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Using Function Based Self-Monitoring to Teach Functional Communication Skills and Decrease Problem Behavior for Middle School Students with ASD

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by

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DEDICATION

I dedicate this manuscript to my parents Jackqueline and Garry Ganey. Thank you all for your unwavering love and support throughout this journey.

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ABSTRACT

This study examined the effects of a function-based self-monitoring procedure on functional communicative response (FCR) and problem behavior in middle school students with autism spectrum disorder. Three middle school age students diagnosed with and autism spectrum disorder and displaying challenging behavior and their respective classroom teachers and supporting staff (paraprofessionals) participated in this study. The study employed a multiple baseline design across participants to evaluate the effect of function-based self-monitoring on FCR, task engagement, and problem behavior. Following a 30-min training, the students and staff independently implemented the function-based self-monitoring procedure with fidelity which led to desired changes in student behavior. Results demonstrated that teaching students FCR and having them self-monitor their behavior effectively improved classroom behavior. The paraprofessionals successfully produced desired behavioral outcomes for students, even when implementing the intervention independently without researcher support. Both teachers and students found the function-based self-monitoring intervention to be effective and favorable.

CHAPTER ONE: INTRODUCTION

Problem behavior displayed by students in the classroom setting are prevalent issue reported by many teachers across all levels of the education system (Reinke et al., 2013; Westling, 2010). These behaviors can range from minor disruptions to more severe incidents, impacting both the learning environment and academic outcomes (Drasgrow, Bradley, & Shriner, 1999). However, teachers often have limited training to effectively address their students' problem behavior and rarely receive adequate coaching support during the implementation of interventions (Alter et al., 2013; Freeman et al., 2014). This limited preparation and ongoing support can lead to ineffective methods for addressing problem behavior and increased teacher stress within the classroom (Reinke et al., 2011; Zee & Koomen, 2016). Students with disabilities, in particular, students with autism spectrum disorder (ASD) require specialized attention during instructional activities (Koegel et al., 2012). However, due to student to teacher ratio, as well as limited skills and implementation support, teachers often face challenges in providing the necessary behavioral support to these students (Lindsay et al., 2013; Wood et al., 2009). Considering the negative impact of problem behavior on student behavioral and academic outcomes, as well as overall classroom dynamics, the implementation of effective school-based interventions to improve classroom behavior for students with disabilities is extremely important (Ellingson et al., 2000; Wadsworth et al., 2015).

Research has demonstrated that evidence-based behavioral interventions are highly effective in significantly reducing problem behavior and increasing the rate of academic engagement among students with disabilities (Horner et al., 2020). However, the successfulness

of these interventions is dependent on a comprehensive understanding of the underlying functions of the specific problem behaviors. Literature and principles of behavior analysis explain how these functions typically fall in categories such as negative social reinforcement (e.g., the escape or avoidance of demands) and positive social reinforcement (e.g., access to tangibles or activities) (e.g., Carr, 1977; Iwata et al., 1994). Understanding these functions is a crucial step in developing interventions that are tailored to address the specific needs of each student, which could in turn increase the effectiveness of specific behavioral interventions.

Function Based Intervention

Because of the importance of addressing the functions of problem behavior displayed by students with disabilities, researchers and practitioners have focused on conducting functional behavior assessment (FBA) and designing a behavior intervention plan (BIP) based on the FBA results (Brooks et al., 2003). Extensive literature has shown that function-based interventions that address the function of problem behavior, have positive behavioral and educational outcomes for students with disabilities including ASD in varying age and grade levels (Bruhn et al., 2015; Liauspin et al., 2006). Function-based interventions have been found to be essential to helping students communicate their needs in an appropriate manner without engaging in problem behavior during classroom activities (Brooks et al., 2003; Carter & Horner, 2007; Umbreit et al., 2007; Wood et al., 2009).

Most of the studies on function-based interventions implemented during academic instructions (e.g., math, science, social studies) have aimed to increase on-task behavior or task engagement and decrease off-task behavior (Lane et al., 2007; Liauspin et al., 2006; Umbreit et al., 2007). In a few studies, noncompliance was targeted for students with behavioral and emotional disorders. (Wadsworth et al., 2015; Wilder et al., 2007). For example, in a study that

included students with behavioral disorders in elementary school, Payne et al. (2007) found that conducting an FBA and incorporating its results into an intervention proved to be effective in decreasing noncompliance.

Bruhn et al. (2015) examined the effectiveness of function-based intervention in improving classroom behavior of high school students with ASD who engaged in disruptive stereotypical behaviors and found the behaviors functioned as access to attention and escaping from difficult tasks. After the implementation of the function-based intervention, decreases in the students' stereotypical behaviors were observed. These studies provided evidence that function-based intervention is effective in improving classroom behavior by addressing the functions of problem behaviors. Moreover, they highlight the importance of teachers receiving implementation support from professionals or experts to effectively implement these interventions with fidelity.

Self-Monitoring Intervention

One effective school-based intervention that has been used to address various problem behavior in students with disabilities including ASD is self-monitoring. Self-monitoring involves an individual self-observing and then self-recording a target behavior. It is a universal procedure that can be adapted to teach various skills for students with or without disabilities. Self-monitoring typically involves three important steps (Umbriet et al., 2021). The steps include: (a) teaching the student to discriminate the difference between problem behavior and appropriate behavior, (b) training them how to record their behavior, and (c) in some cases, teaching them how to graph their behavior. Self-monitoring has been used in the school setting to increase on-task behavior and decrease problem behavior during numerous academic and non-academic activities, such as academic instruction (Holifield et al., 2010), social interaction (Dunlap et al.,

1991), spelling (Prater et al., 1992), group reading instruction (Woodard et al., 2016), and English Language Arts and writing (Risse et al., 2013).

There are two different variants of self-monitoring that have been utilized in the literature, which are self-monitoring of performance and self-monitoring of attention. The self-monitoring of performance focuses on the students recording how well they performed on the academic task (Reid et al., 1993) whereas self-monitoring of attention focuses on the students recording the extent to which they are paying attention in class (Holifield et al., 2010; Marshall et al., 1993). These variations of self-monitoring have been shown to be effective in increasing students' academic engagement (Wang et al., 2017). In a recent study, Risse et al. (2023) used self-monitoring to increase task completion and decrease off-task behavior among students with disabilities in 5th grade.

There are a variety of ways that self-monitoring can be implemented. In Legge et al. (2010), the researchers used a device, called the MotivAider along with a self-recording sheet to implement the self-monitoring procedure with children with autism in fifth and sixth grade. The MotivAider vibrated at set intervals, and every time that the device vibrated, the children recorded whether or not they were on-task or off-task (Raffertey, 2012). Some studies used an application called, *SCORE IT*, which targeted academic engagement in students with ADHD (Vogelsang et al., 2016) or academic engagement and disruptive behavior in students with emotional and behavioral disorders (Bruhn et al., 2014). The app helps students self-record their target behavior at predetermined intervals and enables them to monitor their progress through the software-generated graph displaying their target behavior over time. Another application that has been used is I-Connect, which was developed by researchers at the University of Kansas. In a recent study conducted by Huffman et al., (2022), the authors utilized I-Connect to investigate its

effect on increasing on-task behavior among a postsecondary student with ASD. The app allowed students to independently reflect on their behavior at the end of each set interval and answer with a "yes" or "no" for whether they engaged in the behavior. The study showed decreases in disruptive behavior and increases in academic engagement.

In some studies, self-monitoring was used in conjunction with other evidence-based interventions. For example, Mcdermit et al. (2019) incorporated self-monitoring within the Check-in/Check-out (CICO) intervention. The intervention involved teachers prompting students to self-asses their behavior after the completion of each academic subject, instead of the teachers completing the daily report card. The results of this study showed that the procedure was only effective for one of three participants; the rest required additional reinforcers to reduce off-task behaviors. The results suggest that combining reinforcement with self-monitoring may yield greater effectiveness compared to using self-monitoring alone in implementing the CICO intervention. In other studies (Bruhn & Watt, 2012; Hanel & Martin, 1980; Maag et al., 1992; Zlomke & Zlomke et al., 2003), incorporating reinforcement into implementation of self-monitoring was shown to enhance the outcomes of the intervention.

Function-Based Self-monitoring

Recognizing the importance of addressing the behavioral function, a few studies have explored incorporating function-based self-monitoring into self-monitoring interventions. Implementation of function-based self-monitoring begins by assessing whether it is necessary to teach the student functional communication skills (Pinkleman & Horner, 2017). This depends on whether the student has an existing repertoire of verbal communication or any other communication method and their ability to effectively express their needs and wants. If the student already possesses these skills, targeting the functional communication skill is not

required when implementing a self-monitoring intervention (Shimabukuro et al., 1999). However, if the student lacks these skills, functional communication training (FCT) is implemented in conjunction with self-monitoring procedures, guided by the results of the FBA.

