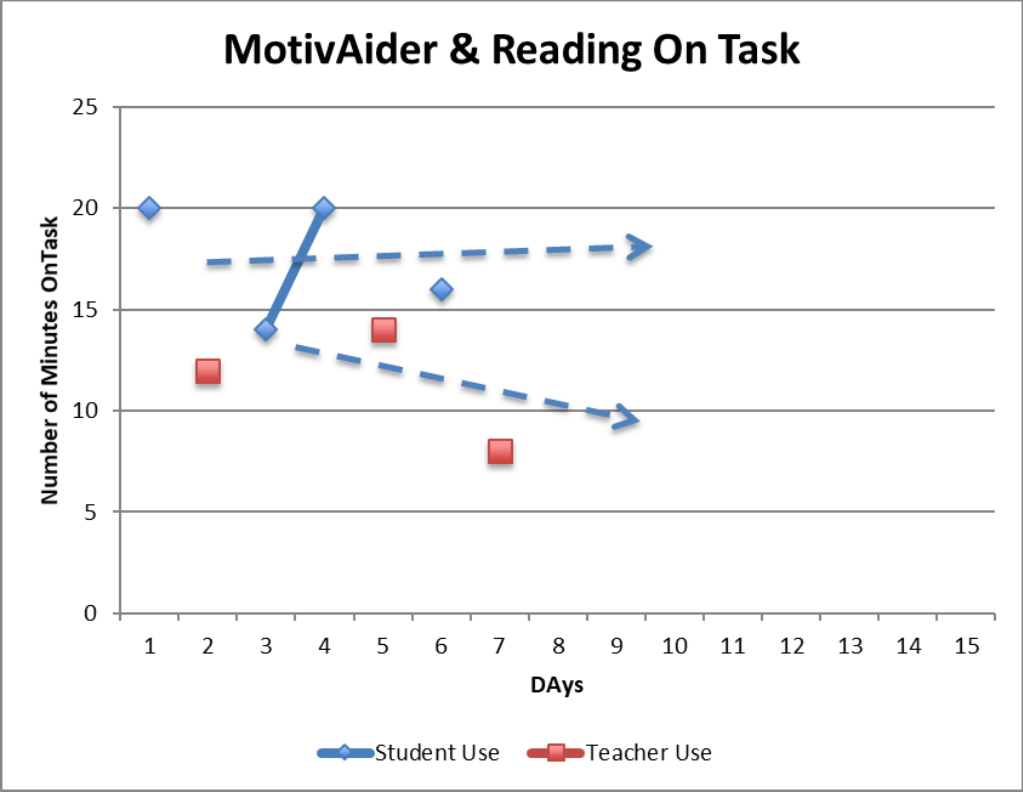


Figure 2. Total on-task time measured for reading sessions each day

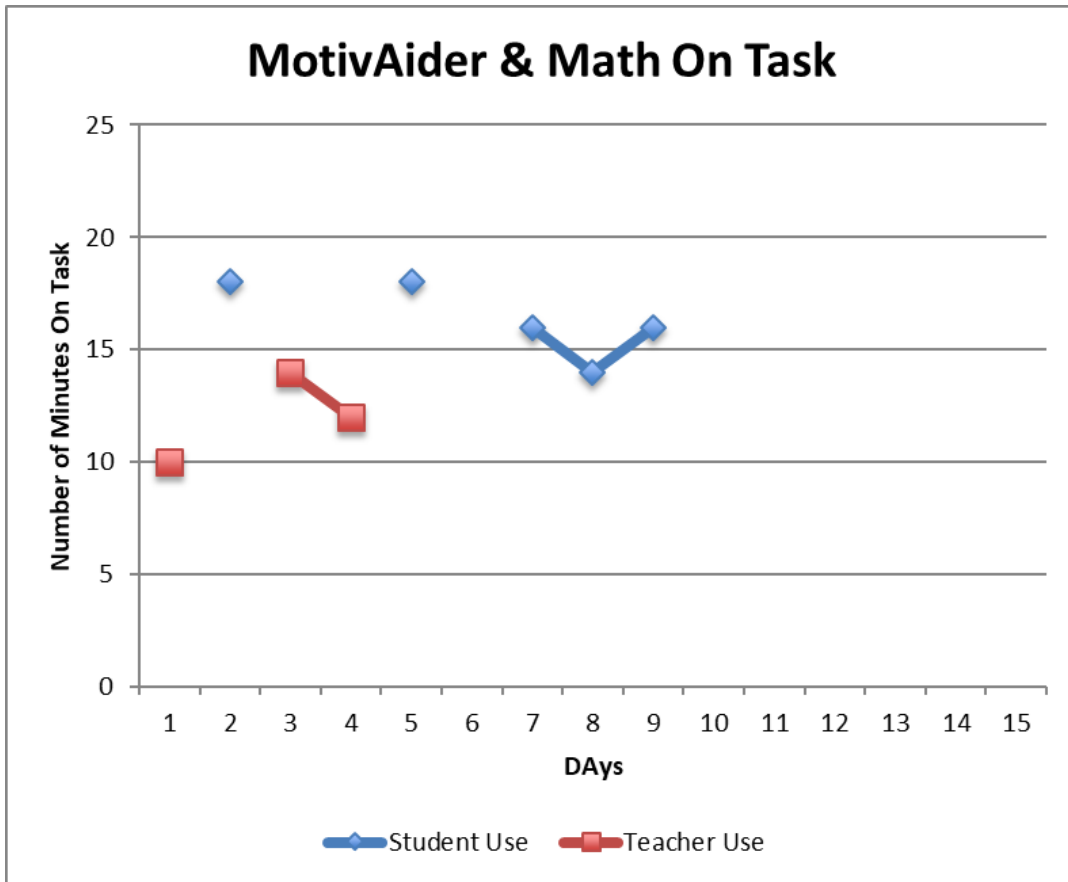


Figure 3. Total on-task time measured for math sessions each day

The target behavior was measured in 20-minute intervals. The data shows that the time on task ranged from 8 to 20 minutes. Visual analysis of the graphed daily minutes of on-task behavior (# time of On Task behavior/Total Observation Time) was used to evaluate the relative effects of the Student Use of MotivAider vs Teacher Use of the MotivAider. The data shows that the student was on task more when he used the MotivAider as opposed to the teacher using the MotivAider. He was on-task 14-20 minutes when he used the MotivAider at his seat and 8-18 minutes when the teacher used the MotivAider and reminded him to be on-task. In addition to the graph of on-task behavior, the following descriptive statistics was calculated and compared for the two intervention conditions: 1) the Mean Level of On-Task Behavior (Student use 17.25, Teacher use 13); 2) the percentage of non-overlapping data points between the two conditions; and, 3) the trend in On-Task Behavior in each condition using the split middle trend line estimation technique.

### **Student/Teacher Use of MotivAider Intervention (Treatment Fidelity)**

The Checklist of Intervention Steps was used to evaluate the treatment fidelity of the Student and Teacher MotivAider intervention for each day of intervention. As indicated in the facsimile of this checklist in Appendix D, there were 2 steps (Wearing the MotivAider and Marking the On-Task Sheet). For both student and teacher use of the MotivAider, there was 100% compliance on each day of the study.

### **Social Validity**

The Social Validity of the intervention was evaluated in terms of the teacher's and student's ratings of the intervention using the *Behavior Intervention Rating Scale* (Elliot &

