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The Effect Of A Self-monitoring Treatment Intervention Package On The Academic Productivity Behavior Of Three High School Students With Autism Spectrum Disorder

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THE EFFECT OF A SELF-MONITORING TREATMENT INTERVENTION PACKAGE ON THE ACADEMIC PRODUCTIVITY BEHAVIOR OF THREE HIGH SCHOOLS STUDENTS WITH AUTISM SPECTRUM DISORDER

by

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ABSTRACT

This study employed a multiple baseline across participants design to investigate the effect of a self-monitoring treatment intervention package (independent variable) consisting of a wristwatch that delivers timed vibrating and digital text prompts, a self-recording form, and a performance graphing worksheet, on the ability of three high school students with Autism Spectrum Disorder to self-monitor the academic productivity component behaviors (dependent variable) of homework assignment completion and submission rates, classroom-based work completion and submission rates, and accuracy and rate of documentation of academic tasks in their student planners. Students earned academic productivity composite scores reflecting the percentage of academic productivity behavior they demonstrated in their target classroom each day. All participants achieved marked improvements in their academic productivity composite scores from baseline to intervention to the maintenance phase. A detailed analysis of the study results, implications for clinical practice, limitations of the current investigation and recommendations for future research completes this investigation.

Keywords: *Autism Spectrum Disorder, self-monitoring, academic productivity*

This work is dedicated to my wife Michelle.

Thank you for supporting my dream, believing in me, listening to my endless musings, and loving me through the process.

Lest I forget, many thanks to my mother, Frances Craanen; my children Matthew Christian, Aimee Frances, and Samuel Thomas; and family members, Marvin and Donna Mims.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

It is not uncommon today to find the vast majority of students with Autism Spectrum Disorder (ASD) in possession of at least an average intellectual ability being educated alongside their typically developing peers in the general education setting. Such is the result of years of tireless advocacy by parents, educators and professionals alike on behalf of students with ASD as well as legislative action leading to Federal special education laws designed to ensure that students on the spectrum are challenged and educated at their highest potential.

It is also not uncommon to witness these same students with ASD, especially those at the high school level, struggling to manage the general education curriculum, function independently, and be academically productive in the multifaceted social-academic environment of the typical secondary classroom (Hewitt, 2011). Several research studies suggest that the academic productivity difficulties experienced by students with ASD placed in the general education setting may be due to an inherent deficit in executive function skills (e.g., planning, organization, goal-selection, flexibility, set maintenance, self-assessment/evaluation, and self-monitoring/self-management), skills that many agree are a critical component of academic success at the secondary level (Adreon & Durocher, 2007; Hewitt, 2011; Ozonoff, 1998; Ozonoff & Schetter, 2007).

Executive function disorders are not limited to the ASD population but are inherent in many special needs subgroups where sensory and cognitive processing deficits underlie poor academic performance (Barkley, 2001; Singer & Bashir, 1999) However, for students on the

spectrum, executive function disorders are at the core of the social communication and self-management complications frequently experienced by this population (Kenworthy, Black, Harrison, della Rosa, & Wallace, 2009) . Unfortunately, there is scant research investigating the effect of self-monitoring interventions on the academic productivity behavior of secondary level students with ASD and further, the impact of such interventions on the academic success of this population of students (Ozonoff, 1998; Ozonoff & Schetter, 2007).

As far back as 1998, Ozonoff wrote of an ever-expanding body of literature geared toward the treatment of the communication and social disabilities inherent in ASD yet in the same piece she lamented that, "virtually nothing has been written about the executive deficits these individuals demonstrate" (p. 263). Nearly a decade and a half later, a review of the current literature reveals that not much has changed since Ozonoff's original lamentation. Hewitt (2007) asserts that autism spectrum disorder is a disorder of complex information processing, he also states, "the social world requires complex processing, but many other things do as well" (Hewitt, 2011). In other words, if clinicians focus primarily on social interventions to help students with ASD, they risk neglecting other areas in need of their critical intervention service such as the executive function sub skill of self-monitoring (Hewitt, 2011).

In their extensive literature review, Lee, Simpson and Shogren (2007) purport, "Self-management for students with autism is important both as a management tool and as a means to enhance students' quality of life by empowering them to control their own behavior" (p. 2). Building on this theme, Ozonoff and Schetter (2007) reasoned, "Because executive [function] skills are a core cognitive deficit for children with ASD's, these are the exact skills that these

students should be actively learning" (p.). However, Ozonoff and Schettter also added that once students are comfortable with understanding and demonstrating executive function skills then self-management strategies should be taught, specifically self-monitoring (aka, self-recording, self-observation, or self-assessment) whereby the individual observes and records the occurrence or non-occurrence of a particular target behavior (e.g., on-task behavior, academic performance; Ozonoff & Schetter, 2007). Ozonoff and Schetter (2007) further cite the importance of self-monitoring behavioral skills in the following quote:

> "It is necessary for a person to accurately measure his or her own behavior in order to determine if that behavior is changing in the desired direction. In fact, the mere act of recording or monitoring one's behavior can have the effect of changing that behavior in the desired direction" (p. 153).

A cursory search of the literature revealed several studies that have investigated the influence of self-monitoring interventions on the level of on-task behavior of participants (Amato-Zech, Hoff, & Doepke, 2006; Ganz & Sigafoos, 2005; Harris, Friedlander, & Saddler, 2005). A few studies such as Harris et al. (2005) have even contrasted the effects of self-monitoring of attention with self-monitoring of an element of academic productivity (e.g., number of words spelled correctly during practice drills). Study results of Harris el al. suggested academic performance was improved for two-thirds of their participants with ADHD who were being served in the general education setting when participants self-recorded their attention-to-task behavior. In contrast is the finding of an earlier study conducted by Harris, Graham, Reid, McElroy and Hamby (1994) which suggested just the opposite, citing participants with learning

disabilities fare better academically by self-monitoring their academic productivity in comparison to when they self-monitor their on-task behavior.

When one goes beyond a cursory search of the self-monitoring literature and into the use of self-monitoring interventions with the ASD population, one finds the merits of self-management/self-monitoring interventions for individuals with ASD are well supported in the literature whether one is talking about individuals in elementary (Amato-Zech et al., 2006; Callahan & Rademacher, 1999; Cihak, Wright, & Ayres, 2010; Harris et al., 2005; Holifield, Goodman, Hazelkorn, & Heflin, 2010; Legge, DeBar, & Alber-Morgan, 2010; Rock, 2005; Wilkinson, 2008), middle (Endedijk, Denessen, & Hendriks, 2011; Ferguson, Myles, & Hagiwara, 2005) high school (Adreon & Durocher, 2007; Myles, Ferguson, & Hagiwara, 2007) or post-secondary/adult education settings (Ganz & Sigafoos, 2005; Howlin & Moss, 2012). As one ascends the academic ladder, there is a paucity of research addressing the effects of self-management/monitoring interventions on the academic outcomes of students with ASD in secondary general education settings (Howlin, 2003; McDougall, 1998; Ozonoff & Schetter, 2007). Further, although assistive technology appears to help students with ASD in their self-monitoring/self-management efforts, as a percentage of all such research there is surprisingly little of this genre of research (Amato-Zech et al., 2006; Davies, Stock, & Wehmeyer, 2002; Ferguson et al. , 2005; Legge et al., 2010; Myles et al., 2007; Norris and Soloway, 2003a; 2003b).

Therefore, based on the fact that the effectiveness of self-monitoring interventions for individuals with autism is well supported in the primary educational level literature, and to fulfill

a need for investigations involving secondary level students with ASD, this investigation explored the effect of a self-monitoring treatment intervention package comprised of a wristwatch that delivers timed vibrating and digital text prompts, a self-recording form, and a performance graphing worksheet; on the academic productivity behavior of three high school students with autism spectrum disorder.

In order to effectively address the research question, the researcher employed a multiple baseline across participants design consisting of three phases: baseline, treatment intervention and maintenance. The multiple baseline across participants design in this study addressed the impact of manipulating the independent variable (the self-monitoring treatment intervention package) on the dependent variable (academic productivity behavior) for three different participants**.** After first establishing stable and predictable performance in baseline, treatment is staggered individually across all three participants. Single-case research (e.g., multiple baseline studies) is unique in that it uses control procedures in lieu of control groups (Good, 2000) with each participant serving as his own control (Gay & Airasian, 2000; Wolery & Gast, 2000). Replication and treatment effectiveness serve as bellwethers for experimental control. Consequently if one participant shows improvement upon initiation of the treatment intervention (i.e., introduction of the independent variable) then it is probable that improvement is due to the treatment intervention.

Additionally, in single-subject design experiments, cause-and-effect relationships are amplified through treatments and replications (Kratochwill, et al, 2010). The purpose of the multiple baseline design in this study is to determine levels of causation for each individual

participant involved in the study (Dermer & Hoch, 1999). The probability of a functional relationship increases if the student's performance changes only in response to the systematic application of the independent variable (Neuman & McCormick, 1995). Changes that occur within the confines of tightly controlled and systematic study are more likely to indicate a treatment intervention effect when baselines are independent from the treatment (Kazdin & Kopel, 1975).

The anticipated benefits of this study include a marked improvement in academic productivity behavior resulting in improved grades in the target intervention class and increased possibility each participant will pass his target intervention class. This study has practical significance for secondary-level students with ASD as well as their parents, teachers, therapists (i.e., speech-language pathologists, occupational therapists), and experts in the field of autism spectrum disorder. High school students need to begin preparing now for the day when they will graduate and move on into the world of work, education, or vocational training (Adreon & Durocher, 2007). As one will discover in reading this document, executive dysfunction is indeed an inherent characteristic of ASD. However, executive function skills, like self-monitoring can be learned by students on the spectrum thereby outfitting these students with skills that can bring them success in high school and beyond.

The review of the literature addresses the latest information about what is entailed in autism spectrum disorder (ASD), the neuropsychological underpinnings of ASD and executive function, self-monitoring interventions for students with ASD, and technological solutions for self-monitoring deficits in the ASD population. A detailed discussion of the self-monitoring

treatment intervention package (independent variable) that will be used to effect an improvement in the academic productivity behavior (dependent variable) of the three study participants with ASD is followed by a detailed description of the participants, setting, materials and procedures (e.g., phase change criteria, treatment procedural fidelity, inter-observer agreement and inter-rater reliability measures) involved in the study. A complete analysis of the results along with a comprehensive discussion social validity data concludes this study.

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CHAPTER TWO: LITERATURE REVIEW

The Challenges of Autism Spectrum Disorder

Autism is a life-long disorder characterized by impaired social interaction, repetitive behaviors and narrowly defined, restricted interests (http://www.DSM5.org; World Health Organization, 2012). As of this writing, there are no reliable and specific recognized biological markers, thus autism is defined solely by behavioral criteria alone. According to the Diagnostic and Statistical Manual-Fifth Edition (DSM-5) of the American Psychiatry Association (2012) and the International Classification of Diseases (ICD-11) of the World Health Organization (2012); ASD is now defined by two domains: (1) social communication/ social interaction and (2) restricted, repetitive behaviors and interests (http://www.DSM5.org; World Health Organization, 2012).