While there are only a limited number of studies that have examined function-based self-monitoring, most of these studies have primary focused on elementary school-aged children with ADHD or emotional and behavioral disorders (Germer et al., 2011; Hanson et al., 2014; Kern et al., 2001; Stahr et al., 2006) or without disabilities (Briere et al., 2011; Lane et al., 2007). For example, Lane et al. (2007) examined a function-based self-monitoring procedure to decrease disruptive behavior and increase academic engagement for a 6-year-old student. The FBA demonstrated that the function of the student's disruptive behavior was attention followed by tangible reinforcers. The authors incorporated differential reinforcement into the function-based intervention in addition to self-monitoring to decrease the student's disruptive behavior. The results of this study demonstrated that the function-based self-monitoring not only decreased disruptive behavior, but also increased academic engagement.

In another study, Germer et al. (2011) evaluated the function-based self-monitoring for a 7-year-old child with ADHD, who was in the second grade. The intervention involved identifying the functions of the student's target behavior based on functional behavior assessment and delivering reinforcement contingent on accuracy of self-monitoring and task completion. The identified function of the child's behavior was to access attention and to escape task, and the intervention focused on teaching the child the FCR (requesting peer or teacher assistance by moving the pin on the visual hierarchy). The introduction of the intervention resulted in immediate increases in on-task compared to baseline levels.

Current Study

Given the scarcity of information on function-based self-monitoring in the literature, there is a clear need for further research to examine the effectiveness of this intervention for students with ASD across different grade-levels in classroom settings. Therefore, the purpose of this study was to further investigate the outcomes of implementing the function-based intervention in conjunction with self-monitoring. The focus was on middle school students with ASD who engage in problem behavior during instructional activities due to limited communication skills and who could benefit from learning to self-monitor their own target behaviors. Specifically, this study aimed to address the following research questions:

1. To what extent will using the function based self-monitoring procedure help middle school students with ASD learn to use FCR?
2. To what extent will the function-based self-monitoring improve task engagement in students with ASD?
3. To what extent will the function-based self-monitoring procedure reduce problem behavior exhibited by these students with ASD?

CHAPTER TWO: METHOD

Participants and Setting

This study was conducted at a private school in a southern U.S. state providing services for students with developmental disabilities, until they reach the age 22. The school had eight classrooms, with each classroom serving 10-12 students across PreK to 12th grade levels, staffed by a teacher and a supporting staff member (paraprofessional). The study participants consisted of three middle school students (ages 12-13) with ASD, along with their respective classroom teachers and paraprofessionals. The primary teacher's involvement encompassed setting expectations at the beginning of intervention implementation session and collecting the self-monitoring device at the end of each session. The paraprofessionals played a more direct role in implementing the intervention, which involved comparing self-monitoring data with students after each interval and at the end of the implementation session. Additionally, the teachers completed a social validity questionnaire at the end of the study.

Students

Inclusion criteria for participation were as follows: (a) enrollment in a middle school (grades 6-8) classroom; (b) ability to follow 2- to 3-step directions; (c) verbal communication skills with difficulty communication their desires and preferences; (d) minimum reading proficiency at 3rd grade level; (e) engagement in problem behavior for at least 50% of the time during academic periods (e.g., math, science, elective) as measured through direct observations; and (f) a confirmed diagnosis of ASD. Students were excluded from the study if they exhibited

frequent absences or tardiness to class, or if their target problem behavior was maintained by automatic reinforcement. All names provided are pseudonyms to protect privacy.

Noah was a 12-year-old Caucasian male student in Mrs. Jennifer's classroom. He was referred by his teacher to participate in this study because of problem behavior that occurred during academic periods. Noah had never received ABA services. Mrs. Jennifer reported that he was below his grade level (6th grade) for his age and was performing at a 4th-grade level in reading, writing, and math. In addition, the research reported that Noah had trouble attending during academic periods. He required several prompts to remain focus on the task, to not distract or engage in conversations with peers, and to raise his hand before speaking or receiving attention from school staff. Typical classwork included tracing worksheets, spelling, addition, and subtraction. His teacher reported that Noah especially exhibited deficits in appropriate forms of communication including raising his hand compared to the communicative skills of other same-aged peers within the classroom. Mrs. Jennifer approximated that Noah engaged in off-task behavior 50% of the time. She also expressed that his off-task behavior hindered his academic progress and that he was sometimes disruptive to other peers in the classroom. Examples of Noah's typical off-task behavior included initiating and engaging in irrelevant conversations with peers, gazing around the room and at other peers, and calling out during instructional or lecture time.

Adam was the 13-year-old male student with an Asian background in Mrs. Lacey's classroom. He was referred by his teacher and mother to participate in this study because of problem behavior that occurred during academic periods as well as deficits in the use of functional communication skills. Adam received ABA services outside of school, in clinic and home settings. His teacher, Mrs. Lacey reported that he was performing below grade level,

functioning at a 3rd grade level in reading, writing, and math. She reported that Adam engaged in high levels of problem behavior and rarely attended to academic work. Mrs. Lacey explained that either she or the classroom paraprofessional had to sit directly next to Adam for him to complete his work. During Math and language arts activities that were worksheets-based, the teacher would explain and complete the first 2-3 questions before having Adam independently answered the rest. Mrs. Lacey estimated that Adam engaged in off-task behavior approximately 40% of the time. She expressed a desire for an intervention targeting this behavior as she believed it would allow Adam to excel academically and create a less disruptive classroom environment, enabling more time to be focused on other students needing help. Examples of Adam's typical problem behavior included breaking pencils, non-attending, and ripping or crumbling academic work.

Grey was a 13-year-old Hispanic male student, in Mrs. Beyoncé's classroom. He was referred by his teacher and paraprofessional due to exhibiting disruptive behavior during academic task. His teacher, Mrs. Beyoncé, reported that he was at his grade level, and excelled past his classmates in math and language art. However, she noted that his off-task behavior disrupted both his work completion and the classroom environment. Grey previously received one-on-one ABA services, but these were discontinued due to insurance denial. Typical math and language arts instructions involved the teacher explaining each question, calling on students to answer, and providing the correct answers. Students were expected to engage and write down these correct answers. Mrs. Beyoncé estimated that Grey was off-task approximately 40% of the time during the academic periods. She informed the researcher that his off-task behavior was disruptive to other students in the classroom, to the teacher and paraprofessional's ability to teach, and to Grey himself, often preventing him from completing his work and staying on-task.

Examples of Grey's typical off-task behavior included blurting out statements and comments unrelated to the academic task and distracting peers by initiating unrelated conversations.

Teachers

Three teachers of the participating students, who taught in separate classrooms within the private school, participated in the study. None of the teachers had prior experience implementing function-based self-monitoring. Table 1 outlines the participants' demographic information.

Mrs. Jennifer (Noah's Teacher) was a 56-year-old Hispanic woman with a bachelor's degree in psychology and 40-hr training course for the Registered Behavior Technician (RBT) certificate. She had worked as a paraprofessional at the private school for a year, and at the time of the study, this was her first-year teaching. Prior to working at the school, Mrs. Jennifer worked as a clinic psychologist in a South American country.

Mrs. Lacey (Adam's Teacher) was a 45-year-old Caucasian woman and the most experienced teacher among the teacher participants. Mrs. Lacey held a high school diploma with a 40-hr training for the RBT certificate. At the time of the study, she had been teaching the same class for 3 years. Uniquely, Mrs. Lacey worked alongside her daughter, Samantha who served as the paraprofessional in her classroom.

Mrs. Beyoncé (Grey's Teacher) was a 40-year-old Black woman with an associate degree in pharmacy technology, and 40-hr training course for the RBT certificate. At the time of the study, Mrs. Beyoncé had been teaching for 2 years in her current position as a teacher at the school. Her transition to teaching followed 2 years as a paraprofessional at the same school, giving her comprehensive understanding of both support and lead roles in the classroom.

Paraprofessionals

Mrs. Julieta, a paraprofessional in Noah's classroom, was a 58-year-old Hispanic woman. At the time of the study, she had worked 10+ years in her current position. However, it is important to note that this was Mrs. Julieta's first year working with the teacher she was paired with in the classroom. Her highest level of education is a high school diploma.

Ms. Samantha, a paraprofessional in Adam's classroom, was a 19-year-old Caucasian woman. She was a recent high school graduate and worked as a paraprofessional in the same class where her mother, Mrs. Lacey, taught.

Mr. Potter a paraprofessional in Grey's classroom, was a 21-year-old Black man. At the time of the study, he was in his first year of employment at the school. He had recently completed his bachelor's online in psychology.

The function-based self-monitoring intervention was implemented during regular classroom routines. The implementation sessions followed a schedule that included arriving at least 15 min before the start of the first academic activity. Data collection in all experimental phases took place during a 40-min academic time (e.g., Math, Language Arts). The targeted classroom activity time was selected based on teacher report of high rates of the problem behavior.