Treuting, 1991) at the end of the study. Descriptive data were calculated for the respective student and teacher versions of this scale.

Student social validity. Because the student version had some items that were positive statements about the intervention and others that were negative statements and the rating was a dichotomous Agree/Disagree, it was necessary to convert the student ratings to a common scale in which a “disagree” rating of a negatively stated item (e.g., “The project was hard to do”) was converted to a positive rating. All positive ratings were given a value of “1” and all negative ratings were given a value of “0”. The student ratings of his use of the MotivAider on each of the seven rating items were all positive (100%).

Teacher social validity. Recall that the teacher scale differed from the student scale in that there were 12 items, all of which were positively stated, and rated on a 6-point scale of Strongly Disagree (1) to Strongly Agree (6). Higher ratings indicate higher perceived social validity. Teacher social validity ratings ranged from 5 (Agree) to 6 (Strongly Agree) with a Mean rating of 5.92 indicating very high social validity. Indeed, the teacher gave each item on the intervention rating scale a “6” with the exception of item 3 (“The intervention proved effective in changing the students' problem behaviors”) which she rated a “2” or Agree. A mean rating and range of ratings was computed for both the teacher and the student. Also mean ratings for each of the question categories – appropriateness/acceptability of the intervention, effectiveness of the intervention, and efficiency of the intervention was also computed, the data is displayed in an appropriate table showing the summary descriptive statistics for the teacher and the student.