The new diagnostic criteria in the DSM-5 and ICD-11 are based on three guiding diagnostic features within the social dimension: social-emotional reciprocity, nonverbal communicative behaviors used for social communication and deficits in developing and maintaining relationships (http://www.DSM5. org). Thus, in order to receive a diagnosis of ASD, an individual must present with at least one current example of difficulty in use and/or understanding within each of the three levels. Under the nonverbal communication deficits, one would see inappropriate and/or ineffective use and/or understanding of eye contact, body language, facial expression, gesture, and integration of language and nonverbal behaviors (http://www.DSM5. org; Lord & Jones, 2012). Social reciprocity includes sharing one's

interests with a communication partner, engaging in conversation, turn taking, sharing one's feelings, and inappropriate and/or ineffective approach to social situations such as starting up a conversation (Lord & Jones, 2012) Deficiencies in developing, building and maintaining relationships "include both adjusting behavior to suit different social contexts, sharing within imaginative play and difficulties forming and/or maintaining relationships appropriate to age and developmental level" (Lord & Jones, 2012, p. 494).

The second domain, restricted, repetitive behaviors and interests (RRB), includes an array of stereotyped and repetitive behaviors, verbal and nonverbal; rituals and insistence on sameness; fixated or excessively circumscribed interests and unusual reactions to sensory input (see DSM-5.org; Lord & Jones, 2012). Individuals with ASD are prone to display unique and unusual interests, inflexible devotion to routines void of a functional basis, stereotyped body movements (i.e., repetitive, seemingly driven, and nonfunctional motor behavior such as hand shaking or waving, body rocking, head banging, mouthing of objects, self-biting, picking at skin or body orifices, hitting one's own body, etc.), and a hyper-focus on the parts or sensory qualities of objects (see DSM-5.org; Ozonoff & Schetter, 2007). Lord and Jones (2012) explain this new single category in the following manner:

> One major change in DSM-5 is the formal acknowledgment that, at this point, a diagnosis of autism represents a name for a complicated set of behaviors believed to derive from yet unknown neurobiological causes and pathways. Distinctions between individuals with ASD and severe language deficit or no history of language delay or between individuals with ASD and average or greater intelligence from those with intellectual disabilities are made by specifying additional other diagnoses, such as communication and language disorders and intellectual disability or the lack of these diagnoses (e.g., ASD with high verbal and nonverbal intelligence) (p. 498).

When transitioning from middle to high school, students are confronted with a myriad of changes in the way of school routines, day-to-day academic procedures, and a wide variety of novel and challenging social situations (Adreon & Stella, 2001). Chief among these changes are the increased student population and physical size of the school, a subject-based teaching pedagogy influenced district and school based philosophies, and a marked increase in academic expectations of the classroom teacher and social-personal behaviors and expectations of fellow students (Adreon & Stella, 2001). Add to this the physiological changes associated with the onset of puberty that students must cope with and "this combination of environmental, psychological, physiological, and social stressors have many students feeling overwhelmed"; (p. 267) in particular, those students with ASD.

Howlin (2003) explained that as individuals with ASD age, it becomes more challenging for teachers and other educational professionals to meet their growing, evolving, and at times, more pronounced needs. For professionals working with the pre- and primary grade levels, there is a broad and deep repository of literature and teaching methods available, however, this is not the case with secondary students with ASD who are predominantly taught in the general education classroom (Howlin, 2003). As Howlin states, "research on children with mixed intellectual disabilities indicates that although inclusion may succeed in the early years, relatively few studies have reported on successful integration of these students within secondary school" (p. 269). Unfortunately for this population, few systematic studies of interventions are available. The paradox is that without the appropriate support, children with ASD may very well

receive less appropriate intervention and individualized instruction in the general education classroom than in a segregated classroom (Howlin, 2003).

Difficulties arise quickly when the school routines, academic procedures, and social situations of the high school environment come in contact with the impaired social interaction, repetitive behaviors and narrowly-defined, restricted interests of the student with ASD. The demands of high school are further increased for students with ASD because they also lack the planning, organization, time management, and self-monitoring skills; collectively referred to as executive function skills, possessed by typically developing peers.

Executive Function

The term ‘executive function’ is used as "an umbrella [term] for various complex cognitive processes and sub-processes" (Elliott, 2003, p. 49). Abilities such as task-switching, time management, resource allocation, working memory, attention, problem solving, verbal reasoning, initiation and monitoring of actions are inherent characteristics of this multi-faceted concept (Alvarez & Emory, 2006; Elliott, 2003). The concept of executive function also involves a range of abilities that many students with attention deficit hyperactivity disorder (ADHD), specific learning disability (SLD), and autism spectrum disorder (ASD lack including planning, organization, goal-selection, flexible thinking, inhibition, set maintenance, and self-monitoring (Hill, 2004a; 2004b; 2006). As a higher order cognitive process, executive function involves a combination of cognitive abilities necessary for purposeful, goal-directed, and problem-solving behaviors (Gioia, Isquith, Kenworthy, & Barton, 2002; Hughes, 2011). The control center for

executive function lies in the frontal and pre-frontal cortex areas of the brain, areas that are often associated with regulatory control of the brain (Poletti, 2009). Compared to other foundational cognitive functions, executive functions are more complex and take longer to develop, sometimes continuing to mature through adolescence and into young adulthood as a result of myelination of axons (Choudhury, Charman, & Blakemore, 2008).

Even though 'executive function' and 'frontal lobe function' are frequently used interchangeably, recent theories regard this take as too basic in light of support that subcortical regions of the brain may also play a critical role especially in Autism Spectrum Disorder (ASD; Alvarez & Emory, 2006; Anderson, 2008; Elliott, 2003; Poletti, 2009; Vaughan, & Giovanello, 2010). An investigation providing empirical evidence that executive dysfunction is a characteristic impairment of individuals with Autism Spectrum Disorders (ASD) is one conducted by Robinson, Goddard, Dristschel, Wisley and Howlin (2009). In this study, the authors examined whether executive function disorders are related to autism or to an associated intellectual disability. The focus of their study was to investigate executive function ability in a group of children with ASD (n = 54, all IQ $\geq$ 70) and compare them to a control group of typically developing children individually matched for age, gender, IQ and vocabulary.

Compared to the control group participants, the group of participants with ASD in Robinson, et al. (2009) exhibited significant impairments in the inhibition of pre-potent response (as evidenced on both a Stroop and a Junior Hayling Test) and planning (on the Tower of London activity) but evidenced preserved performance for mental flexibility (on the Wisconsin Card Sorting Task) and generativity (on a task of Verbal Fluency). Also compared to controls in

this study, children with ASD were also deficient on tasks of response inhibition and self-monitoring. In the end, the authors proposed a multidimensional idea of executive functions characterized by deficits in the ASD population's ability to plan, constrain prepotent responses, and self-monitor, all of which are salient features of ASD yet independent of IQ and verbal ability and consistently observed across the childhood years.

Additional support for the existence of executive dysfunction in ASD comes from a study by Ciesielski and Harris (1997). In their research of executive function disorder in individuals with ASD, they used 5 executive function tests with different degrees of rule constraint to assess the mental flexibility of selective inhibition/switching abilities in the participants with autism involved in their study. Controlling for age and socioeconomic status, the authors matched 19 participants with high-functioning autism (IQ > 85) with 16 controls possessing at least average psychometric intelligence. Results demonstrated that the performance level of participants with autism was significantly lower than for controls on all executive function tasks.

The construct of executive function is well documented in the neuropsychological literature (Espy & Kaufmann, 2002; Miyake, Friedman, Emerson, Witzki, Howerter & Wager, 2000) and in communication disorders research investigating the results of damage to the frontal cortex (Kennedy & Krause, 2011). Similar to individuals with autism spectrum disorder, patients with damage to the frontal lobe areas of the brain have demonstrated marked deficits in distraction inhibition, flexible thinking, shifting set, appropriately initiating an activity, demonstrating purposeful behavior based on anticipation, planning, and self-monitoring (Hill, 2004; Hughes, 2011; Ozonoff, 1998; Ozonoff & Schetter, 2007). The research community is

also investigating the executive dysfunction similarities between diverse groups such as autism spectrum disorder and traumatic brain injury (Gioia et al., 2002; 2003).

O'Hearn, Asato, Ordaz, and Luna (2008) claim "Functional imaging studies consistently find that executive dysfunction", which continues to develop through the adolescent stage, "is associated with impaired prefrontal activity and its functional integration with the rest of the brain" (p. 1124) and further state that "Individuals with autism may have limited but not absent frontally guided executive function" (p. 1124). Because this type of evidence suggests a "presence of plasticity" indicative of a "prolonged window for effective treatment" (p. 1124), they confidently concluded their paper with the following statement:

> In particular, our evidence of developmental improvement from late childhood to adolescence suggests that neural mechanisms underlying this transitional time (i.e., myelination) might be relatively intact in autism. If so, interventions can target this late, and largely ignored, developmental stage in which there is still substantial improvement in autism on executive function tasks (p. 1124).

Other investigations have addressed the neuropsychological underpinnings of ASD and executive dysfunction in this population of individuals. For instance, in Cederlund et al.'s (2010) study, the authors reviewed the medical records of 100 clinical cases of males diagnosed with ASD, more specifically Asperger Syndrome (AS), at least 5 years before their study and secured family consent to participate for 76 out of the original 100. The participants (mean age of 21.8 years) were assessed via neuropsychiatric and neuropsychological testing and interview protocols and questionnaires. Specifically, the investigators explored how young adult males with AS view themselves in light of their clinical diagnosis, how similar/dissimilar their perceptions of the core features of their diagnosis are to their parent's perceptions of the same

core features, if individuals with AS acknowledge other psychological/cognitive problems usually not included in the diagnosis of AS, and finally, the role executive dysfunction plays in the day-to-day life of individuals with AS.

To address their research questions, the authors administered a number of assessments. On the Asperger Syndrome Diagnostic Interview (ASDI), parents and participants differed significantly in their interview responses across several key domains. However, the Leiter-R-Questionnaires evidenced no significant participant-parent differences in the scores of the cognitive/social and emotional/adaptive skills. The Beck Depression Inventory (BDI) was also administered and was useful in correctly identifying the vast majority of cases with clinical depression in the AS group. Finally, the Dysexecutive Questionnaire (DEX) results' suggested an executive function deficit problem profile in males with AS similar in severity as experienced by individuals with traumatic brain injury (TBI) and schizophrenia.