Recruitment Procedures

The researcher distributed recruitment flyers via electronic and hard copy methods. The flyer provided a quick summary of the study's purpose and procedures used in the study, as well as the researcher' s contact information. Teachers, who showed interest in being a part of the study, attended a meeting with the researcher to review and provide informed consent. After informed consent had been obtained from the teachers, recruitment flyers were sent home to the

parents of the students in their classroom. The researcher scheduled time to meet with parents to discuss any questions they had, discuss the purpose and procedures of the study, and review the parental informed permission forms. Parents were allotted 2 weeks to sign the forms. The researcher also obtained written or verbal assent from the student participants whose parents provided a signed informed consent. The assent process involved briefing the students about the study in a clear and understandable manner. After obtaining both assent from the student and parental consent, the researcher determined the eligibility of each potential student participant. This was accomplished using a referral form consisting of 7 questions (See Appendix A). The form was completed by each student's primary teacher to provide information on the student's eligibility, as well as their disability and demographic details.

Materials

In addition to data collection sheets including the social validity and treatment integrity forms, the materials utilized in this study included: (a) an iPad equipped with the I-Connect application, which enabled student participants and paraprofessionals to access a self-monitoring app and rate target behavior at set intervals; and (b) tangible items (e.g., phone, stickers, Hersey bar) for the preference assessment. The I-Connect application is a free iPad application designed to record target behaviors at regular intervals. It uses a data collection system where users mark "yes" or "no" to indicate whether the behavior occurred. Features of the application includes: (a) a timer and visual cue to help students and teachers track each interval and (b) automatic generation of graphs and charts after data collection, which helps teachers perform a visual analysis to determine whether their implementation of an intervention produced changes in the student behavior.

Table 1. Participant Information

	Classroom 1	Classroom 2	Classroom 3
Students	Noah • 12 yrs old • 7th grade • ASD diagnosis • Caucasian	Adam • 13 yrs old • 8th grade • ASD diagnosis • Asian	Grey • 13 yrs old • 8th grade • ASD diagnosis • Caucasian
Teachers	Mrs. Jennifer • 56 yrs old • Hispanic • 1 yr of teaching • Bachelor's degree in psychology • RBT	Mrs. Lacey • 45 yrs old • Caucasian • 5 yrs of teaching • High school diploma • RBT	Ms. Beyoncé • 40 yrs old • Black • 2 yrs of teaching • Associate degree in pharmacy tech • RBT
Paraprofessionals	Mrs. Julieta • 58 yrs old • Hispanic • 10 + yr as paraprofessional • High school Diploma	Ms. Samantha • 19 yrs old • Caucasian • 2 yrs as paraprofessional • High school diploma	Mr. Potter • 22 yrs old • Black • 1 yr as paraprofessional • Bachelor's degree in psychology

Measures

Student Behaviors

The primary dependent variable in this study was the functional communicative response (FCR), and secondary dependent variables included task engagement and problem behavior. The FCR was defined as any instance in which the student communicated a request for an item, attention, or break, following the end of set intervals, and resulted in the student receiving the requested item, attention, or break. Examples of the communicative response include raising their hand to make a comment or ask for assistance with work or holding up a picture card to request a break or preferred tangible item (or activity). Table 2 provides the specific modes and definitions for FCR for each participating student.

The measurement of FCR was calculated as a percentage based on the number of opportunities provided to the student to engage in the response. The students were only allowed one opportunity per interval to use the FCR. If they asked twice within the interval, then they were given the statement of redirection, "it is not available right now, we can try again later." These opportunities were determined by the set intervals and indicated by the I-Connect application, which signaled the end of each interval and prompted the student to engage in the communicative behavior. The percentage of FCR was calculated based on the total number of opportunities given. The primary teacher and researcher determined the duration of the intervals and the timing of reinforcer delivery. This was based on the student's average frequency of problem behavior during the baseline phase and the feasibility of the paraprofessional delivering the reinforcer. The participating students engaged in the target problem behavior approximately every 3 min. Thus, the intervals were set at 3 min across the students.

Task engagement included both passive and active engagement behaviors during classroom activities. Passive task engagement was defined as any instance in which the student makes eye contact with teacher or instructional materials, complies with instructions, or provides a response when prompted by the teacher. Active task engagement was defined as any instance in which the student engaged in behaviors that showed active involvement in the instructional activities, such as asking questions, offering input (e.g., volunteering answers, sharing ideas), engaging in discussions with teachers or peers, taking notes, and completing assigned work (see Table 2 for definitions for each student).

The problem behavior included off-task or destructive behavior that interfered with instructions or learning activities, such as talking to other peers without permission from the teacher or violating any classroom rules or expectations, swiping items off the desk causing them

to fall or be displaced, damaging or inappropriately using classroom materials, and eloping around the room or leaving their assigned seat or designated area (see Table 2 for definitions for each student). Both the task engagement and problem behavior were measured using a 15-s partial interval recording system. For each observation session, the percentage of intervals for task engagement and problem behavior were calculated. Data on Noah's and Adam's behaviors were collected during language arts academic periods, while data on Grey's behaviors were collected during the math academic period.

Procedural Integrity

The researcher utilized a procedural integrity checklist (see Appendix B) to assess the accuracy of paraprofessionals' implementation of the function based self-monitoring procedures. The checklist consisted of 11 steps, and the integrity was calculated as the percentage of steps implemented correctly, based on the total number of steps that should have been implemented. The step was scored as (Y) if the paraprofessional completed the step, (N) if they did not, and (N/A) if there were no opportunities to engage in the behavior. Procedural integrity was assessed for 60% of the sessions for each student during intervention phases, and 50% of sessions for each student during fading phases. The percentage of steps completed correctly was calculated after each observation by dividing the number of steps completed correctly by the total number of steps observing and multiplying the result by 100.

Table 2. Targeted Behaviors and Definitions

	Problem Behavior	FCR	Task Engagement
Noah	Off-task • Taking to peers, teacher, or paraprofessional without permission or without raising his hand, while the teacher is teaching/giving instruction and during specified "no talking" periods. This excludes designated group work times. • Visually focusing on peers or other non-instructional stimuli instead of the teacher or relevant instructional materials during teacher-lead instruction	• Raising hand and waiting for teacher's acknowledgement (e.g., nod, verbal permission) to ask for permission to make comments or talk to a peer	• Eyes on assigned tasks, teacher, or instructional materials displayed board, writing using pencil on paper as part of completing assignments or taking notes, verbally responding to questions posted by the teacher, or raising hand to seek permission to speak or ask a question
Adam	Destruction/Off-task • Intentionally damaging or inappropriately using classroom materials, including but not limited to breaking pencil, ripping paper, or crumbling paper • Turing head away from the teacher or instructional area looking at or talking to peers while the teacher is instructing the class, excluding brief glances at peers lasting less than 2 s or looking at peers to gather information related to the lesson	• Pointing with index finger to a break card or extending the hand towards the designated visual cue (e.g., break card on the desk) that signals a break from ongoing academic or instructional task.	• Focusing on the task or instructional activity with eyes directed towards relevant instructional materials or the teacher, completing the given work, answering questions, or raising hand, without engaging in disruptive behavior or turning away from the materials.
Grey	Off-task • Verbal outbursts, including blurting out answers, making unrelated statements or remarks without receiving permission, or using the designated signal (e.g., raising hand) when silence is expected • Verbal disruptions, including talking to other peers for a duration of more than 5 s, while the teacher is giving instruction	• Raising hand to request permission to speak, maintaining the raised hand for 10 s or until acknowledged by the teacher, whichever comes first.	• Eyes are oriented towards personal work materials or the teacher during instruction or assigned activities, excluding looks at materials unrelated to the current task or instruction, writing or manipulating a writing instrument on paper, or verbally responds to questions asked by teacher within 5 s of the question being asked.

Social Validity

To assess the acceptability and satisfaction of both teachers and students with the function based self-monitoring intervention, two separate social validity questionnaires were used (see Appendices C and D). The questionnaire for teachers consisted of 15 questions, which were rated on a 6-point Likert-type scale. There was one open-ended question at the end which allowed teachers to provide any suggestions that they had regarding the intervention. For students, a 5-question questionnaire was used to assess their satisfaction with the intervention procedure. The questionnaire utilized a 3-point Like-type scale. To ensure students' comprehension and understanding of the questions, the PI had each student read the questions aloud and provide explanations of the question meanings if needed.

Data Collection and Interobserver Agreement (IOA)

Data collection sessions were conducted 2-5 times a week, for the duration of the academic activity time. The researcher and research assistants used the 15s partial interval recording data sheet to collect data on student behaviors. Two research assistants, who were master's students in Applied Behavior Analysis, received training on collecting procedural integrity data and recording student behaviors. The training involved first providing instruction on how to collect data on students behavior, which included providing definitions of students specific problem behavior and FCR. Next, the researcher modeled using the data collection system, and having the research assistants practice after the model. Lastly, feedback was provided on correct and incorrect performance. For procedural integrity data training, research assistants were handed the procedural integrity checklist while the research read and explained each step. Then the researcher modeled the behavior while research assistants completed the

checklist. Feedback was provided on correct and incorrect performance, and training was provided until they demonstrated 100% accuracy.