On the Behavior Intervention Sheet, the student marked that this intervention helped him to stay on-task and was not hard to do. The student marked that the intervention (a) did not cause problems with his friends, (b) that he did not know a better way to help him stay on-task,

(c) that he liked the intervention (d) that he thought it would help other students, and (e) that it helped him do better in school. On the Behavior Intervention Sheet, the teacher marked that she felt this was an acceptable intervention for the student's problem staying on-task. She marked that (a) most teachers would find the intervention suitable for the behavior (b) would suggest it to other teachers, (c) that the intervention proved effective in changing the student's problem behavior, (d) that behavior was severe enough to warrant the use of the intervention, (e) that she liked this intervention and would use this intervention again with a variety of other students seeing that there were no adverse or negative side-effects for the child. She feels that this intervention was a fair way to handle the student's problem behavior. She saw a quick improvement in the student's behavior and felt the overall treatment was beneficial for the student.

## CHAPTER 5

### DISCUSSION

Students with ADHD often have difficulties staying on-task in a regular education classroom (McConaughy et al., 2011). Not all ADHD students have trouble staying on task. Some may work on a task but act impulsively for example kids work hard on a math assignment but fail to notice that the math examples are mixed (e.g. some addition, some subtraction) therefore, answer all examples as if they are addition. Many students with ADHD take medications to help them focus during the school day, but medication alone does not always help a child stay on-task (Nigg, 2010). They need interventions in the classroom to help them stay on-task so they can learn the skills needed to complete their work. There are many interventions available for teachers and students to use. This study further researched one such intervention, the use of the MotivAider timer as a self-monitoring intervention to help students with ADHD stay on-task using self-monitoring. In an alternating treatments design student use of the timer was experimentally contrasted with the teacher's use of the MotivAider to help remind her to prompt and check the student's task engagement. Results of the current study showed that student application of the MotivAider produced a greater amount of time on-task than did the teacher's use of the MotivAider. Not only did the MotivAider increase the student's time on task, a social validity analysis using student and teacher versions of the Behavior Intervention Rating Profile indicated that both the student and teacher found the intervention to be acceptable, effective and appropriate.

These results generally replicate the findings of prior studies in showing the MotivAider to be an effective behavior intervention for children with ADHD/attention problems (Boswell et al., 20013, Legge et al., 2010, & Levinson et al., 2017). Furthermore, the present results

replicate those of a recent similar study reported by (Amutairi, Hudson, Fox, & Nyarambi, 2017) who also contrasted the time on task effects of the MotivAider when applied by the student himself as opposed to the teacher. Furthermore, Amutairi et al, (2017) evaluated the social significance of his results by comparing the change in on task to both the classroom teacher's standard (85% on task) as well as the normative amount of Academic Engaged Time grades 1 – 3 students of the SSBD, noting that student MotivAider use consistently was associated with both teacher and SSBD normative levels while the teacher use was less so. In the current study a similar finding was made, When the student used the MotivAider, his on task behavior exceeded the 80% of the time on task for 6 of the 8 observations whereas when the teacher used the MotivAider, the student's behavior only reached or exceeded the 80% level on only 2 of the 6 observations. In addition, the present study's social significance was further validated by the highly positive ratings that the student and the teacher on the Behavior Intervention Rating Profile (Witt & Elliot, 1985). The student began the study staying on-task 90% of the time when he was using the MotivAider. The student also began staying on-task more often when the teacher used the MotivAider throughout the study. As with many other research areas, being in a real classroom and not a controlled environment, outcomes may or may not be exactly the way the researcher would like. This research shows that he was on-task more when he had the MotivAider than when the teacher had the device. A few factors that could have caused the student percent on task to go down toward the end of the study was that the research was done at the end of the school year, so other distractions and extra activities may have caused some imbalance with the data that would not occur during another time of the year. Another factor that could have influenced the data collection is the fact that the student's mother took him off his ADHD medicine a week before the study began. The discrepancy with math and reading

could be that he has more difficulty with math than reading causing him to not want to focus on the math lesson. His Functional Assessment Screening Tool (FAST) shows that he likes to escape work which would be a factor in math if he felt the work was hard. The student did stay on-task more using the MotivAider than when there was no intervention according to the teacher and she was pleased with that.