Teacher perception is a critical factor in autism research and as such, Ashburner, Ziviani and Rodger's (2010) study focused on a teacher's perception of students with autism spectrum disorders (ASD) and compared that same teacher's perceptions of typically developing students' capacity to perform academically and regulate emotions and behavior in a mainstream classroom. The authors used a case control research design that involved drawing the typically developing controls from the classrooms as the students with ASD. This allowed for control for differences in teaching styles, classroom environments, educational programs and differences in the way that teachers rate behaviors and academic achievement. Participants were divided into two groups: 28 students with ASD (with average range IQ) and 51 age- and gender-matched

typically developing (TD) students selected from the same mainstream classroom. The authors compared teacher ratings of academic performance and classroom emotional and behavioral regulation for both groups of students and found that teachers rated students with ASD as exhibiting behavioral and emotional difficulties (including attention difficulties, anxiety, depression, oppositional and aggressive behaviors) at a significantly higher level than students in the neuro-typical control group.

Further, in Ashburner et al.'s (2010) study, teachers overwhelmingly rated students with ASD as under-achieving academically (54%) compared to their typically developing peers (8%). The authors maintained that students with ASD were underperforming relative to their level of ability, struggling to maintain their attention, and laboring to regulate their emotions and behaviors in mainstream classrooms, in spite of getting a wide variety of support services by teachers and despite a having a variety of support services (i.e., teacher aides, speech-language pathologists, occupational therapists, physical therapists) available to them in their classroom. Although the students in their study were fairly young (6-10 years) and were in the same classroom with the same teacher for the majority of the school day, the authors cautioned that difficulties "are likely to be exacerbated in secondary school where they [students with ASD] must contend with multiple classes and teachers, an increasing complexity of timetabling and curriculum, and the social pressures of adolescence" (p. 26).

Thus far this literature review has established that executive dysfunction is an inherent characteristic of ASD, that the executive function deficiency in males with ASD and higher intelligence (i.e., Aspergers Syndrome) is similar to the level of executive dysfunction found in

individuals with TBI and schizophrenia who have a defined frontal cortex involvement, and further, that general education teachers may view students with ASD as under-achievers relative to their ability compared to their typically developing peers. As mentioned above, the academic battles experienced by students with ASD include a lack of skills such as planning, organization, time management and self-monitoring.

Meltzer et al. (2007) propose that the way to reduce behavioral and organizational problems as well as the number of education referrals is by recognizing an individual's needs and then imparting appropriate executive function skills and strategies for use in the face of problematic academic situations. If a student has good executive functioning skills, then he is adept at setting goals, self-monitoring his behavior and performance across a variety of settings and situations, effectively inhibiting inappropriate responses, thinking flexibly regardless of the situation, and engaging in future-oriented decision-making and planning behavior (Happe, Booth, Charlton, & Hughes, 2006; Zimmerman & Pons, 1986; Zimmerman, 1990; Zimmerman, 2002a; Zimmerman, 2002b) . Even though at times they demonstrate evidence to the contrary, students with ASD do value structure and being in control thus, interventions to improve self-management/self-monitoring and move more responsibility from teachers, parents, and others to the student is critical to the student's continuing educational development (Klin & Volkmar, 2000; Klin, Pauls, Schultz, & Volkmar, 2005) .

Hewitt (2011) addressed several of the primary challenges individuals with ASD may face as they enter post-secondary collegiate settings. She pointed out that individuals on the autism spectrum with the intellectual capacity to enter college "still need individualized and

ongoing supports from their families and others to ensure success" (p. 273) and further that "there is a need for more and better services if such individuals are to achieve their full potential" (p. 277). Hewitt states that the time between middle school and either entry into the workforce or postsecondary education passes rather quickly and unfortunately may be over before everyone, including the student, fully grasps and learns the skills needed for success post-high school.

Additionally, Hewitt (2011) strongly recommends that if college is indeed the goal for an individual with ASD, then he or she had better develop the independent functioning and adaptive learning skills needed for such an environment long before the transition occurs and so, "addressing executive function deficits in a clinical setting may be helpful for some students" (p. 275). In addition to the social challenges these individuals face, there are a host of executive functioning and higher order planning (e.g., attention allocation, rapid decision making under changing conditions) skills that most with ASD do not possess which they will need in the higher education arena and "are critical to the modern world" (p. 277). Therefore, the ideal time and place to experiment with and develop these abilities should be once the student sets foot on their high school campus and should continue throughout a student's secondary education years (Adreon & Durocher, 2007; Hewitt, 2011).

Similar to Hewitt's take on post-secondary concerns for individuals with ASD, Adreon and Durocher (2007) warn in their concept paper that "many individuals with ASD will need accommodations for organizational strategies because the majority of these students have significant deficits in many aspects of executive functioning" (p.276). Executive function is a set

of interacting cognitive processes (e.g., goal-directed behavior, planning, initiation, organization, inhibition, working memory, and self-monitoring) therefore, there is little success with one-size-fits all approaches (Adreon & Durocher, 2007; Clark, Prior, & Kinsella, 2002) . In summary, if students with ASD who are primarily receiving their academic instruction in the general education setting are to be successful, then educators, clinicians and other professionals must be fully in tune with the inherent executive function deficits found in ASD and informed by the latest neuropsychological research regarding this segment of the student population.

The literature appears to support the idea of teaching students with ASD how to set goals, develop flexible thinking strategies, refrain from inappropriate responses, plan for future situations and events, and self-monitor behaviors and performance levels. It is this latter teaching objective, self-monitoring behaviors and performance, which seem to be the red thread running through the current research concerned with remediating executive dysfunction in students with ASD.

Self-Monitoring

With regard to executive dysfunction in individuals with ASD, Ozonoff (1998) suggests using cognitive-behavior management, namely self-management training, for remediation of executive function disorder in students with ASD. Ozonoff's suggested approach to self-management training is to train individuals to self-monitor their own behavior thereby moving the locus of control for attending and staying on task from parents and teachers to the student with ASD. Recent studies have provided empirical evidence for the success of self-monitoring

programs that coach individuals with ASD to keep track of their academic and classroom behaviors, thereby putting the onus for self-management/self-monitoring on the individual with ASD and thus, decreasing maladapted behaviors while at the same time strengthening desirable academic and classroom behavior skills (Happé et al., 2006; Semrud-Clikeman, Walkowiak, Wilkinson, & Butcher, 2010)

According to Ganz and Sigafoos (2005), "Self-monitoring is a cognitive-behavioral strategy that falls under the umbrella of self-management" (p. 25). Some researchers only use the term "self-management" when they are speaking of behavior in which an individual exercises control over their on-task, academic productivity, social skill behaviors, etc. (Lee, Simpson, & Shogren, 2007). Other researchers opt for the term "self-monitoring" to describe the same or similar set of behaviors as those in the self-management camp (Ganz & Sigafoos, 2005; Harrower & Dunlap, 2001). However, the majority of studies gleaned for this review of the literature fall somewhere in the middle, in other words, they refrain from making a clear distinction between self-monitoring and self-management (Koegel, Koegel, & McNerney, 2001) resulting in an ambiguous, interchangeable use of the two terms. Consequently, this author settled on the term self-monitoring, reasoning that self-monitoring one's behavior allows an individual to exercise greater control over his or her academic destiny, to become a better manager of oneself if you will. If one sees the term self-management, it will usually be in the context of explaining a particular study, in which case out of respect for a study's author(s), the researcher will acquiesce to their preferred term. In all other cases though, readers are to

understand that for purposes of this review (and this study), self-monitoring will be the term of choice.

Rankin and Reid (1995), explained that people use self-monitoring to affect their cognitive processes and private speech/self-talk in such as way as to explicitly impact or change their observable, outward behaviors while Koegel et al. (2001) speak of management of one's own behavior, or self-management, as a "pivotal behavior" with a pervasive impact on the treatment of individuals with ASD. Further, Koegel, Koegel, and Carter (1999) posit that when individuals with ASD learn self-management skills, they can use those same skills across a variety of settings and behaviors and at the same time not have as great a need for external resources (i.e., teachers, one-to-one assistants, other professionals) to monitor them. Building on this idea of facilitating greater independent functioning skills, Ganz and Sigafoos (2005) explain the independence-building benefits of teaching students to self-monitor in the following manner:

> "…the process of teaching individuals to self-monitor is rewarding to those individuals, requires little training for practitioners, requires few materials that are not already available in the classroom, and demands only a small amount of the teacher's time once the student gains independence. Thus self-monitoring may be useful for promoting greater independence among individuals with ASD" (p. 24).

Callahan and Rademacher (1999) utilized a multiple baseline across behaviors design in their investigation of the effectiveness of using self-management strategies plus reinforcement to improve the self-monitoring of attention (SMA) and self-monitoring of performance (SMP) behaviors of a student with ASD (in their case High-Functioning Autism or ASD) being served in an inclusive-based, general education setting. Although their subject was doing well

academically, he struggled to maintain attention to task, work independently, use time wisely, follow directions and evidenced a variety of inappropriate and socially inept behaviors. The participant was trained on how to use a self-recording sheet to document on- and off-task behavior whenever he was cued to self-monitor by an external auditory tone. Self-tracking results were then compared against those of one of the classroom assistants with bonus points awarded to the student for matching checklist items. After several weeks, the participant met criterion (i.e., 90% accuracy), external cues were faded, and the participant continued independently self-monitoring his own behavior. Results suggest that children with High-Functioning Autism (i.e., HFA, Asperger's Syndrome) might benefit from an intervention program built upon self-monitoring strategies.

Using a combined self-monitoring and static self-model picture prompt intervention, Cihak, Wright and Ayres (2010) evaluated the effects on the academic engagement of three students with autism in a general education classroom setting. The authors underscored that a major benefit of self-monitoring is "the focus on skill building to teach students to be more independent, self-reliant, and responsible for their own classroom behavior" (p. 137). They reported that by learning how to self-monitor, students can learn to direct their own behaviors and rely less on external control and constant supervision (i.e., cues, prompts, or direct assistance from parents, teachers, teacher assistants, or peers). The percentage of intervals engaged academically and the number of teacher prompts was analyzed in the context of a multiple probe across settings design with an embedded A-B-A-B. Results indicated that all students benefitted

from use of the handheld computer self-model static-picture prompts. In addition, students were also able to successfully self-monitor and regulate their behavior in multiple settings.

Wilkinson (2008) calls for such a standard approach in his study about the usefulness of self-management as a conduit for improving the on-task behavior of students with high-functioning autism. After providing a rationale for the effectiveness of self-management interventions, Wilkinson presented an approach for developing and implementing an effective self-management intervention plan that included the following 10 steps:

1. Identify preferred behavioral targets.
2. Determine how often students will self-manage their behavior.
3. Meet with the student to explain self-management, identify goals, and establish preferred rewards contingent upon achieving those goals.
4. Prepare a student self-recording sheet.
5. Model the self-management plan, and provide the student with an opportunity to practice the procedure.
6. Implement the self-management plan.
7. Meet with the student to determine whether the behavioral goals were attained.
8. Provide the rewards when earned.
9. Incorporate the plan into a school-home collaboration scheme by sending the self-recording sheet home for parent review.
10. Fade the intervention by increasing the length of intervals between self-monitoring cues.