Interobserver Agreement (IOA) was assessed across three phases of the study: baseline, intervention, and fading. Overall, IOA was assessed for 33% of baseline, 20% of intervention, and 50% of fading sessions. For Noah IOA was assessed for 33% of baseline, 20% of intervention, and 50% of fading sessions. For Adam IOA was assessed for 20% of baseline and intervention, and 50% of fading sessions. For Grey IOA was assessed for 28% of baseline, 20% of intervention, and 50% of fading sessions. IOA for FCR, task engagement, and problem behavior was calculated by dividing the total number of intervals with agreements by the total number of intervals with agreements and disagreements for the session, then multiplying the result by 100. Procedural integrity IOA was calculated by dividing the task-analyzed steps on which both observers agreed by the total number of steps, and then dividing that number by 100.

For Noah, IOA was 100% for all measures of FCR, academic engagement, and problem behavior and in all phases. For Adam, IOA was 100% for FCR and academic engagement across all phases, and 81% for problem behavior during baseline and 100% during both intervention and fading phases. For Grey, agreement averaged 92% (range = 84%-100%) for problem behavior during baseline, 80% during intervention, and 100% during the fading phases. Agreement for FCR was 100% across baseline, intervention, and fading phases.

IOA on procedural integrity was assessed using point-by-point agreement for each step on the procedural integrity checklist (Appendix H). To calculate IOA, the total number of agreements was divided by the total number of agreements and disagreements, then multiplied by 100. Agreement was 100% across both intervention and fading phases for all three paraprofessionals

Experimental Design

A multiple baseline design across participants was used to evaluate the outcomes of the function based self-monitoring intervention. Experimental control was demonstrated through replicating the intervention among the three students, and through the fading of the intervention intervals.

Procedures

This study was conducted in three phases: (a) baseline, (b) function-based self-monitoring, and (c) fading. Prior to conducting the baseline and intervention phases, the researcher conducted a preference assessment and functional behavior assessments, which included both an indirect assessment and a functional analysis.

Preference Assessment

A preference assessment was conducted to identify potential reinforcers to use during the intervention. The reinforcers were delivered when the students accurately used the self-monitoring procedures by evidenced by the paraprofessionals' recorded self-monitoring. This assessment was conducted by laying out two items and placing them in front of the student. The researcher then informed the student that he or she can pick one of the two items that was displayed, and this continued unto each item was paired with every other item. The researcher then recorded which item the student selected. Once the student selected an item, the researcher removed both items that the student selected, then presented a new pair of items. This continued until every item had been selected. The results were used to create a hierarchy of items ranging from highly preferred to moderately preferred. After the assessment, the teacher asked the student to identify which of the highest preferred reinforcer they wanted to use as a reinforcer for accurate self-monitoring.

The paired stimulus preference assessment results revealed distinct preferences for each student. Noah showed the strongest preference for the fishing game (50%), while slime emerged as his least preferred item (10%). Adam's choices indicated a clear favorite, with M&M being selected most frequently (50%) compared to kinetic sand, which he never chose (0%). Grey's preferences were more distributed, with Music (50%) being his top choice. The remaining preferences - the teacher, slime, and the game 'Guess Who – were equally less preferred, each being chosen 17% of the time.

Indirect Functional Assessment

For each student, the researcher conducted an indirect functional assessment using the Prevent-Teach-Reinforce Assessment (PTR-A) tool developed by Dunlap et. al. (2010) to identify the student's hypothesized functions of the problem behavior. The three components of PTR-A assess environmental factors or antecedents (Prevent), alternative appropriate behaviors (teach), and a reinforcement schedule that can be used to encourage the use of the environmental factors (Reinforce). The assessment involved conducting interviews with the primary teachers using the PTR-A, which took approximately 30 min to complete.

For Noah, the indirect assessment results indicated Noah engaged in the problem behavior during academic work. Peers, teachers, and paraprofessionals were typically nearby when the problem behavior, his function of the behavior appeared to be gaining attention from peers and staff. An appropriate replacement behavior identified was raising his hand, with acknowledgment or attention from staff or peers serving as positive social reinforcement.

For Adam, his teacher reported that he engaged in problem behavior primarily in the morning when specific academic tasks were being distributed. The function of the behavior

appeared to be terminating or delaying non-preferred academic activities. Therefore, the appropriate replacement behavior selected was asking for a break.

For Grey, his teacher described that he engaged in the problem behavior during academic work. Peers, teachers, and paraprofessionals were usually close by when the problem behavior, The function of the behavior was hypothesized to be gaining attention from peers and staff. Therefore, the replacement behavior identified was raising his hand, with acknowledgment or attention from staff or peers serving as positive social reinforcement.

Brief Functional Analysis

To test the hypothesized functions of each student' problem behavior, a brief functional analysis was conducted using a multi-element design (Vollmer & Northup, 1996) in the clinic area of the private school. Each student's FA consisted of a play condition and escape, tangible, and/or attention conditions, each lasting 5 min and with a 2- to 3-min break between them. Each condition was tested once; however, the condition that exhibited the highest rate of problem behavior (response per min) was tested again. Following the reintroduction of the condition, a treatment probe was conducted during the condition with the highest rate of problem behavior. In this probe, reinforcement was provided contingent upon the occurrence of the target FCR. At the start of this treatment probe, the researcher modeled and physically prompted the use of the FCR approximately every 30 s until the student independently used the FCR. The researcher identified tangibles and preferred attention through teacher and parent reports.

In the control or play condition the researcher allowed the student to play with moderately preferred items or activities, and provided the student with attention every 20 s. No demands were placed during this condition, and problem behavior was ignored. During the escape condition, the researcher placed demands similar to those observed in the classroom,

using a 3-step prompting procedure. If the student completed the task, in the absence of problem behavior the researcher provided them with verbal praise. If the student engaged in problem behavior, the researcher removed or withdrew the demand or activity for 20 s.

During the tangible condition, the researcher allowed the student access to a highly preferred toy for 20 s. After 20 s, the preferred item was removed from the participant. If the student engaged in problem behavior, the researcher allowed access to the item again for 20 s. Finally, in the attention condition, the student had access to moderately preferred items. The researcher then gave a statement to the student informing them that they will be busy doing some work and that the student should play independently. If the student engaged in problem behavior, then the researcher provided a brief reprimand (e.g., "No, stop.") for 20 s. The results of the functional analysis are provided in the results section.

Baseline Data Collection

Three to six observations (or until stability was established) were conducted during the targeted academic activity. The researcher and research assistant observed the participants for the occurrence of the FCR, task engagement, and problem behavior. For students whose target problem behavior was maintained by escape, a break card was placed on their desk for the purpose of collecting baseline data. Teachers carried out their classroom routines as they typically did, such as setting class expectations, reminding students of classroom expectations, and ignoring problem behavior. The data recording took place once the teacher transitioned to the academic activity and concluded once the teacher transitioned to the next activity. Sessions ranged from 14-20 min.

Teacher and Paraprofessional Training

After baseline data was collected, the researcher scheduled a meeting with each teacher and paraprofessional. The meetings lasted approximately 30 min and involved training the teachers on how to implement the function-based self-monitoring procedure. The first step involved providing instructions on what the function-based self-monitoring was, along with the rationale for using it, how to implement the procedure, and how to use the I-Connect application.

This information was presented using a PowerPoint presentation. Additionally, the researcher distributed a printed teacher proficiency sheet to the paraprofessionals. The subsequent steps included the researcher modeling the correct implementation of the procedure. After observing the researcher's demonstration, the paraprofessionals had the opportunity to practice and rehearse the procedure with the researcher. During this practice session, a research assistant collected data on how well the paraprofessional implemented the procedure, using the paraprofessional proficiency/performance checklist. Following the practice session, the paraprofessional continued to role-play the procedure until they achieved a score of 90% or higher for three consecutive trials. This same training procedure took place for each students' relevant paraprofessional.

Functional Communication Training

The participating students received training on using FCR from both their paraprofessional and the researcher This training involved teaching the student how to engage in the communicative behavior that would result in the same reinforcer identified from the functional assessment. Engaging in the communicative response would result in the same reinforcer that they received when they engaged in the problem behavior.

For both Noah and Grey, FCR training, involved teaching them how to raise his hand, in replacement of his problem behavior of calling out. First, the researcher explained the significance of raising one's hand along the lines of, "When you blurt out in class it can be disruptive to other students, and hard for us to hear you properly. Instead, you can raise your hand, and wait for the teacher to call on you". Following this rationale, the researcher demonstrated both appropriate (raising hand) and inappropriate instances (calling out) of the communicative response. After modeling, Noah rehearsed raising his hand which resulted in the relevant functional reinforcer (attention) that he could earn once the training was completed. This involved the researcher engaging in a brief conversation with the student complementing.

For Adam, FCR training involved teaching him to point to a break card. First the researcher explained the significance of asking for a break, which was along the lines of "When you rip and crumple your work, we don't know what you want. Instead, you can point to the break card if you want to take a break." Following the rationale the researcher demonstrated both ripping the paper up and pointing to the break card to help Adam learn to discriminate between inappropriate and appropriate responses and understand what the consequences for each would be.