In contrast to another study, the teacher could use the MotivAider successfully due to working with a small group of students at the time of the assessment (Amutairi et al., 2017). As in the research by Legge et al, (2010), the accuracy of the completed assignments was not checked during this study only the time the child worked on-task completing the assignments. The results were consistent with other research being done using the MotivAider as an intervention to help students remain or return to on-task behavior. The MotivAider increased the time students spent on-task during the intervention.

### **Limitations**

This study is not without its limitations. First, this was a study with a single subject and over a relatively short period of time (i.e., 8 observations over 15 days). The alternating treatments design is one of a class of single subject experimental designs, each of which has high internal validity (Kennedy, 2005). These findings by themselves lack external validity (generalizability) but considered in the context of a number of prior single subject studies of the MotivAider (Boswell et al., 2013, Legg et al., 2010, & Levinson et al., 2017), the MotivAider's effectiveness is increasingly evident. The brief length of the study was largely dictated by several incidental factors. It unfortunately had to be conducted near the end of the school year and along with absences of the subject student, changes in the school schedule, competing end of the year activities, etc. these factors prevented a longer-term analysis of the MotivAider.



Another qualification of the study was the finding, that although student use of the MotivAider overall produced greater levels of on task behavior, it appeared that there was a light decreasing trend in on task behavior across the student MotivAider use sessions and a slight increasing trend in on task behavior over the teacher use sessions. The extent to which such results might have been influenced by the end of the year factors or the variability in the student's adherence to his medication regimen were unclear. Additional intervention sessions and greater control over some variables such as medication adherence would have been desirable.

A final methodological limitation is that typically, in an Alternating Treatments design, once a particular intervention is shown to be more effective than the other intervention, there should be a subsequent phase in which that less effective intervention is terminated and the more effective intervention is applied by itself. This is done to ensure that the more effective intervention, in this case the student use of the MotivAider, is not in some way due to or affected by its contrast with the second intervention. Again because of the limited time frame application of the student use of the MotivAider by itself was not possible. This was done in the prior study by Amutairi et al, (2017) in which the student use of the MotivAider maintained its effectiveness even when the teacher use was terminated. However, further experimental evaluation of possible contrast or additive effects should be explored in future research.

## **Future Studies**

Given the effectiveness of the MotivAider in this and prior studies there are a number of possible and profitable areas for future studies that could and should be pursued. Researchers could repeat the current study and that of (Amutairi et al., 2017). Additional subjects, different ages/grades, different baseline levels of off-task behavior and/or different SPED diagnoses (e.g. ADHD, Behavioral disorders, autism, etc.) could be studied. A researcher could conduct a study over longer period of time and/or look at if and how to reduce the student's use of the MotivAider by gradually fading its use to see if you can maintain improved levels of engagement. Collecting concurrent academic data (e.g. acquisition, fluency, mastery data on class assignments in reading, math, language arts) as well as on task data is another option for future studies.

Future studies could evaluate will the MotivAider impact self-monitoring on academic skills in other subject areas (e.g. science and social studies). Another study could research the effects of the MotivAider use with students who have other disabilities (e.g. autism or Down Syndrome)? Researches could also extend the length of time the study was conducted and in a different time of the school year. This study was conducted at the end of the school year. Doing this study at the beginning or middle of the school year could give more definite results. By doing the study earlier in the school year researchers could use a phase out method to see if the results would continue without the student using the device. An ABAB design would be another option for future research. This design would use a baseline and could evaluate a different area of need for the device.

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APPENDIX A

Behavior Rating Form (Student & Teacher)

## APPENDIX B

### Functional Assessment Screening Tool (FAST)

#### FUNCTIONAL ASSESSMENT SCREENING TOOL (FAST)

Name: \_\_\_\_\_ Age: \_\_\_\_\_ Date: \_\_\_\_\_

Behavior Problem: \_\_\_\_\_

Informant: \_\_\_\_\_ Interviewer: \_\_\_\_\_

**To the interviewer:** The Functional Analysis Screening Tool (FAST) is designed to identify a number of factors that may influence the occurrence of problem behaviors. It should be used only as an initial screening tool and as part of a comprehensive functional assessment or analysis of problem behavior. The FAST should be administered to several individuals who interact with the person frequently. Results should then be used as the basis for conducting direct observations in several different contexts to verify likely behavioral functions, clarify ambiguous functions, and identify other relevant factors that may not have been included in this instrument.