Wilkinson concluded his 2008 work with a vignette case involving an 8 year-old boy with Asperger Syndrome name Matthew. Prior to implementation, Matthew's teacher completed a behavior ratings inventory that determined that Matthew was "disengaged and noncompliant" over 60% of the time during independent seatwork and small-group instruction. After identifying on-task behaviors and compliance with classroom rules as the target behaviors, Wilkinson instituted the self-management (aka self-monitoring) procedure using self-observation (e.g., "Was I paying attention to my assigned work?") and self-recording (i.e., the response to the self-observation question) as the primary components.

Next, Wilkinson informed Matthew, "Self management means accepting responsibility for managing and controlling your own behavior so that you can accomplish the things you want at school and at home" (p. 155). Wilkinson also provided Matthew with examples of the target behaviors of "on-task" and "compliant" that Wilkinson would be tracking. After three days of training, Wilkinson began collecting data. A physical cue was provided by his teacher by tapping on the corner of his desk at 10-minute intervals which prompted Matthew to then self-observe (i.e., ask himself his self-monitoring question) followed by self-recording (e.g., mark his response on his record form). The self-recording form was sent home daily for his parent's signature and so they could review it and provide rewards from a list of pre-determined contingencies (e.g., more computer time, access to a preferred game or activity before school dismissal). The recording sheet was then returned the following day.

Matthew's classroom teacher continued to collect performance data for the next three weeks until Matthew's engagement and compliant behavior had increased to 90% accuracy. At

that point the procedure was faded slowly by increasing the time intervals between self-monitoring prompts and then, finally eliminating the self-monitoring cues altogether in order to shift control over to Matthew to keep tabs on his own behavior. The daily home-school communication continued in concert with the positive reward incentive system. Several weeks after completely fading the self-monitoring procedure, Matthew's teacher reported that Matthew's task engagement and compliant behavior held at significantly improved levels.

The idea that most children with autism require specialized interventions to experience success in educational settings is supported by Harrower and Dunlap (2001). Before embarking on their study, they conducted an extensive review of several empirically supported interventions that assist students with ASD in inclusive classrooms including strategies such as antecedent manipulations, delayed contingencies, peer-mediated interventions, and self-management. The authors further see self-management as a strategy which is used to promote independent functioning in the classroom by gradually shifting responsibility for managing one's behavior from external sources (e.g., teachers, teacher assistants, peers) to internal sources (i.e., the student) thereby freeing a teacher to focus on instruction.

Harrower and Dunlap (2001) also explained that self-management consists of teaching the student to "(a) discriminate between appropriate and inappropriate behaviors, (b) evaluate her or his own behavior, (c) monitor his or her behavior over time, and (d) reinforce her or his behavior when pre-specified criteria are met" (p. 768). The researchers point to Koegel, Harrower, and Koegel's 1999 findings as foundational support for their proposition that self-management is a documented, effective strategy for several different types of behaviors in the

classroom and is also very useful for promoting independent functioning and decreasing or eliminating reliance on the teacher or teacher aide. Self-management allows students with disabilities to take an active role in their own intervention process and in their classroom surroundings (Harrower & Dunlap, 2001).

The investigation conducted by Harrower and Dunlap (2001) was primarily designed to investigate the effectiveness of a self-monitoring procedure on the on-task behavior and academic performance of two students with ASD in a self-contained elementary school classroom. Using a multiple baseline across participants research design, the investigators measured the effectiveness of their intervention across two academic subject areas: language arts and mathematics. Attending to task was documented when participants were observed reading aloud, writing on their language arts worksheet, erasing a language arts answer, following a teacher directive, or asking or answering a task-related question. For math, being on task was recorded if participants were observed to read or write on their math worksheet, count manipulatives, erase a math answer, follow a teacher's directive, or ask/answer a task-related question.

Academic accuracy data was gathered by inspecting permanent products and calculated by taking the number of items completed correctly and dividing that number by the number of items given and then multiplying the quotient by 100%. Even though attending to task and academic accuracy were recorded, only attending to task was self-monitored. Both students learned to self-monitor in language arts and mathematics as measures of attending to task and academic accuracy were collected simultaneously. Results in academic accuracy were variable,

but the authors concluded that the self-monitoring procedure was effective for both students and resulted in immediate increases in attending to task and academic accuracy.

Numerous research studies have repeatedly demonstrated deficits in planning, flexibility, organization, goal setting, set maintenance, self-assessment/evaluation, and self-monitoring in individuals with autism spectrum disorder (Kenworthy et al., 2009; Verté, Geurts, Roeyers, Oosterlaan, & Sergeant, 2006) . Parents, teachers, therapists, and counselors also frequently report the existence of these types of problems in high school students with ASD (Cederlund, Hagberg, & Gillberg, 2010) . Again Ozonoff (1998) argues that although executive function problems are readily apparent in verbal, higher-functioning individuals, "these deficits stand out in contrast to the many other areas in which the autistic individual has progressed. Yet these difficulties have received virtually no attention in the remediation literature on autism" (p. 282) even in light of promising research involving assistive technology to remediate and/or compensate for the self-monitoring deficits in students with ASD.

Technological Solutions for Self-Monitoring Deficits

The benefits of using technology to assist student self-monitoring is a burgeoning field of research. For instance, Ferguson et al. (2005) utilized a personal digital assistant (PDA) as their intervention of choice. At the time they conducted their study (i.e., 2005), PDA's were being used extensively in the mainstream population. However, PDA's were in their infancy as an assistive technology intervention device in the exceptional student education and rehabilitation research literature. In their study, the authors employed a multiple baseline across settings study

to determine the effectiveness of a PDA in facilitating greater independence in an adolescent with Asperger Syndrome both at home and at school.

Their participant, Kent, was a 14-year-old, above average IQ, average academically performing Caucasian male in his final year of public middle school. He was diagnosed Asperger's Syndrome several years prior by a medical doctor who used diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders-4th Edition (DSM-IV; American Psychiatric Association, 1994). Baseline measurement and observational data indicated that Kent needed a high volume of prompts from parents and teachers to complete his daily academic activities. If his mother failed to provide him with multiple prompts, then routine daily tasks were left undone due to Kent's natural tendency to become distracted and stop his routine. Kent's teachers also served as external prompters and prompted him to get his materials together before class commenced, to pay attention during class, to hand in his homework, log his homework assignments, and then when class was over, to transition to the next class. Indeed, the authors expressed their concern with such on externally prompted routine as Kent's and questioned how he would be able to function independently in the higher grade levels where the demands to function independently would increase exponentially.

Based on their observation and interview data, the investigators purposed their study on increasing Kent's independence level during morning and evening home activities and in-school tasks by decreasing his dependence on the adults in his home and school life. To begin, Kent, his mother and resource room teacher were trained on the PDA, a Hewlett Packard Jornada 560 Personal Digital Assistant (Hewlett-Packard, 2001) that basically was the same product available

to the general public at the time of the study. The software included Microsoft Windows for Pocket PC Software 2002 (Microsoft, 2002). Two data collection sheets were designed for the intervention. First, Kent would use a data sheet with his four morning tasks and the desired times he needed to complete each one. Next, Kent would use a similar data sheet for his four evening activities. Included on each data sheet were three additional columns off to the right of each listed task to allow for Kent's mother to indicate if the task was completed independently or with prompts and the time the task was completed. A third data collection sheet listing six tasks Kent was responsible for completing during his social studies and math classes (each class 50 minutes in length) was created and used by the first author.

Baseline data was collected after Kent was given a list of tasks and times for completing his usual routine activities. If a task was completed within two minutes of the time listed on his task list, then the task was marked as being completed independently. During the intervention phase, a preset alarm (both and audible tone and a visual flashing signal) would alert Kent to begin each of the listed tasks. Kent's mother recorded the number of morning and evening tasks he completed independently with the help of his PDA, the number of tasks he completed with her prompting him, and the time each was completed. During school, the first author used the same recording process. The number of tasks completed independently was divided by the total number of tasks possible resulting in a percent of tasks completed percentage. Inter-observer reliability (aka inter-rater reliability or IRR) across 20% of data days compared with Kent's paraprofessional was 100%.

Results indicated a significant change from a baseline of 0% of morning and evening tasks and 63% of school tasks completed independently to a mean of 47% of morning, 33% of evening and 87% of school tasks completed independently with the PDA serving the primary prompt. The study ran for a total of 20 days before ending due to a break in the school calendar. Similar to studies completed by Davies, Stock and Wehmeyer (2002) and Norris and Soloway (2003a; 2003b) that utilized a handheld, self-directed visual and audio prompting system, Ferguson et al. (2005) concluded the PDA effectively addressed their student participant's target behavior.

Another study by the same three authors (Myles et al., 2007) utilized the same model PDA containing the same software package, specifically employing the calendar function, to improve the homework recording behavior of a student with Asperger Syndrome. The authors used a multiple baseline across settings design to determine the accuracy with which their 17-year-old male participant recorded assigned homework, the due date of the assignment, and the particular details of the assignment (e.g., which problems to complete, what chapter questions he was supposed to answer, etc.). The study participant, Joseph, had an above average IQ but performed average to below average academically and presented with a history of inconsistently recording homework in his planner. When he did record his homework, he often left out important information such as due dates. Because he oftentimes recorded so little details in his planner he frequently could not recall the specifics of a homework assignment.

Before the study began Joseph had already been required to record homework assignments in his planner for which he received participation points from the resource room

teacher. His pre-intervention data indicated that Joseph's planner entries were incomplete, missing, or required external prompting from one of his teachers. Thus the researchers determined the target intervention behavior would encompass Joseph independently entering his English, history, and science class homework assignments in his planner. A homework assignment was operationally defined as entered correctly if the entry contained "(a) the subject in which the homework was assigned, (b) the date the assignment was due, and (c) qualifying details of the assignment (e.g., problem numbers, chapter questions)" (p. 97).

Joseph and his resource room teacher were trained on how to use the PDA prior to the study. During training, Joseph learned the basic functions of the PDA and how to enter his homework into the device. Joseph was adept with all functions of the PDA by the close of the first training session. His resource room teacher on the hand, experienced more difficulty learning how to operate the device.