If the student engaged in the target FCR, they received access to the reinforcer. If the student engaged in the problem behavior, the paraprofessional or researcher reminded the student of using the communicative response and delivered a 3-step prompting procedure to help the student use the communicative response. Once the student demonstrated the communicative behavior with 90% accuracy or higher for three consecutive trials during training, the student was then taught how to use the self-monitoring procedure. A performance checklist was used to ensure that the training was conducted correctly. The trainings lasted between 30-40 min.

Self-Monitoring Training

After the training on FCR, the researcher and each paraprofessional provided a separate 30-40 min training on self-monitoring to their student. Before the training, the researcher and paraprofessional collaborated on how to deliver the self-monitoring training procedures. During 30-40 min training, they explained and described the self-monitoring procedures to the student in a child-friendly manner, emphasizing its usefulness within the classroom setting. After providing an explanation, the researcher and paraprofessional modeled the procedure for the student. Following the model, the student rehearsed using the procedure. The student was equipped with an iPad containing the I-Connect application. The researcher initiated the timer on the application by tapping the start button and prompted the student to engage in the targeted FCR when the audio and visual notification for the end of the designated time period appeared on the I-Connect application. The student was instructed to record whether they used the communicative response and engaged in the task related behavior (e.g., following instructions, working on assigned tasks). During the rehearsal, the researcher provided positive verbal feedback and access to their identified reinforcer whenever they engaged in the target FCR and recorded their behavior on the I-Connect app.

For the student whose function of problem behavior was escape (Adam), the I-Connect app was paused when delivering the reinforcer and while the paraprofessional set up a timer on their displaying how much break time he had. Once the time ended, the teacher would return the materials to the student's desk. During training, the self-monitoring intervals were set at 1-2 min and increased to 5 min once the student independently used the self-monitoring procedure with 100% accuracy. The training was repeated for two to three more sessions. Before data collection for the intervention phase began, the researcher and paraprofessionals had the students practice

the self-monitoring procedure again for 30 min, during the specific academic period targeted for intervention.

Implementation of Function-Based Self-Monitoring

Implementation of a function based self-monitoring involved both the classroom teacher and paraprofessionals. The teacher involvement was limited to conducting a brief review of the class expectations, reiterating the self-monitoring procedure, and distributing the iPad with the I-Connect application to the student. The self-monitoring intervals were programed for 3-min intervals based on the student's baseline of problem behavior and feasibility of the paraprofessional delivering the reinforcer. After the student received the iPad from the teacher, the paraprofessional reminded the student that they should record whether they engaged in the FCR and the task related behavior when the device signaled that the interval had ended. For example, the paraprofessional would say, "Remember to raise your hand and record whether you were working on your tasks and raised your hand when you receive the notification that time is up."

The paraprofessional then instructed the student to record their communicative and task related behaviors at the end of the interval. In the case where the student did not independently record or use the FCR, the paraprofessional provided a verbal prompt as a reminder for the student to complete the necessary steps. If the student did not use the FCR or complete self-recording and engaged in problem behavior at the end of the interval, the paraprofessional delivered a 3-step prompting procedure to guide the student in using the FCR and completing self-recording. The paraprofessional then encouraged the student to try again in the next opportunity. To prevent disruption of instructional activities, the students were only allowed to use FCR at the end of the 3 min interval, and then self-record whether they used FCR or not. If

the student used FCR during the 3 min interval they were ignored, but this rarely occurred. The paraprofessional was supposed to use a "first-then" statement as a prompt if the student engaged in noncompliant behavior, such as refusing to return to working on the academic task, but this never happened. For example, the paraprofessional was supposed to say, "You need to do some work first, and then you can have another break," but this situation did not occur. While the student was recording their responses the paraprofessional also recorded whether the student engaged in the specific FCR and self-monitoring behaviors using another iPad with the I-Connect application, at the end of the set intervals of time. Only the independent use of FCR was counted as an occurrence.

When the student engaged in FCR without displaying problem behavior and completed the self-monitoring, the paraprofessional provided them with the appropriate, corresponding function-based reinforcer for the duration of 1-2 min at the end of the interval. For example, if the student's elopement was maintained by escape from an academic task, then pointing to the break card to request a break resulted in the paraprofessional removing the work from the student's desk, which allowed the student to enjoy a brief period of time without work. If student's calling out was maintained by attention, then the student's raising his hand resulted in the paraprofessional briefly talking to the student (e.g., talking about the badge the student was wearing, activities that would take place during the day, commenting on the work they completed). When delivering the reinforcer, the I-Connect app was paused while the paraprofessional set up a timer on their phone to ensure the student was aware of how much break time they had, and once the time ended, the teacher would return the materials to the student's desk.

In addition to reinforcing FCR where reinforcers were delivered that were functionally equivalent to those mainlining the problem behavior, reinforcement was provided for accurate self-monitoring at the end of the academic time. At the end of the academic time, the teacher collected the iPad and provided the student with verbal praise for using the self-monitoring procedure and engaging in the communicative behavior. Additionally, the paraprofessional compared their rating with the student's rating. Once the paraprofessional selected "end session", the I-Connect application displayed the graph, showing the percentages of using FCR, engagement in task related behavior, and completing self-recording based on the total number of opportunities. The paraprofessional showed their graph to the student and provided feedback on whether the student accurately recorded their FCR and task engagement. The feedback included a discussion of the consistency or difference between the paraprofessional and student ratings. Following the verbal feedback, if the student had at least one agreement with the paraprofessional's observations (either for on-task behavior or FCR use), the paraprofessional provided a reinforcer, chosen based on a prior preference assessment.

Fading

When the students demonstrated independent utilization of the self-recording and FCR at the 80% (Adam) or 100% (Noah and Grey) rate, a fading procedure was implemented. The fading procedure involved increasing the self-monitoring intervals by 4 min, extending the time between recording intervals.

The data from the I-Connect application showed that the overall agreement rate between student self-recordings and paraprofessional observations was 59.5% across all sessions, indicating a moderate level of correspondence. On-task behavior showed a higher agreement rate of 71.4%, while FCR had a lower rate of 47.6%. Individual student performance varied during

the intervention phase: Noah demonstrated 85.7% agreement for on-task behavior but only 28.6% for FCR, Adam showed consistent 57.1% agreement across both behaviors, and Grey exhibited the highest overall agreement at 64.3%. During the fading phase, agreement rates reached 100% across all students for both on-task behavior and FCR use. Overall, Noah and Adam each received reinforcement in 57.1% of sessions (4 out of 7), whereas Grey received reinforcement in 71.3% of sessions (5 out 7). This reinforcement rate directly corresponded to the number of sessions where students had at least one agreement with the paraprofessional's observations

CHAPTER THREE: RESULTS

Brief Functional Analysis Results

The brief functional analysis results suggested that attention was the primary function for Noah and Grey's problem behavior, whereas escape was the primary function for Adam's problem behavior. For Noah, escape was a secondary function. Noah's problem behavior (speaking without permission/raising hand) occurred most frequently in the attention condition (1.2 per min), followed by the escape condition (0.4 per min). During the play (control) and tangible conditions, Noah did not engage in any instances of off-task behavior. During the treatment probe, which measures the use of FCR, he engaged in problem behavior 1 per min.

Adam's problem behavior (destruction) was most prevalent in the escape condition (1.8 per minute), with a lower rate during the tangible condition (0.2 per min). No off-task behavior occurred during the control or attention condition. During the treatment probe he exhibited the behavior 0.4 per min.

Grey's problem behavior (talking without permission) was observed only in the attention condition (0.9 per min)**.** During the play, tangible, and demand conditions, Grey did not engage in any instances of problem behavior. During the treatment probe, he exhibited the behavior 0.6 per min.