**To the informant:** After completing the section on "Informant-Person Relationship," read each of the numbered items carefully. If a statement accurately describes the person's behavior problem, circle "Yes." If not, circle "No." If the behavior problem consists of either self-injurious behavior or "repetitive stereotyped behaviors," begin with Part I. However, if the problem consists of aggression or some other form of socially disruptive behavior, such as property destruction or tantrums, complete only Part II.

**Informant-Person Relationship**

Indicate your relationship to the person: \_\_\_\_\_ Parent \_\_\_\_\_ Teacher/Instructor \_\_\_\_\_ Residential Staff \_\_\_\_\_ Other

How long have you known the person? \_\_\_\_\_ Years \_\_\_\_\_ Months

Do you interact with the person on a daily basis? \_\_\_\_\_ Yes \_\_\_\_\_ No

If "Yes," how many hours per day? \_\_\_\_\_ If "No," how many hours per week? \_\_\_\_\_

In what situations do you typically observe the person? (Mark all that apply)

\_\_\_\_\_ Self-care routines \_\_\_\_\_ Academic skills training \_\_\_\_\_ Meals \_\_\_\_\_ When (s)he has nothing to do  
 \_\_\_\_\_ Leisure activities \_\_\_\_\_ Work/vocational training \_\_\_\_\_ Evenings \_\_\_\_\_ Other: \_\_\_\_\_

**Part I. Social Influences on Behavior**

- |  |     |    |
|--|-----|----|
| 1. The behavior usually occurs in your presence or in the presence of others   | Yes | No |
| 2. The behavior usually occurs soon after you or others interact with him/her in some way, such as delivering an instruction or reprimand, walking away from (ignoring) the him/her, taking away a "preferred" item, requiring him/her to change activities, talking to someone else in his/her presence, etc. | Yes | No |
| 3. The behavior often is accompanied by other "emotional" responses, such as yelling or crying   | Yes | No |
- Complete Part II if you answered "Yes" to item 1, 2, or 3. Skip Part II if you answered "No" to all three items in Part I.*

**Part II. Social Reinforcement**

- |   |     |    |
|---|-----|----|
| 4. The behavior often occurs when he/she has not received much attention  | Yes | No |
| 5. When the behavior occurs, you or others usually respond by interacting with the him/her in some way (e.g., comforting statements, verbal correction or reprimand, response blocking, redirection)      | Yes | No |
| 6. (S)he often engages in other annoying behaviors that produce attention   | Yes | No |
| 7. (S)he frequently approaches you or others and/or initiates social interaction  | Yes | No |
| 8. The behavior rarely occurs when you give him/her lots of attention   | Yes | No |
| 9. The behavior often occurs when you take a particular item away from him/her or when you terminate a preferred leisure activity (If "Yes," identify: _____)   | Yes | No |
| 10. The behavior often occurs when you inform the person that (s)he cannot have a certain item or cannot engage in a particular activity. (If "Yes," identify: _____)                                     | Yes | No |
| 11. When the behavior occurs, you often respond by giving him/her a specific item, such as a favorite toy, food, or some other item. (If "Yes," identify: _____)  | Yes | No |
| 12. (S)he often engages in other annoying behaviors that produce access to preferred items or activities.   | Yes | No |
| 13. The behavior rarely occurs during training activities or when you place other types of demands on him/her. (If "Yes," identify the activities: _____ self-care _____ academic _____ work _____ other) | Yes | No |

- |   |     |    |
|---|-----|----|
| 14. The behavior often occurs during training activities or when asked to complete tasks.             | Yes | No |
| 15. (S)he often is noncompliant during training activities or when asked to complete tasks.           | Yes | No |
| 16. The behavior often occurs when the immediate environment is very noisy or crowded.                | Yes | No |
| 17. When the behavior occurs, you often respond by giving him/her brief "break from an ongoing task.  | Yes | No |
| 18. The behavior rarely occurs when you place few demands on him/her or when you leave him/her alone. | Yes | No |