Joseph's study was carried out in four stages. First, during baseline phase, Joseph was observed performing the regularly required expectation of all students to record their homework assignments. Data was taken over several days until a stable and predictable trend line was graphed over three consecutive data points. Next Joseph was requested to enter the subject, assignment and due date for his history class but he was prompted to enter the history homework assignment at the beginning of class only on Day 1. After achieving a stable and predictable trend line, Joseph did the same for English and then science but once again, only for Day 1 of each class. For follow through, Joseph received points in the following manner: 1 point for any assignment information, 2 points for entering the subject, and 3 points for entering the subject

and qualifying details of an assignment, and 4 points if the due date, qualifying details, and subject were all entered into his PDA device. A percentage of homework entered correctly figure was calculated by dividing the total number of points earned by 4 (i.e., the total number of tasks). The inter-rater reliability percentage was determined by dividing the number of agreements by the sum of the agreements plus disagreements and multiplying that number by 100 resulting in an inter-rater reliability of 100%.

The authors reported that during baseline, Joseph independently documented his homework assignments in his planner with a mean accuracy rate of 33%, 29%, and 34% for history, English, and science, respectively. During the intervention phase, the mean accuracy rates were, 75%, 75%, and 33% for history, English, and science, respectively resulting in an overall increase in independently recording homework assignments into his planner of 29 percentage points from baseline to intervention.

Research continues to employ technology-based interventions to improve the self-monitoring behaviors of individuals with Autism Spectrum Disorder; however, the recent trend in assistive technology choices appears to be moving toward less obtrusive prompting devices than handheld PDAs offer. In one such study Amato-Zech et al. (2006) used an ABAB reversal design across their participants to examine the effectiveness of a tactile self-monitoring cueing device to increase the on-task (i.e., self-monitoring of attention or SMA) behaviors of three elementary-aged students in an exceptional student education classroom. The participants were selected based on teacher referral of students with low on-task behaviors. The researchers also confirmed the evidence of low SMA behavior via direct classroom observations of all three

participants prior to their final selection for the study. On average, the researchers determined on-task behavior occurred on less than 55% of the intervals observed for all three participants.

The technology used for the study was the MotivAider (MotivAider, 2000), an electronic vibrating device that vibrates to provide a tactile cue to prompt the participant to self-monitor. The device, which resembles a pager, was attached to the participant's belt or waistline after being programmed to emit a vibrating pulse every 2-3 minutes. Whenever the participant felt the vibrating pulse, it was their cue to self-monitor their behavior by indicating on paper-and-pencil recording sheet whether or not they were paying attention at the time the MotivAider vibrated.

Results of Amato-Zech et al.'s (2006) study demonstrated that students increased their on-task (SMA) behavior from an average of 55% to greater than 90% of the intervals observed for all three participants. Teacher and student social validity scores of treatment acceptability were also high. The authors concluded that using the MotivAider to increase on-task behavior for students with learning and behavioral challenges is an effective and practical invention. Based on their results, they also called for additional research to both replicate and extend their findings and to further investigate ways in which students might take a more active role in their own behavioral changes.

Legge et al. (2010) responded to the call for additional research to both replicate and extend their findings in the previously described study and explored the effects of self-monitoring on the on-task behavior of three fifth and sixth grade boys with autism and other disabilities. Two of the boys, one fifth and one sixth grade, had a primary diagnosis of ASD while the third boy, another fifth grader, had a primary diagnosis of cerebral palsy but also

presented with behaviors attributable to ASD (e.g., stereotypy). Once again, these authors employed a MotivAider (MotivAider, 2000) to signal each participant, via vibrating pulse set at a pre-set time schedule, to self-monitor and self-record whether or not they were on-task at the time the MotivAider cued them. Results of their multiple baseline across participants design indicated the existence of a functional relationship between the independent variables (i.e., tactile prompting via the MotivAider) and the resulting increased on-task behavior (dependent variable; Legge et al., 2010).

Assistive technology offers many opportunities for use with students with special needs especially those with ASD. However, because the research in the study involved high school students in their senior year, the researcher was cognizant of the need to respect the dignity of each participant. Although the devices covered in this section of the literature review do offer some degree of unobtrusiveness, an even less attention-attracting device was employed in this study.

Based on the research covered in this literature review, it is clear that individuals with Autism Spectrum Disorder (ASD) have as one of their core deficits a disorder of executive function and further, an inability to consistently self-monitor their on-task and academic productivity behavior. It is also clear that is possible to teach/train students with autism to self-monitor their own task behavior and academic productivity behavior such as completing homework and classroom assignments and documenting homework assignments in their student planners. Simply expecting high school students with executive dysfunction to learn one of the critical executive function skills (i.e., self-monitoring) on their own without explicit training

from teachers, therapists, and parents will more than likely result in a further inability to plan, organize, set goals and self-monitor their on-task and academic performance and behaviors (Ozonoff, 1998).

As stated early on in this literature review, students with ASD value structure and being in control (Klin & Volkmar, 2000; Wilkinson, 2008). Thus, since interventions to improve self-monitoring and move more responsibility from teachers, parents, and others to the student with ASD are adequately supported in the research (Dorminy, Luscre, & Gast, 2009; Klin & Volkmar, 2000; Wilkinson, 2008), it makes sense that this study should focus on training students with ASD to self-monitor their academic productivity behavior (e.g., homework and classroom-based work completion and submission rate and rate and accuracy of planner documentation); an idea current research supports as critical to the academic success of students with Autism Spectrum Disorder. Indeed, the single most important finding of this review of the literature is that there is an obvious need for studies investigating the effectiveness of self-monitoring intervention behaviors on the academic productivity, and by default, the academic success of secondary students with ASD.

This literature review established the fact that current research supports the effectiveness of self-monitoring interventions for individuals with autism. At the same time however, there is a gap in the literature with regard to investigations concerned with the effectiveness of self-monitoring interventions for secondary level students with ASD primarily educated in the general education classroom setting. This study shall serve to address that gap by exploring the effect of a self-monitoring treatment intervention package (independent variable) on the

academic productivity behavior (dependent variable) of three high school students with ASD by addressing the following research question:

> What is the effect of a self-monitoring treatment intervention package on the academic productivity behavior of three high school students with autism spectrum disorder in a general education setting?

Using the empirical results of the studies presented in this literature review as a foundation for predicted outcomes, the author offers also offers the following hypotheses:

As a blended self-monitoring treatment intervention package, an assistive technology device in combination with academic productivity self-recording and performance graphing instruments, will improve the academic productivity behavior of students with ASD being instructed in the general education setting.

CHAPTER THREE: METHODOLOGY

Study Design

This study employed a three phase multiple baseline across participants design to investigate the effect of a self-monitoring treatment intervention package on the academic productivity behavior of three high school students with Autism Spectrum Disorder (ASD). "Single-subject research designs provide experimental control for most threats to internal validity and, thereby, allow confirmation of a functional relationship between manipulation of the independent variable and change in the dependent variable" (Horner, Carr, & Halle, 2005, p. 168). Experimental control is established when the researcher can demonstrate evidence "of the experimental effect at three different points in time with a single participant (within-subject replication), or across different participants (inter-subject replication)" (p. 168). According to Horner, Carr, and Halle (2005), experimental control is documented through introducing and withdrawing an independent variable, staggering the introduction of an independent variable at various points in time, and repeatedly manipulating the independent variable across different phases of the experiment.

A multiple baseline design is appropriate in educational and clinical research venues where "it is not possible or desirable [or ethical] to reverse the effects of an intervention, as with academic, aggressive, and self-injurious behaviors" (Gast, 2010, p. 325). Furthermore, the design was selected due to its ability to demonstrate inter-subject replication across participants as well as to defend against potential threats to internal validity (Gast, 2010). A multiple

baseline design should allow for a data trend to be established with a minimum of five data points (Horner et al., 2005) resulting in less data collection and a decrease in the delay time for participants to move from baseline to treatment (Gast, 2010).

As pointed out in the literature review, there is ample evidence in the research in support of using technology as part of a self-monitoring treatment intervention package designed to assist students with ASD in developing their self-monitoring skills. Therefore, this study will attempt to answer the following research question: What is the effect of a self-monitoring treatment intervention package on the academic productivity behavior of three high school students with autism spectrum disorder in a general education classroom setting?

Participants

A total of three students assented to participate in this study with their parents giving written consent. All three participants are Caucasian males, seniors (i.e., in the 12th grade), and attend an East Central Florida high school where the investigator, a speech-language pathologist, is currently employed. All participants have a well-documented history of low academic productivity behaviors. For this study, acceptable academic productivity behaviors shall be defined as completing and submitting one's homework assignments (given accommodations as documented on each participant's respective IEP) on a regular and consistent basis; completing, and when appropriate, submitting one's classroom-based work (given accommodations as documented on each participant's respective IEP) such as in-class projects, taking lecture notes, taking assessments (i.e., quizzes and exams) and small-group work; and writing down homework

assignments in one's student planner on a daily basis.

The three student participants formed a homogeneous sample based on the fact they shared the same following characteristics: enrolled as a seniors in high school and pursuing a standard diploma track in the general education setting, in possession of at least an above average intelligence level (see Appendix J), performing at or near the same academic level as their same-age peers as measured by their performance on the Peabody Individual Achievement Test (PIAT; see Appendix J) have a medical diagnosis of Autism Spectrum Disorder, meet the county school system's eligibility criteria for the Autism Spectrum Disorder Program, have an individual education plan (IEP) with ASD as their primary category of service, receive exceptional student education (ESE) services under the Autism Spectrum Disorders label, have a well-documented history (according to school records) of low academic productivity behaviors, at risk for failing the course in which the target intervention was implemented, and at-risk for not attaining academic-based graduation requirements for graduation during the 2012-2013 academic school year.

Setting

The study was conducted at a high school in an East Central Florida public school district. Participant training took place in the speech-language pathology resource room; a well-lit, 35x25-foot standard-sized classroom with a single entry/exit windowed door. The settings for the intervention and maintenance phases were Participant 1's (P1) English Honors classroom, Participant 2's (P2) Math for College Readiness classroom and Participant 3's (P3) Forensic

Science classroom.

P1 and P2's classrooms were 35 x 25-foot standard-sized with a single entry/exit windowed door. Students were seated in standard resin chairs with metal legs and particleboard Formica covered desktops, all facing the front of the classroom. P3's classroom, which was in the Science Building, was 40 x 25-ft with a windowed entry door at the front of the room and a windowed exit door at the back of the room. Students sat at granite top tables, two to a table, placed in two columns, six rows per column two tables per row. P1 and P3 had 25 students in each of their classes while P3 class, a popular elective, had 32.

Materials

There are three items that were used as part of the self-monitoring treatment intervention package: a WatchMinder2, a Student Paper-and-Pencil Academic Productivity Recording Form, and a Student Paper-and-Pencil Performance Graphing Worksheet. Each item is discussed below:

WatchMinder2 (WM2; see Figure 1)-The WM2 resembles an ordinary digital wristwatch that was worn on the participant's wrist of choice. The WM2 is fully programmable and was utilized to deliver interval and fixed timed vibrating and text message prompts to cue participants to remain on task, submit homework and classroom-based assignments, and write details about the evening's homework assignment (when assigned) in their academic planner.