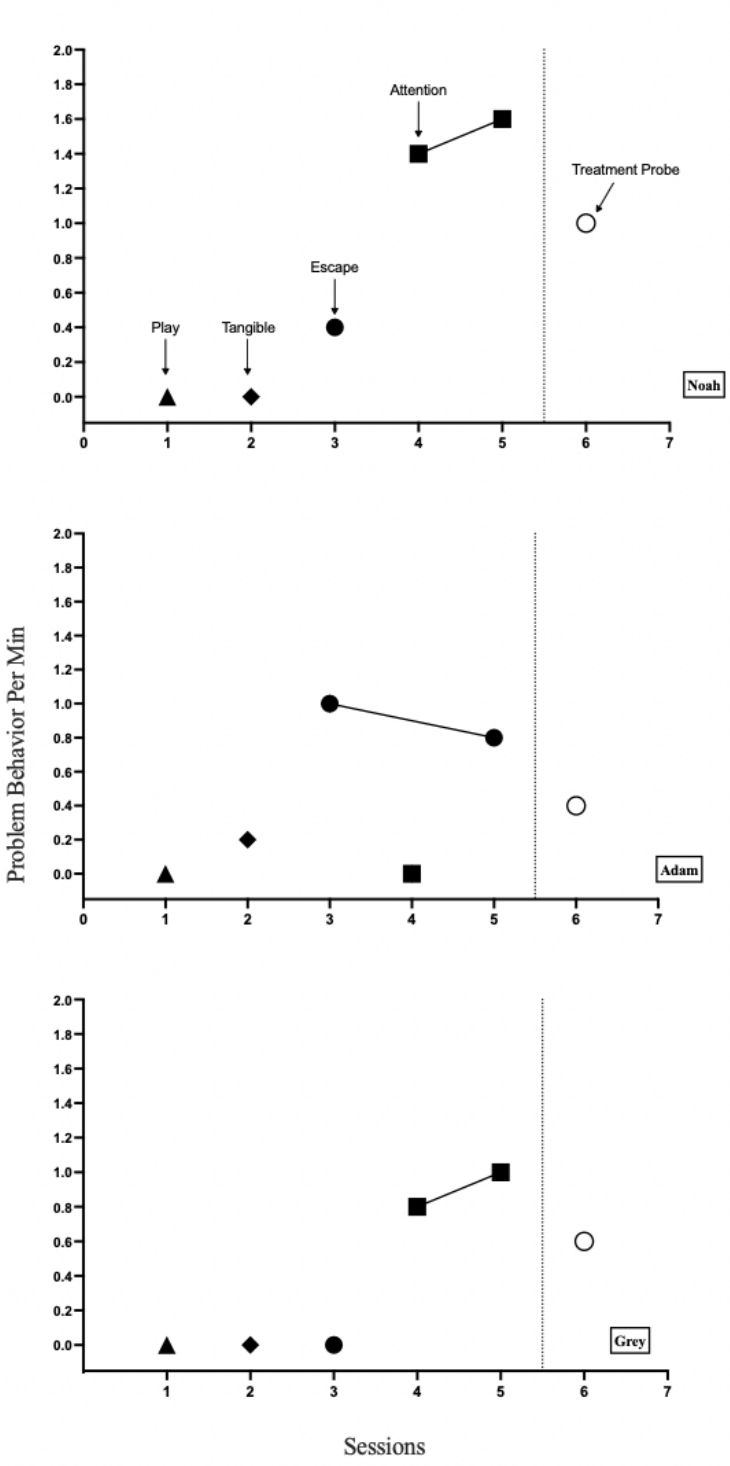

Figure 1. Brief Functional Analysis Results

Functional Communicative Response

Figure 1 displays data on percentage of FCR for Noah, Adam, and Grey. The results demonstrate that the function-based self-monitoring intervention led to increased FCR for all three students. During the baseline phase, none of the students exhibited any FCR, with all three showing 0% occurrence. Upon implementation of the intervention, substantial improvements were observed. Noah's FCR increased to an average of 55% during the intervention phases, while Adam's FCR increased to 54.2%. Grey showed the highest improvement during intervention, with FCR increasing to 67.6%. Notably, during the fading phase, all three students achieved and maintained 100% FCR. These results indicate not only the effectiveness of the function-based self-monitoring procedure in increasing FCR but also suggest that the improvements were sustained and even further increased as the intervention was faded.

Problem Behavior and Task Engagement

Figure 2 presents data on problem behavior and task engagement collected via partial interval recording system. The intervention demonstrated substantial effects across all three participants. For Noah, the mean percentage of problem behavior during baseline was 72% (range = 70% - 75%), showing an increasing trend. When the intervention was introduced, his off-task behavior decreased substantially, displaying a clear decreasing trend, with a mean percentage of 27% (range = 0% - 50%). On the other hand, during baseline, the mean percentage of task engagement was 52% (range = 30% -84%), showing variability. Noah’s task engagement immediately increased significantly with the implementation of the intervention to a mean percentage of 86% (range = 75% - 100%), showing an increasing trend before leveling out. Similarly, during the fading phase the mean percentage was 100%, demonstrating a consistent/steady level. During the fading phase, Noah's improvements were maintained, with

problem behavior consistently absent across sessions, while task engagement remained consistently at 100%.

Adam's data showed a similar pattern, with problem behavior immediately dropping from a slightly increasing baseline trend of 70.6% (range = 75% - 93%) to 30.6% (range = 0% - 33%) during intervention, showing an initial decreasing trend before eventually stabilizing. His task engagement immediately increased from a stable baseline of 39% (range = 35% - 45%) to 80.6% (range = 67% - 100%), displaying an initial increasing trend before stabilizing. In the fading phase, Adam's off task behavior remained at 0% and his task engagement maintained at 100% across sessions.

Grey's results also showed immediate effects. The mean percentage of problem behavior during baseline was 77% (range = 64% - 78%), showing slight variability and a steady level. When the intervention was introduced, Grey's problem behavior decreased substantially to a mean percentage of 32% (range = 0% - 32%), demonstrating slight variability and a decreasing trend. His task engagement immediately improved from a steady baseline of 41% (range = 25% - 58%) to mean percentage of 90% (range = 67% - 100%), displaying an increase trend before stabilizing. During the fading phase, Grey's problem behavior remained at 0% while his task engagement maintained a consistent 100% level.

The data on task engagement collected using the whole interval recording system during intervention and fading were consistent with the data collected using the partial interval recording system, with one exception where an intervention session for Noah showed a minor deviation in measurement.