**Part III. Nonsocial (Automatic) Reinforcement**

- |  |     |    |
|--|-----|----|
| 19. The behavior occurs frequently when (s)he is alone or unoccupied   | Yes | No |
| 20. The behavior occurs at relatively high rates regardless of what is going on in his/her immediate surrounding environment   | Yes | No |
| 21. (S)he seems to have few known reinforcers or rarely engages in appropriate object manipulation or "play" behavior.   | Yes | No |
| 22. (S)he is generally unresponsive to social stimulation.   | Yes | No |
| 23. (S)he often engages in repetitive, stereotyped behaviors such as body rocking, hand or finger waving, object twirling, mouthing, etc.  | Yes | No |
| 24. When (s)he engages in the behavior, you and others usually respond by doing nothing (i.e., you never or rarely attend to the behavior.)  | Yes | No |
| 25. The behavior seems to occur in cycles. During a "high" cycle, the behavior occurs frequently and is extremely difficult to interrupt. During a "low" cycle the behavior rarely occurs. | Yes | No |
| 26. The behavior seems to occur more often when the person is ill.   | Yes | No |
| 27. (S)he has a history of recurrent illness (e.g., ear or sinus infections, allergies, dermatitis).   | Yes | No |

**Scoring Summary**

Circle the items answered "Yes." If you completed only Part II, also circle items 1, 2, and 3

													<u>Likely Maintaining Variable</u>
1	2	3	4	5	6	7	8						Social Reinforcement (attention)
1	2	3	9	10	11	12	13						Social Reinforcement (access to specific activities/items)
1	2	3	14	15	16	17	18						Social Reinforcement (escape)
19	20	21	22	23	24							Automatic Reinforcement (sensory stimulation)	
19	20	24	25	26	27							Automatic Reinforcement (pain attenuation)	

Comments/Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

APPENDIX C

Child Behavior Intervention Rating Form

1. This project helped me stay on-task.

I Agree -----I Do Not Agree

2. This project was hard to do.

I Agree -----I Do Not Agree

3. This project may cause problems with my friends.

I Agree -----I Do Not Agree

4. There are better ways to help me stay on-task.

I Agree -----I Do Not Agree

5. This project would be good to help other children stay on task.

I Agree -----I Do Not Agree

6. I like the project used to help me pay attention.

I Agree -----I Do Not Agree

7. I think this project helped me do better in school.

I Agree -----I Do Not Agree

Note: Adapted from "Self-Monitoring to Increase Time On-Task and Its Impact on Accuracy: Is the MotivAider Necessary?" by K. L. Dodson, 2008, The University of Utah.

### Teacher Behavior Intervention Rating Scale Form

You have just participated in a treatment addressing problems for one of your students in your classroom. Please evaluate the intervention by circling the number which best describes your agreement or disagreement with each statement. You can omit any answers you choose.

1= Strongly Agree 2= Disagree 3= Slightly Disagree 4=Slightly Agree 5=Agree 6=Strongly Agree

1. This was an acceptable intervention for the student's problem behavior (off-task)

  1          2          3          4          5          6  

2. Most teachers would find this intervention suitable for the behavior addressed

  1          2          3          4          5          6  

3. The intervention proved effective in changing the students' problem behavior

  1          2          3          4          5          6  

4. I would suggest the use of this intervention to other teachers

  1          2          3          4          5          6  

5. The student's behavior problem was severe enough to warrant use of this intervention

  1          2          3          4          5          6  

6. I would be willing to use this intervention again in a classroom setting

  1          2          3          4          5          6  

7. The treatment did not result in negative side-effects or adverse events for the child

  1          2          3          4          5          6  

8. The treatment would be appropriate for a variety of students

  1          2          3          4          5          6  

9. The treatment was a fair way to handle the student's problem behavior

  1          2          3          4          5          6  

10. I like the procedure used in the intervention

  1          2          3          4          5          6  

11. Overall the treatment was beneficial for the student

  1          2          3          4          5          6  

12. The treatment quickly improved the student's behavior

\_\_1\_\_      \_\_2\_\_      \_\_3\_\_      \_\_4\_\_      \_\_5\_\_      \_\_6\_\_

Note: Adapted from “Self-Monitoring to Increase Time On-Task and Its Impact on Accuracy: Is the MotivAider Necessary?” by K. L. Dodson, 2008, The University of Utah.