Student Paper-and-Pencil Academic Productivity Recording Form (see Appendix D)-Participants used this recording form to document the completion and submission rate of

homework assignments and classroom-based work as well as the accuracy and completion rate of homework assignment documentation in their student planner.

Student Paper-and-Pencil Performance Graphing Worksheet (see Appendix F)-During the intervention and maintenance phases, participants transferred the data from their academic productivity recording forms onto the graphing worksheet providing each participant with a running visual representation of their academic productivity behavior for the week.

Figure 1: The WatchMinder2 Vibrating Watch and Reminder System

Procedures

This study, which began six weeks into the 18-week long final spring semester of the participant's senior year, employed a multiple baseline across participants design divided into three phases: baseline, intervention, and maintenance. P1's baseline, intervention and maintenance phases were in effect for one, four and six weeks, respectively. P2's baseline, intervention and maintenance phases were in effect for two, four, and five weeks, respectively. P3's baseline, intervention and maintenance phases were in effect for four (to be precise, three weeks and 4 days), four, and three weeks, respectively. During all phases of the study,

participants did not receive any additional or alternate training aimed at improving their academic productivity behavior apart from the training provided in the present study.

The researcher followed the procedural protocol outlined in Gast (2010) by first identifying a "minimum of three participants who exhibit similar behaviors under similar environmental conditions [and] are independent of one another" (Gast, 2010, p. 314). The target behavior was measured for each participant under pre-treatment intervention conditions until a stable and predictable trend was established for each. Once an acceptable level and trend was established for a participant, the self-monitoring treatment intervention package (independent variable) was introduced to that participant while the researcher continued to measure the academic productivity behavior (dependent variable) of the other two participants under pre-treatment intervention conditions (i.e., baseline condition).

When the target behavior (i.e., academic productivity behavior) reached the preset criterion level (i.e., 80%) for the first participant in the treatment intervention phase, then the researcher introduced the independent variable to the second participant with the most stable baseline data while continuing to monitor and collect baseline data on the last participant still in baseline. "This systematic and sequential introduction of the independent variable continues until all participants have been introduced to the same intervention" (p. 314). After four weeks in the treatment intervention phase and after a participant was able to maintain criterion over the last five consecutive data points, that participant was moved to the maintenance phase. The maintenance phase allowed the researcher to determine if the experimental effect was durable over time and it avoided the ethical dilemma inherent in a withdrawal phase.

Treatment Integrity and Procedural Fidelity

In an effort to add treatment fidelity and procedural fidelity to the methodological approach of this study, the researcher executed the following four procedures:

1. Each participant was video recorded with an iPod II using the iMovie software application during a one-on-one training session with by the researcher on the first day of the treatment intervention phase, thereby. This provided for a permanent record of treatment across participants (Gast, 2009). Also, in the event a participant needed a booster training session (during the maintenance phase) the researcher could simply play the 15-20 video of the participant's original training session followed by a 3-5 minute question and answer session at the participant's discretion.
2. The researcher followed a strict step-by-step scripted narrative protocol and used a procedural fidelity checklist for each participant's individual training session (see Appendices A).
3. Two trained observers-both certified ESE teachers external to the study-viewed each participant's individual training video recording with a Step-by-Step Treatment Procedural Fidelity Checklist for Video-Recorded Treatment Sessions and Inter-Observer Agreement Calculation Worksheet (see Appendix B) in hand to ensure all procedures outlined in the Step-by-Step Treatment Protocol Narrative (Appendix A) were thoroughly followed.
4. To further augment and amplify the treatment fidelity and procedural fidelity of the study, Inter-Observer Agreement (IOA) scores were calculated using the point-by-point method (see Appendix B; Gast, 2010). The point-by-point method (see Figure 1) calls for the

researcher to add up the total number of times two independent observers agree on ratings between their individual rating forms on a point-by-point basis (i.e., item-by-item). This number is then divided the total the number of agreements plus disagreements between the two observers' forms. The result is a quotient that is then multiplied by 100 to generate the IOA score. Gast (2010) suggests the minimum acceptable IOA score is 80%. In this study, IOA scores of 100% were calculated for all three individual treatment intervention sessions. This indicates a high likelihood that all critical training points and procedures were followed by the researcher and more importantly, that all three participants received the same level and quality of treatment.

$$\frac{Agreements}{Agreements + Disagreements} \times 100 = Percent\ Agreement$$

Figure 2: Inter-Observer Agreement /Inter-Rater Reliability Formula

Inter-Rater Reliability

In order to be in line with What Work's Clearinghouse' (http://ies.ed.gov/ncee/wwc/, http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_scd.pdf) evidence standards of *strong evidence* of causal relations, the researcher measured the dependent variable (i.e., academic productivity behavior) systematically over time by more than one rater on at least twenty percent of the data points across all conditions (e.g., baseline, intervention, and maintenance). In this study, inter-rater reliability score thresholds (aka, inter-assessor) were set a priori to not fall below the minimal threshold criteria of .80 to .90 (as an average) as measured by percentage agreement (Kratochwill et al., 2010; Kratochwill et al., 2013)

Inter-Rater Reliability (IRR) scores were calculated using an event recording, point-by-point method approach (Gast, 2010). The point-by-point method (see Figure 1) calls for adding up the total number of times two independent raters agree on ratings between their individual rating forms on a point-by-point basis (i.e., item-by-item). This number is then divided by the total the number of agreements plus disagreements. The result is a quotient that is then multiplied by 100 to generate the IRR score. IRR results will be discussed in detail in the Results chapter.

Social Validity

(Wolf, 1978) recommended that data should be collected to identify a study participant's perceptions regarding the value of the intervention as a means of establishing its value to society. In other words, what is the value of an intervention, even if it results in increasing positive behaviors or decreasing negative behaviors, if study participants would not consider using the intervention beyond the boundaries of the study, if parents would not recommend the intervention to other parents, or if teachers and clinicians would not support the use of the intervention with similar groups of students to facilitate similar success. Wolf refers to this concept as social validity and proposes that social validity measures be included in all research designs as a matter of course claiming that researchers should not be the sole judges as to whether or not a treatment intervention is socially valid.

Therefore, social validity data was collected using a Likert-style questionnaire (see Appendices J, K and L) designed to allow respondents to rate their level of agreement or

disagreement with a series of statements. In creating the social validity instrument, the researcher closely adhered to Wolf's framework in formulating the questionnaire items. All three student participants, their mothers and their target class teacher will also be encouraged to answer the open-ended questions included on the social validity questionnaire. Social validity outcomes will be discussed in the Results chapter.

Data Analysis

This study employed visual analysis techniques to describe the level; trend; variability; immediacy of effect; overlap and consistency of data patterns across similar phases of performance during baseline, intervention and maintenance conditions; and the magnitude of any effect the manipulation of the independent variable had on the dependent variable (Dorminy et al., 2009; Horner et al., 2005; Kratochwill et al., 2010; Kratochwill et al., 2013; Palmen, Didden, & Lang, 2012) Level is the average (i.e., mean) performance during a condition/phase of a study (Horner et al., 2005; Kratochwill et al., 2010), trend is the rate of increase or decrease of the best-fit straight line (i.e., slope) for the dependent variable within a condition/phase (Horner et al., 2005) and variability is "the degree to which performance fluctuates around a mean or slope during a phase" (Horner et al., 2005, p. 171).

Immediacy of effect compares the final three data points in the previous phase and the first three data points in the phase that is just getting underway (Kratochwill et al., 2010). Immediacy is also referred to as latency. When researchers speak of "latency" they are talking about how quickly, or slowly, a participant reacts to the treatment intervention (or the withdrawal

of the treatment intervention) in the desired direction of the researcher. Quick responses to the introduction (or withdrawal) of the treatment intervention are more convincing. They give researchers more support to claim the change in behavior was due to the effect the manipulated independent variable is having on the dependent variable, whereas delayed or gradual effects are a threat to the internal validity of the study (Kratochwill et al., 2010).

Overlap is the percentage of data in one phase that overlaps with data in the prior phase (Kratochwill et al., 2010). The greater the overlap, the less support the manipulation of the independent variable was effective. On the other hand, the less overlap the better it is for the researcher who is trying to demonstrate a treatment intervention effect (Kratochwill et al., 2010; Kratochwill et al., 2013). Consistency refers to the consistency of data patterns across similar phases of performance with "multiple presentations of intervention and nonintervention conditions" (Kratochwill, et al., 2010; Horner et al., 2005, p. 171).

Based on the percentage of overlap between phases, namely baseline and intervention, researchers can make claims regarding the magnitude of the effect of the treatment. Employing Scruggs and Mastropieri (1998) and Gast's (2010) approach for measuring the effect of single subject design studies, the investigator calculated the percentage of non-overlapping data points (PND). To do so, the researcher observed the graphed data between conditions and determined a range of data-point values of the first condition. Next the number of data points in the second condition was counted along with the number of data points in the second condition that fall outside the range of values of the first condition. Finally, the researcher divided the number of data points in the second condition that fell outside the range of data points of the first condition

by the total number of data points in the second condition and multiplied the resulting quotient by 100 to obtain the PND (Gast, 2010). The higher the PND, the greater the impact (i.e., effect) of the intervention on the target behavior (Gast, 2010). Scruggs and Mastropieri (1998) state that a PND of 90% or higher represents a large effect; 70% to 90%, a medium effect; and 50 to 70%, a small effect.

By integrating and comparing the information produced from the multiple assessments referenced above, conclusions can be made about the existence of a functional relationship between the independent and dependent variables contained in this study (Horner et al., 2005). Data was graphed after each session and used for visual analysis of the primary dependent measure to judge if a functional relationship existed between the independent and the dependent variables (Gast, 2010). Single-subject research results may be interpreted with the use of various traditional methods of statistical analyses (Kratochwill, et al, 2013; Todnian & Dugard, 2001). However, it's considered standard procedure to analyze single-subject research by way of systematic visual analysis of data within and across conditions (Horner et al., 2005). Therefore, the aforementioned visual analytic techniques were the methods of analysis selected for this study.

CHAPTER FOUR: RESULTS

A description of each phase, criteria for phase changes, and specific details about each participant's performance within each of the three phases follows.

Baseline

All three participants began in the baseline condition. During baseline, self-monitoring procedures were not in place. Each classroom teacher was instructed not to do anything out of the ordinary for each participant other than to provide each student with the accommodations listed on their IEP. The researcher had initially planned to fit target classroom teachers with WatchMinder2 devices set to prompt each professional to take academic productivity behavior data. However, there are several warnings in the literature (Gast, 2010; Horner et al, 2005) cautioning investigators against any pre-treatment intervention practice that runs the risk of alerting would-be participants as to the real or the participant's imagined nature of the study. There is always a possibility that baseline data collection and evaluation procedures can cause a reactive effect in participants thus, the researcher opted for a mix of in-class observations, review of electronic grading records and teacher interviews. Even so, the Researcher and Teacher still used the Researcher/Teacher Paper-and-Pencil Academic Productivity Recording Forms (see Appendix C) to record baseline observational data and determine inter-rater reliability (IRR) scores between each other's academic productivity recording forms (see Appendix E).