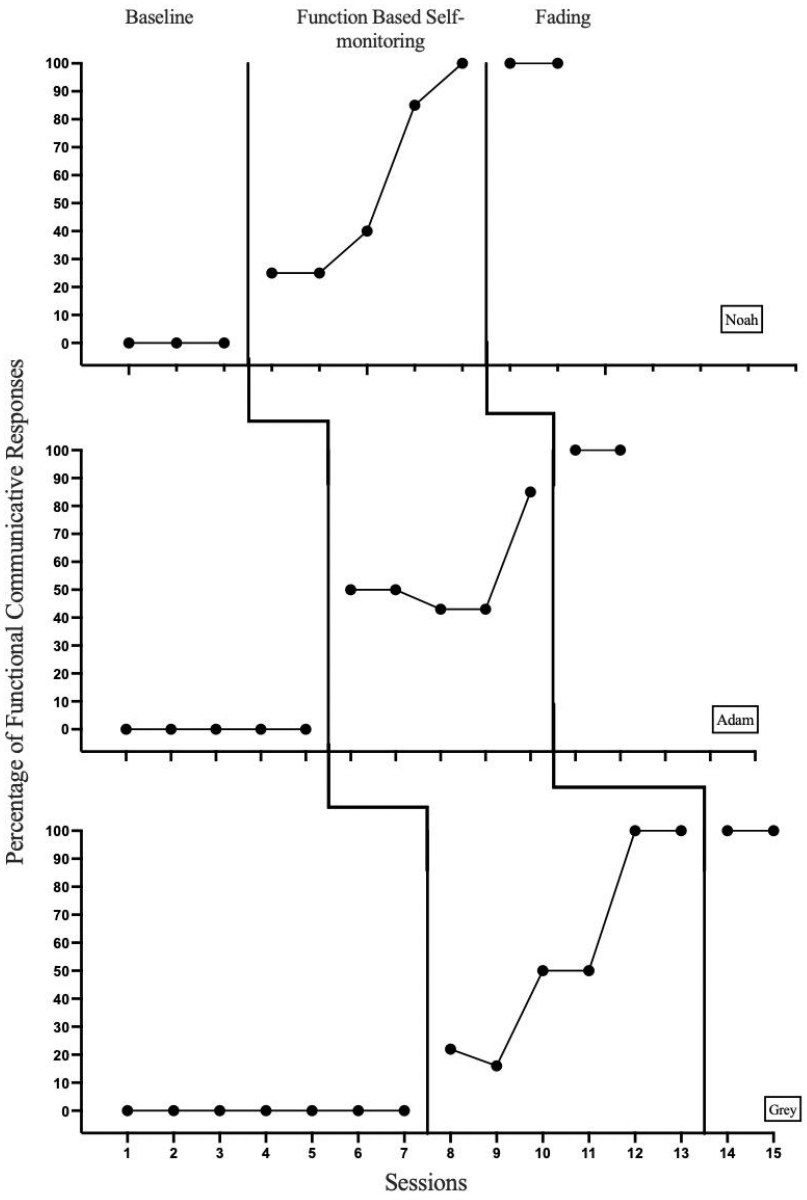

Figure 2. Percentage of FCR across Phases and Participants

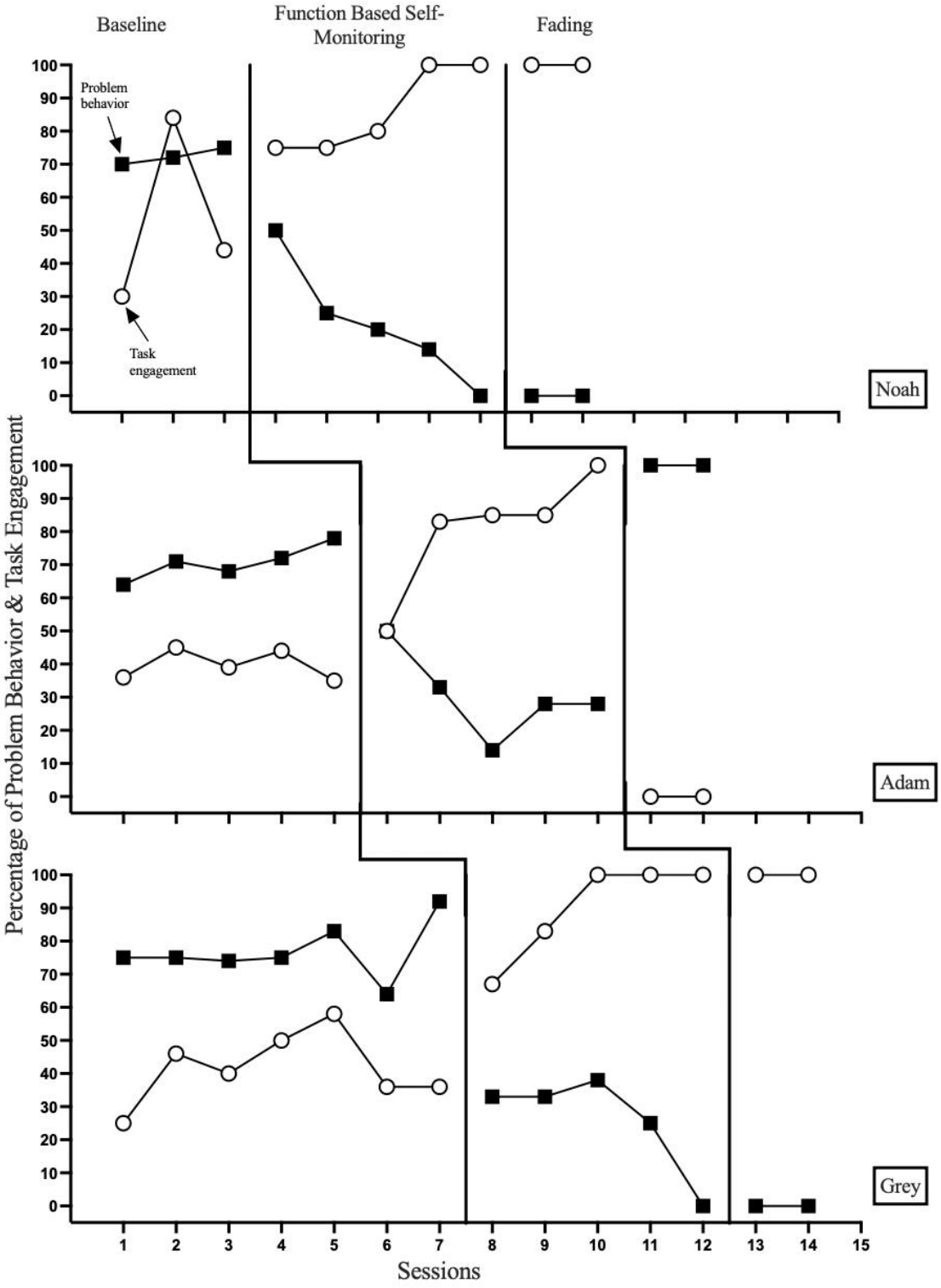

Figure 3. Percentage of Task Engagement and Problem Behavior

Table 3. Teacher Social Validity Results

	Mrs. Jennifer (Noah)	Mrs. Lacey (Adam)	Mrs. Beyoncé (Grey)
1. This was an acceptable intervention for the student's needs.	6	5	5
2. Most teachers would find this intervention appropriate for children with similar needs.	6	5	6
3. This intervention proved effective in supporting the student's needs.	6	4	5
4. I would suggest the use of this intervention to other teachers.	6	5	5
5. The student's needs were severe enough to warrant use of this intervention.	6	6	6
6. Most teachers would find this intervention to other teachers.	6	5	5
7. I would be willing to use this intervention in the classroom setting.	6	5	6
8. This intervention did *not* result in negative side effects for the child.	6	5	6
9. This intervention was consistent with I have used in the classroom setting.	6	5	6
10. Use of PTR would not be disruptive to students.	6	5	6
11. This intervention would be appropriate for a variety of children.	6	5	5
12. This intervention was reasonable for the needs of the child	6	5	6
13. I liked the procedures used in this intervention.	6	5	6
14. This intervention was a good way to handle the child's needs.	6	5	5
15. Overall, this intervention was beneficial for this child.	6	5	6
Mean	6	5	5.6

Social Validity

The results of the teacher social validity assessments are depicted in Table 3. The student social validity ratings can be found in Table 4. On average, the ratings indicated high levels of satisfaction with the effects and the use of the function based self-monitoring intervention, among both the teachers and student

participants. For Mrs. Jennifer, the mean rating was 6, and she gave the highest score on all questions. For Mrs. Lacey, the mean rating was 5.0 (range = 4-6). She also expressed that given more time, the student would have benefited even greater using the intervention. The mean rating for Mrs. Beyoncé was 5.6 (range =5-6). For all three student participants, the mean rating was 3, which was the highest score possible. These results indicate that the students enjoyed the use of the self-monitoring app and they felt that the intervention helped improve their behavior in the classroom.

Table 4. Student Social Validity Results

	Noah	Adam	Grey
1. The self-monitoring app helped me express what I need and want in class better.	3	3	3
2. The self-monitoring app was easy for me to learn how to use.	3	3	3
3. I was able to easily use the self-monitoring app during class.	3	3	3
4. The self-monitoring app was fun for me to use.	3	3	3
5. I would like to continue using the self-monitoring app.	3	3	3
Mean	3	3	3

CHAPTER FOUR: DISCUSSION

This study investigated the effectiveness of a function-based self-monitoring intervention in reducing problem behavior and increasing functional communication exhibited by three middle school students with ASD. This intervention was implemented by the classroom staff in each student participant's classroom. A multiple baseline across participants design, consisting of baseline, intervention, and fading phases, was used to evaluate intervention outcomes. During baseline, students demonstrated low levels of task engagement and high levels of problem behavior, with no instances of FCR. Following the introduction of the function-based self-monitoring intervention, there was an immediate increase in students' FCR and task engagement, and an immediate decrease in problem behavior. This effect was replicated across all three participants.

Major Findings and Implications

The results of this study suggest that function-based self-monitoring was an effective school-based intervention for middle school students with ASD whose problem behavior interfered with academic engagement due to limited communication skills. These results align with previous findings that the use of function-based self-monitoring was effective in reducing problem behavior for students with disabilities in classroom settings while simultaneously increasing appropriate classroom behavior as they started using the FCR (Holifield et al., 2010).

This study adds to the literature showing that the self-monitoring used in conjunction with FCT can result in positive outcomes on student behaviors. Specifically, it demonstrates the efficacy of teaching students to communicate their needs and desires in an appropriate alternative

way and to self-monitor their use of the communicative behaviors (Kern et al., 2001). Similar to the student participants in previous studies (Woodard et al., 2016; Risse et al., 2013), the indirect FBA and functional analysis results in the current study showed that in the current study all three students' problem behavior functioned as a means of gaining access to attention or escaping from task demands. Because of the importance of teaching effective communicative behavior that served the same function as the problem behavior, the self-monitoring procedures focused on teaching the students to monitor their use of FCR. They were allowed to access the same reinforcer as the problem behavior at the end of an interval if they correctly used the FCR and self-recorded their FCR.

The study also demonstrated that the participating students continued to show decreases in problem behavior and increases in task engagement and FCR, ultimately reaching 100% for both task engagement and FCR and 0% for problem behavior. Although the degree of improvement varied among students (e.g., Noah reaching an average of 55% during intervention versus Grey reaching 67.6%), these results emphasize the importance of interventions that are individualized to specific students' needs.

These findings have significant implications for educators and other professionals (e.g., behavior analysts) who provide educational and behavioral supports to students with ASD. The results highlight the importance of incorporating function-based intervention into existing evidence-based practices to maximize the intervention effectiveness within a brief time period. Although this study did not conduct a separate evaluation of self-monitoring without the function-based intervention component through a component analysis, it demonstrates the importance of understanding the underlying functions of problem behavior when designing a self-monitoring intervention. Teaching students to use FCR and ensuring their correct use of the

self-monitoring procedure effectively helped increase academic engagement while reducing problem behavior. Moreover, the study highlights the potential for maintenance of their learned skills and improved classroom behaviors. The 100% correspondence between student self-recordings and paraprofessional observations during fading suggests significant improvement in students' self-monitoring accuracy as the intervention progressed. Throughout this phase, all students' off-task behavior remained at 0%, while their task engagement and use of FCR consistently maintained at 100%, indicating the effectiveness of the function-based self-monitoring strategy over time. Future research could explore the long-term effects of the intervention and their impact on student overall academic performance and social integration. Additionally, future research could evaluate the applicability of function-based self-monitoring across different age groups, disability categories, and educational settings.