## APPENDIX D

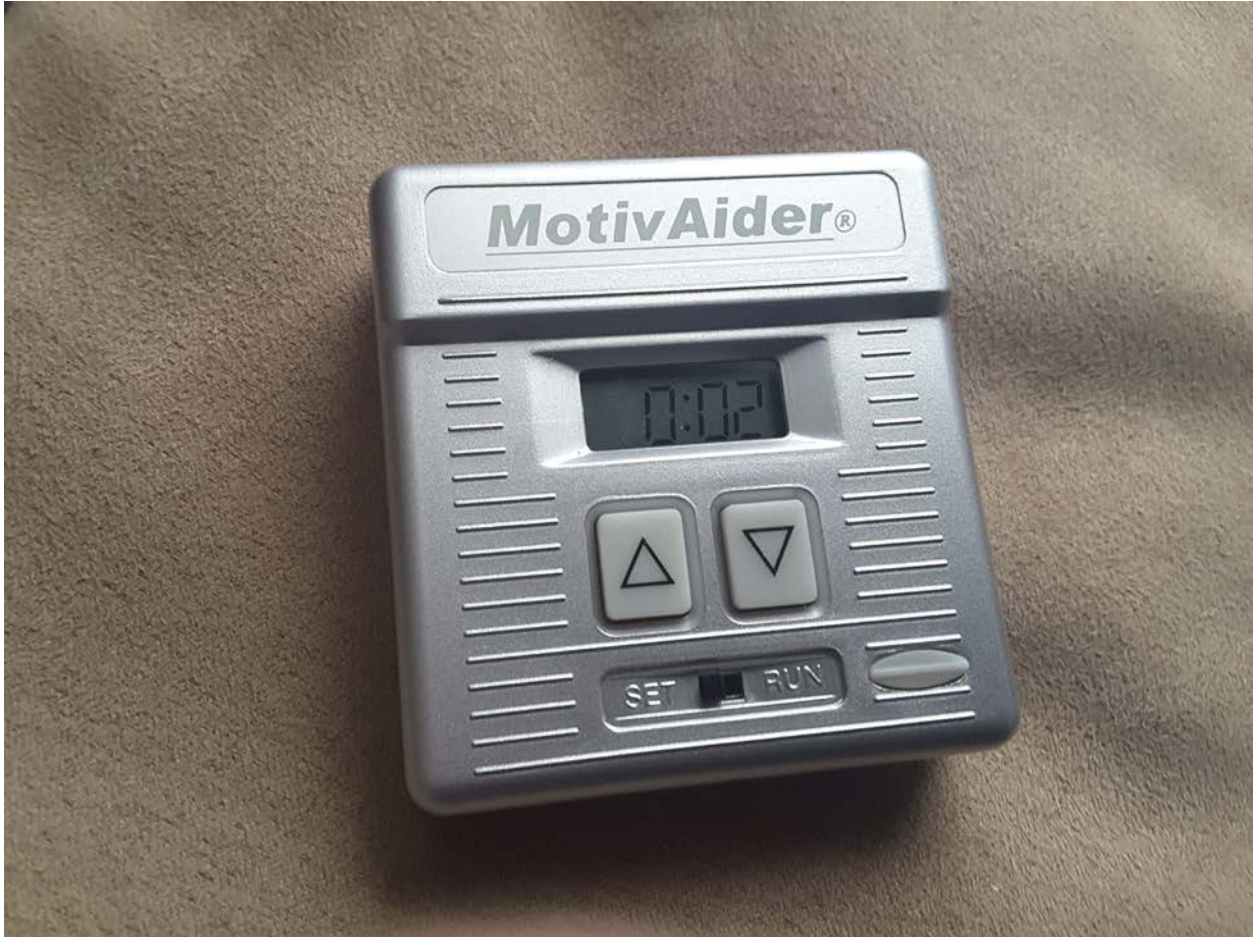
### Checklist of Intervention Steps

1) Did the student/teacher wear the MotivAider: Yes/No

2) Did the student/teacher mark the On Task/Off Task data sheet at the end of each interval?

Yes/No

APPENDIX E  
The MotivAider



*Note.* Use of photo with permission by Levinson, S., (2018). MotivAider Photo. Behavioral Dynamics, Inc.



VITA

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Middle School Endorsement, Tennessee Technology University,  
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