Adding to the concern about reactive effects was the fact that baseline planner documentation data would be the most challenging to obtain. There would be great risk of

inadvertently tipping off a participant if the researcher requested permission to look through the participant's student planner. Therefore, in order to avoid a reactive false positive effect (e.g., student begins documenting homework and other academic to-do tasks) resulting in loss of experimental control (Gast, 2010), the researcher opted to secure more compelling data such as daily interviews with the teacher about student participant academic productivity related behaviors and daily review of electronic grading records during baseline, the researcher was confident planner documentation behavior would be yield a stable and predictable trend line for all three participants. The subjective data from teacher interviews alone indicated that all three participants were not using their planners to document homework assignments on a daily basis. Post-baseline/pre-treatment intervention data confirmed this in that based on an analysis of each student's planner prior to beginning treatment, all three study participants were inconsistently writing homework and other pending academic tasks in their student planners, if at all. When participants did write in their planners, the information was illegible, incomplete and/or unrelated to the target course (e.g., clinic, media center, guidance counselor and/or rest room passes). The result was extremely low planner documentation behavior across all three participants.

In order to determine the first participant to move from baseline to treatment, the investigator must first determine the level of stability of baseline data by way of deliberating the range in data point values within a series of probes (Gast, 2010). Gast (2010) further explains that data are generally accepted as stable by way of the 80/20 rule, that is, 80% of the data points need to fall within a 20% range of the median level of all data points within a condition. To accomplish this, the researcher determined what the 20% range meant in terms of data points in

either direction rounded to one point in either direction. Gast's (2010) guidelines state that the participant with the most stable and predictable individual baseline data over three consecutive data point probes will be the one to move into treatment first. However, in recent years investigators have been adopting Horner et al.'s (2005) practice of using a minimum of five data points in determining a stable and predictable trend line thus, the researcher will employ this latter standard. Thus in order to move from phase to phase, 80% of a participant's data points in the current phase must fall within 20% of the median level for all data points within the current phase.

The goal of baseline is to establish a stable and predictable trend prior to introducing a treatment. Baseline serves as the "no treatment" or pretreatment condition against which data from the treatment intervention phase are compared. Horner et al. (2005) suggest that during baseline, the dependent variable should be measured sufficiently enough that a pattern of future responding (i.e., trend) is fairly predictable. As already mentioned, their specific suggestion is take at least five data points before attempting to establish a stable and predictable trend.

P1 established a stable and predictable trend after five data points (i.e., after five days). However, after five days in baseline, P2's academic productivity behavior was very similar to P1's so a decision had to made as to whether P1's baseline academic productivity behavior data was more stable and predictable than P2's or vice versa. The researcher ultimately determined thatP1's academic productively behavior performance trend line was slightly more stable and predictable than P2's. Add to this the fact that P1's grade point average in his English Honors course was well below P2's grade point average in his Math for College and Careers course, and

P1 became the first participant to enter treatment, leaving P2 to remain in baseline for at least another week. (Note: This is discussed further in the Threats to Internal Validity and Recommendations for Future Research sections in the Discussion chapter.)

An important rule of thumb to remember regarding baseline behavior is that one is looking for either a flat line of data points or a trend that is in the opposite direction of what one expects the post-intervention trend to be (Horner et al., 2005). On the other hand, if the baseline data trends in a direction similar to that which is predicted by the intervention, then the researcher effectively loses experimental control before ever having the opportunity to document a treatment effect (Gast, 2010). At first glance of P2 and P3's baseline academic productivity composite scores, it appears that there is a loss of experimental control. However, P2 began stabilizing around Data Point 5 and remains stable through Data Point 10. A review of P3's baseline phase in Figure 3 indicates a loss of experimental control in baseline around Data Point 6. However, after Data Point 12 data become more stable, predictable and consistent.

Although P3 demonstrated a stable and predictable trend in baseline he was not performing as poorly academically as P1 and P2 at the time of the study's commencement thus, he remained in baseline the longest (i.e., 3.5 weeks or 18 days) and only entered the treatment intervention after P2's intervention data produced a stable and predictable trend. This will be discussed further in the intervention phase section below.

Intervention

Once P1 established a stable and predictable pattern of performance in baseline, the

researcher met with him to conduct his individualized training session on the treatment intervention package (i.e., WM2, self-recording form and performance graphing worksheet) with the researcher strictly adhering to the scripted Step-By-Step Treatment Protocol Narrative (see Appendix A). Every participant's training session was videotaped for treatment fidelity purposes and to create a permanent product of everyone's training session. After the initial, individualized training session, the researcher would meet daily with the participant before his target class in order to personally place the WatchMinder2 on the participant's preferred wrist and hand the participant a student academic productivity recording form with their name, teacher's name, class name and current date in the spaces provided. Over the course of both the intervention and maintenance phases, participants were expected to leave their WM2 and completed tracking sheet on their teacher's desk at the end of the 90-minute target class period.

Beginning at 5 minutes into the 90-minute class period of their target class and every 10-minute fixed interval thereafter, participants would receive a vibrating prompt followed by the text prompt "ONTSK?" displayed on the watch's face. This was basically asking participants to honestly evaluate whether or not they were on task. Participants were trained on what on-task and off-task behavior encompassed (see Appendix A) and if they were off task, then they were to get back on task, make every attempt to do what others were doing, or if they were unsure or "lost" they were to ask their teacher what they should be working on (see Appendix A).

At 10 minutes into each 90-minute class period participants received a vibrating prompt followed by the text prompt "HMWORK" displayed on the watch's face. Per their training, participants responded to the homework prompt by showing their target classroom teacher

evidence of full or partially completed homework, circling "Yes" and recording a 1 point gain, and finally, circling the points corresponding to the percentage of last night's homework assignment they had completed. The participant then calculated and recorded the number of points they had earned out of the five points possible in the homework section of their student academic productivity recording form. If a participant failed to submit or show evidence of his partially or fully completed homework assignment, then he received 0/5 points on the homework section for the day. If the teacher did not assign a homework assignment for the previous night or if the participant did not have leftover classroom-based work to be completed as homework the night before, then participants were to write "N/A" in the homework section point total cell. For N/A situations, the total number of points possible for the day would be reduced by five to avoid negatively impacting the participant's academic productivity composite score for the day.

Next, 20 minutes before the end of the 90-minute class period, participants received a vibrating prompt followed by the text prompt "CLWORK" displayed on the watch's face. Per their training, participants responded to the class work prompt by showing evidence of full or partially completed class work, circling "Yes" and recording a 1 point gain, and finally, circling the points corresponding to the percentage of the day's classroom-based work (e.g., quizzes, exams, small group tasks, independent seat work, notes taken during teacher lectures, etc.) they had completed during class that day. The participant then calculated and recorded the number of points they had earned out of the five points possible in the class work section of their student academic productivity recording form. If a participant failed to submit or show evidence of his partially or fully completed class work assignment, then he received 0/5 points on the classroom-

based work section for the day. In the rare event that there wasn't a classroom assignment for the day, then participants were directed to write "N/A" in the classroom-based work section point total cell. For N/A situations, the total number of points possible for the day would be reduced by five to avoid negatively impacting the participant's academic productivity composite score for the day.

Finally, 10 minutes before the end of the 90-minute class period, participants received a vibrating prompt followed by the text prompt "PLANNR" displayed on the watch's face. Per their training, participants responded to the planner prompt by circling one point for writing down each of the following three items: the appropriate subject name for the homework assignment; the correct chapter, worksheet, or task; and the specific homework problems or academic task to be completed. In addition, participants received one point each for writing their homework on the correct day in their planner and for writing legible enough that the teacher could read what had been written in the participant's student planner.

The participant then calculated and recorded the number of points they had earned out of the five points possible in the planner documentation section of their student academic productivity recording form. If the participant failed to bring his planner to school or to the target class, then he received 0/5 points on the planner documentation section for the day. The planner documentation was the only section where the student was expected to earn points every day of the intervention and maintenance phase conditions.

Upon introduction of the treatment to P1, there was an immediate increase in his academic productivity behavior that continued over the next five days resulting in a stable and

predictable upward trend line with little variability. Baseline data continued to be collected for P2 and P3 during the first five days of P1's treatment. Data across all three phases was entered daily into a spreadsheet using Microsoft Excel (2011) in order to produce line graphs for visual analysis (see Data Analysis section in Results chapter for further explanation).

P2 required a longer stint in the baseline phase (i.e., nine days) in order to meet the 80/20 criteria and establish a stable and predictable trend line. As a result, P3 was not able to begin treatment until roughly three and one-half weeks (i.e., 18 days) into the study. P2's extra time in intervention was due to variability in data which was possibly the result of illness (see Threats to Internal Validity section in the Discussion chapter). Upon establishing a stable and predictable trend line for P2, the treatment intervention package was introduced to P3.

After every fifth consecutive day of treatment, the researcher would meet individually with each participant to review the data recorded on their academic productivity recording forms and to calculate and graph percentages for the academic productivity subcomponents of homework submission and completion rates, classroom-based work submission and completion rates, planner documentation and accuracy rates, and the academic productivity composite scores (see Appendices D and F, respectively). Based on overwhelming support in the literature for providing visual supports for students with ASD (Cihak et al., 2010; Dorminy et al., 2009; Harrower & Dunlap, 2001; Wilkinson, 2005; Wilkinson, 2008) a graphing component was included as an integral part of the three-pronged treatment intervention designed for this study (Holifield et al., 2010). Therefore, as part of the weekly data review sessions, participants graphed their academic productivity subcomponent scores, academic productivity composite

scores and on-task self-reflection percentage scores using the same color of colored pencil for a particular score over the course of the study. This allowed for an effective visual comparison of the current five-day period with the prior weeks' performances; a practice that worked well during the intervention phase but one with which the researcher struggled to maintain during the maintenance phase for a number of reasons to be discussed below in the maintenance phase section.

Clarification about the "ONTSK?" prompt needs to be made at this point. Although the student's self-perception of on-task behavior data was not a critical component of the academic productivity composite score, it was still tracked and graphed not only because 1) the "ONTSK?" text prompt participants received via the WM2 several times each class session, and 2) the researcher wanted participants to create the semblance of a link between being aware, in the moment, mentally present, on-task if you will and being academically productive.