The results of the social validity assessments for both teachers and students indicated high satisfaction, feasibility, acceptance, and effectiveness of the intervention. Teachers expressed their openness to implementing the intervention and that it appropriately fit the needs of the students. Specifically, they expressed that this was an intervention that they could continue to use in the classroom, and students reported that it helped improve their behaviors, and was fun to use. This high level of teacher acceptance is crucial for the successful implementation and sustainability of behavioral interventions in school settings (Fixsen et al., 2005). Similarly, students reported finding the intervention enjoyable to use, helpful for their learning, and expressed a desire to continue using it. This positive reception from students is particularly important, as it may contribute to increased motivation and engagement in the intervention process (Bruhn et al., 2014; Huffman et al., 2022). One teacher provided feedback suggesting an increase in the duration of the intervention implementation. This valuable input could be

considered in future research, potentially exploring the effects of extended intervention periods on skill acquisition and maintenance.

Limitations and Future Directions

While this study demonstrated positive outcomes for student behaviors, some limitations should be noted. Firstly, the study was conducted with three students with ASD in a private school, which limits the generalizability. Further research should replicate this intervention in general education classrooms in public school settings with a larger sample to further demonstrate external validity. Additionally, expanding the study to include participants with diverse disabilities and varying topographies of problem behavior and behavioral functions would provide valuable insights into the intervention's efficacy across different populations.

Secondary, paraprofessionals implemented intervention in the current study, which may have influenced the results. Future researchers should examine the effects of this intervention when implemented by only teachers in the classroom rather than paraprofessionals who provide one-on-one support to students with disabilities. This comparison could provide insights into the intervention effectiveness across different implementers and inform best practices for school-based implementation. Moreover, exploring ways to reduce the dosage of training required for interventionists could be a valuable avenue for future researchers. This could potentially increase the feasibility and adoption of function-based self-monitoring in school settings by reducing the resources needed for implementation (Germer et al., 2011, Hanson et al, 2014; Lane et al., 2007). Another limitation was lack of procedural integrity assessment in training paraprofessionals and students. Without measuring procedural integrity, we cannot be certain that all paraprofessionals and students received uniform training potentially affecting how the intervention was implemented.

A finial limitation relates to the timing of the study phases. Due to health issues affecting Noah and Adam, fading phases had to be delayed by a week. When data collection for fading phases occurred, there were only a couple of weeks left in the school year, during which teachers began assigning easier academic work. This might have affected the students' behaviors. Future researchers should examine the effects of systematic fading of the intervention on the target behaviors during academic work of consistent difficulty and response effort throughout the study period to ensure more reliable results.

Conclusion

In conclusion, this study provides promising evidence for the effectiveness of function-based self-monitoring interventions in improving communication skills and reducing problem behaviors in middle school students with ASD. It demonstrates the importance of individualized, function-based approaches for students with ASD whose problem behavior interferes with academic work. This study offers a practical, socially valid intervention strategy for educators working with this population. Paraprofessionals implemented the intervention procedures with fidelity, resulting in positive outcomes for students. Although the results should be interpreted with caution given the limitations, these findings support the positive outcomes reported in the literature on the use of a function-based self-monitoring intervention.

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APPENDIX A: PARTICIPANT REFERRAL FORM

Student Initial & Grade:_____ Date:_____

1.Is the student diagnosed/classified with Autism Spectrum Disorder (ASD)?

____Yes _____No

2. How old is the student? 10 11 12 13 14

3. Does the student read at or above a 3rd grade reading level?

_____Yes _____No

4. Can the student communicate verbally?

_____Yes _____No

5. Does the student have difficulty expressing their needs and wants?

_____Yes _____No

6. Does the student engage in disruptive or problematic behaviors during academic routines/activities?

_____Yes _____No

7.What kind of problems behaviors does the student engage in?

Physical Aggression. Tantrum. Noncompliance. Other

8. Is the student able to communicate with others (verbally)?

____Yes. _____No

9. Does the student display difficulty in communicating their needs and wants?

___Yes _____No

10. Can the student follow multistep directions? (e.g., "go to the classroom", sit down and take out your book")?

____Yes. _____No

11. What is the student's reading level?

APPENDIX B: PROCEDURAL INTEGRITY CHECKLIST

Person observing:_____ Student: _____ Date: _____

Function-Based Self-Monitoring Procedure

Steps	Observed	Not observed
1. Teacher presents clear instructions and expectations for the student. (e.g., "Remember if to point to your break card, if you want a break when the timer goes off")		
2. Teacher should give the student the self-monitoring device (the iPad).		
3. The teacher should set the timer for 10 minutes		
4. The teacher should provide prompts for the student to record their behavior when they get notified in the score it app		
5. At the end of the interval, the teacher prompts the student to record their behavior		
6. The teacher prompts the student to record their behavior if they did not initiate marking on the score-it app following the use of the functional communicative response		
7. No reinforcement was given if the student engaged in problem behavior during the intervals.		

APPENDIX C: TEACHER SOCIAL VALIDITY QUESTIONNAIRE

Adapted version of the Intervention Rating Profile (IRP)-15

Teacher: _____ Date: _____

	Strongly disagree	***Disagree***	***Slightly disagree***	***Slightly agree***	***Agree***	***Strongly agree***
1. This was an acceptable intervention for the student's needs.	1	2	3	4	5	6
2. Most teachers would find this intervention appropriate for children with similar needs.	1	2	3	4	5	6
3. This intervention proved effective in supporting the student's needs.	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 needs were severe enough to warrant use of this intervention.	1	2	3	4	5	6
6. Most teachers would find this intervention suitable for the needs of this student.	1	2	3	4	5	6
7. I would be willing to use this intervention in the classroom setting.	1	2	3	4	5	6
8. This intervention did *not* result in negative side effects for the child.	1	2	3	4	5	6
9. This intervention would be appropriate for a variety of children.	1	2	3	4	5	6
10. This intervention was consistent with those I have used in classroom settings.	1	2	3	4	5	6
11. The intervention was a fair way to handle the child's needs.	1	2	3	4	5	6
12. This intervention was reasonable for the needs of the child.	1	2	3	4	5	6
13. I liked the procedures used in this intervention.	1	2	3	4	5	6
14. This intervention was a good way to handle this child's needs.	1	2	3	4	5	6
15. Overall, this intervention was beneficial for the child.	1	2	3	4	5	6

Total (sum all points circled; higher scores indicate higher acceptability; range = 15-90)

Comments:

Source: Adapted from Witt, J.C. & Elliott, S.N. (1985). Acceptability of classroom intervention strategies. In Kratochwill, T.R. (Ed.), *Advances in School Psychology, Vol. 4*, 251 – 288. Mahwah, NJ: Erlbaum. Reproduced under Fair Use of copyrighted materials for education, scholarship, and research. 17 U.S.C. § 107

APPENDIX D: SOCIAL VALIDITY QUESTIONNAIRE – STUDENT

1.The self-monitoring app helped me express what I need and want in class better.

1- Disagree. 2- Neutral. 3- Agree

2. The self-monitoring app was easy for me to learn how to use.

1- Disagree. 2- Neutral. 3- Agree

3. I was able to easily use the self-monitoring app during class.

1- Disagree. 2- Neutral. 3- Agree

4.The self-monitoring app was fun for me to use.

1- Disagree. 2- Neutral. 3- Agree

5. I would like to continue using the self-monitoring app.

1- Disagree. 2- Neutral. 3- Agree

APPENDIX E: IRB APPROVAL LETTER

UNIVERSITY of SOUTH FLORIDA

APPROVAL

December 5, 2023

[redacted]

Dear Lanease Ganey:

On 12/4/2023, the IRB reviewed and approved the following protocol:

Application Type:	Initial Study
IRB ID:	STUDY006179
Review Type:	Expedited 7
Title:	Using Function Based Self-Monitoring to Teach Function Communication Skills and Decrease Problem Behavior for Middle School Students with ASD
Funding:	None
Approved Protocol and Consent(s)/Assent(s):	• Protocol_V1_11.27.23.2023.docx; • Consent Form_behavior therapist_v1_11.09.23.pdf; • Consent Form_teacher_v1_11.27.23.pdf; • Consent-Permission Form_parent_v1_11.27.23.pdf; • Student Assent_V1_11.27.23.pdf; • Student Friendly Assent.pdf; Approved study documents can be found under the 'Documents' tab in the main study workspace. Use the stamped consent found under the 'Last Finalized' column under the 'Documents' tab.

This study involving child participants falls under the minimal risk category 45 CFR 46.404: Research not involving greater than minimal risk.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408 Permission of one parent is sufficient. Assent will be obtained as outlined in the IRB application.

UNIVERSITY of SOUTH FLORIDA

Within 30 days of the anniversary date of study approval, confirm your research is ongoing by clicking Confirm Ongoing Research in BullsIRB, or if your research is complete, submit a study closure request in BullsIRB by clicking Create Modification/CR.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

Jennifer Walker
IRB Manager