The weekly meetings between the researcher and individual participants were also a time for the researcher to review inter-rater reliability (IRR) scoring data (two to three days per week or 40-60% of five consecutive days) based on a comparison of the researcher's academic productivity behavior ratings (see Appendix C) with the participant's academic productivity behavior ratings. This was considered a "review" because this was initially done with the participant the day after an in-class observation by the researcher but just before the student participant's target class began for the day (see Inter-Rater Reliability section below). Review time was also an opportunity to reconcile student academic productivity recording form data with electronic grading records for compliance with homework and classroom-based

assignments as well as to perform a physical check of the rate and accuracy of the student participant's planner documentation data against actual entries in their student planner.

In order to change conditions, Gast (2010) suggests that researchers must first set a performance criterion-level *a priori* (i.e., before commencing the study and beginning the process of data collection). Therefore, the researcher decided that participants must demonstrate an academic productivity behavior composite score of at least 80% accuracy when determining whether or not they are being consistently academically productive by completing and regularly submitting teacher assigned homework tasks, regularly completing and submitting classroom-based work, and regularly and accurately documenting homework assignments in their student planner.

Each participant experienced a drastic dip in their academic productivity behavior at one point in time during the intervention phase. On Day 22 of the study, P1's academic productivity composite score dropped to an intervention phase low of 20%. P1 had been under quite a bit of stress for several days leading up to Day 22, much of it self-imposed in the opinion of the researcher, and in his words, he "just needed a break from everything" and "simply didn't feel like participating". The researcher thanked him for his participation thus far and encouraged him to keep going. However, in an effort to be honor study participant rights, the researcher reminded P1 that he reserved the right to back out of the study at any point in the study. P1 did not attrite and remained in the study until its completion.

On Day 25, P2 and P3 also experienced a sudden dip in academic productivity behavior. In hindsight, P2's digression was related to the fact that he was in the initial stages of developing

a gastrointestinal virus. It was also two days before Spring Break. Upon returning from Spring Break, P2 sporadically attended school over the next few weeks during his extended recovery period. P3's situation was entirely different but still caused some initial alarm since it came only three days after of P1's drop in performance. At the end of Day 25, I picked up P3's WM2 and tracking sheet in his target classroom teacher's room and noticed that he had an academic productivity score of 0% with 0's in each category-homework, class work and planner documentation. However, he had documented an on-task behavior rate of 75%. The researcher met with P3 the next day to inquire about the low score. P3 stated that he had simply left everything at home that day-homework, a project that was due, his student planner-everything. The researcher thanked him for his honesty and requested that in the future he share information such as this when he was given his WM2 and tracking sheet for the day.

After 20 consecutive days in the treatment intervention phase, a participant was eligible to move into the maintenance phase if he 1) met the 80/20 rule and 2) maintained 80% performance criterion over his last five consecutive days in the treatment intervention phase. If both criteria were met, then the participant was moved from the more intensive treatment intervention phase into the less treatment intensive maintenance phase that involved less researcher oversight.

Maintenance

Once a treatment has been applied to a behavior, it is never terminated, removed or otherwise permanently withdrawn until the study has concluded for to do otherwise is considered

unethical (Gast, 2009; Horner et al., 2005). The withdrawal and reversal designs are useful in demonstrating an intervention effect by facilitating a participant's return to baseline behavior followed by a re-introduction of the treatment intervention and a subsequent return to pre-withdrawal (or pre-reversal) treatment intervention phase conditions. However, multiple baseline designs do not require any reversals, a withdrawal condition, or a return to a baseline condition to demonstrate experimental control, thus researcher selected it as the design of choice for the current study. Therefore, in lieu of a complete withdrawal of treatment, the researcher opted to include a maintenance phase whereby participants would still be using all three components of the treatment intervention package, but with greater independence and less researcher and teacher oversight.

Thus, after at least four weeks under treatment intervention conditions, each participant's data were visually analyzed for evidence of a stable and predictable trend line. As a result of this analysis, P1 remained a total of 21 days in treatment in order to secure another data point at or above the pre-established 80% criterion level. The researcher ensured that all three participants' last five data points of the intervention phase indicated a stable and predictable trend before moving each into the maintenance phase condition. In the maintenance phase, procedures mirrored intervention phase procedures with three exceptions: 1)utilizing a teacher version of the academic productivity recording form (see Appendix C), IRR scores were calculated after either a one-to-one post-class interview of the target classroom teacher by the researcher or from a classroom teacher's completed academic productivity recording form, 2) IRR data was collected for no more than two target class sessions (i.e., 20-40%) every five consecutive days of

treatment, 3) student participant's reported daily to the researcher's office to collect their WM2 and academic productivity recording sheet before their target class, and 4) the researcher took a more participant-centered approach to the weekly data review meetings which resulted in participants not showing for their sessions on several occasions.

The goal of the maintenance phase was to be unobtrusive in oversight, to turn more control over to the student, and to create a feeling in the student that they were not being hovered over. As mentioned, the researcher opted for the addition of a maintenance phase in lieu of a withdrawal phase because it appeared to be a more ethical approach to withdrawing supports altogether. Also, in the event of two consecutive downward trending academic productivity scores falling below 80% (i.e., the *a priori* performance criterion), the researcher met with the below criterion participant within 24-hours for a 15-20 minute booster treatment session. Booster sessions included an informal review of the treatment intervention package using the procedural fidelity checklist (see Appendix B) and a review of the participant's current level of progress via review of their self-graphing worksheet and their last three to five academic productivity tracking sheets. Upon request by the participant, the video recording of their initial treatment session was also reviewed. Booster treatment sessions were provided two times to P1 and three times to P2 during the maintenance phase (see shaded cells in Table 1 below). Only P2 requested to review his treatment video and this occurred during his second booster session. Since none of the booster sessions were videotaped or viewed by trained observers, IOA scores were not calculated. P3 did not require booster treatment sessions.

Over the course of this nearly 12-week long study, each participant's academic

productivity component score, which encompassed the subcomponent scores of homework completion and submission rate, classroom-based work completion and submission rate and planner documentation accuracy and completion rate, was calculated daily and entered into a table. These daily academic productivity scores, periodic IRR scores and weekly grade point averages for the target-class collected during the intervention and maintenance phases are reported in Table 1 below.

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Table 1: Academic Productivity Scores, Inter-Rater Reliability Calculations and Weekly GPA

Day & Date	Participant 1			Participant 2			Participant 3		
	AP ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**
(1)	20B	*100 (R & T)		20B	*100 (R & T)		40B	*80 (R & T)	
(2)	20B			27B			40B		
(3)	20B		44%	20B	*100 (R & T)	64%	33B		42%
(4)	20B	*100 (R & T)		33B			33B		
(5)	20B			33B			33B		
(6)	60T	80		33B	*100 (R & T)		50B	*80 (R & T)	
(7)	80T			33B			40B		
(8)	80T	100	47%	27B		52%	50B	*100 (R & T)	71%
(9)	90T			27B			40B		
(10	90T	90		27B	*100 (R & T)		40B		
(11	80T	100		60T	100		40B		
(12	73T			67T	100		50B		
(13	87T	100	55%	87T		57%	33B	*80 (R & T)	87%
(14	67T	100		80T	100		40B		
(15	School Event			School Event			School Event		
(16	67T	90		80T	90		40B		
(17	87T			87T			33B		
(18	93T		73%	80T	100	55%	33B		81%
(19	100T	80		80T	100		33B	*90 (R & T)	
(20	100T	100		80T			80T	100	
(21	100T			80T			80T	100	
(22	20T	100		80T	100		80T	90	
(23	100T	100	73%	73T		58%	93T	100	81%
(24	100T			60T	100		100T		
(25	100T	100		50T	80		0T		
(26	100T			100T			80T	90	
(27	100T			80T	100		100T		
(28	100M		77%	Absent		63%	100T	100	89%
(29	100M	100		80T	90		80T	100	

Day & Date	Participant 1			Participant 2			Participant 3		
	AP ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**
(30)	SLP Off Campus			SLP Off Campus			SLP Off Campus		
(31	100M			80T	100		Absent		
(32	100M	100		87T			100T	100	
(33	Absent		78%	Absent		65%	100T		84%
(34	Absent			80T	100		100T		
(35	100M	100		Absent			100T	90	
(36	100M			87T			100T		
(37	Absent			100M	100		87T	80	
(38	School Event		75%	School Event		68%	School Event		84%
(39	Absent			67M			80T	100	
(40	100M			60M	100		80T		
(41	100M			73M	100		100T	90	
(42	100M	100		67M			100T	90	
(43	SLP Off		74%	SLP Off		70%	SLP Off		84%
(44	100M			73M	100		100M	100	
(45	87M	90		Absent			80M		
(46	100M			Absent			67M		
(47	100M			Absent			87M	100	
(48	67M	80	68%	Absent		71%	100M		90%
(49	67M			Absent			Absent		
(50	100M	100		Absent			100M		
(51	67M			80M	80		80M	100	
(52	67M	90		80M	100		80M		
(53	100M		66%	73M		72%	100M	100	90%
(54	100M	100		73M	100		100M		
(55	100M			80M			93M	100	
(56	100M	100		100M			80M		
(57	100M			100M			100M	100	
(58) 5/1	5/13 to 5/17 EXAM WEEK		73%	5/13 to 5/17 EXAM WEEK		68%	5/13 to 5/17 EXAM WEEK		84%

Day & Date	Participant 1			Participant 2			Participant 3		
	AP ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**	**AP** ***B = Baseline T = Treatment M = Maintenance***	**IRR**	**GPA**
0									
Data obtained for 91% of all sessions Final English Honors GPA: 82%				Data obtained for 81% of all sessions Final Math for College Readiness GPA: 74%			Data obtained for 94% of all sessions Final Forensic Science GPA: 90%		

Note: Shaded cells indicate the occurrence of two days in a row of below criterion academic productivity composite scores (i.e., < 80%) after which a booster session was conducted to bring the participant back to criterion (i.e., >80%).
**Researcher-Teacher inter-rater reliability (IRR) scores in baseline.*

Inter-Rater Reliability Scores

Inter-rater reliability data is displayed in Table 1. In the current study, IRR scores were collected for 40% of P1's baseline phase days, 60% of his intervention phase days and 42% of his maintenance phase days with average IRR scores of 100% (no range), 95% (range: 80-100) and 96% (range: 80-100), respectively. For P2, IRR scores were collected for 40% of his baseline phase days, 65% of his intervention phase days and 50% of his maintenance phase days with average IRR scores of 100% (no range) and 97% (range: 80-100) in both the intervention and maintenance phases. Finally, IRR scores were collected for 22% of P3's baseline phase days, 65% of his intervention phase days and 46% of his maintenance phase days with average IRR scores of 86% (range: 80-100), 95% (range: 80-100) and 100% (no range), respectively. The total percentage of days for which IRR scores were collected in baseline for P3 is noticeably lower.

Academic Performance

Weekly grade point averages for P1's English Honors course, P2's Math for College Success course, and P3's Forensic Science course are also presented in Table 1. In Table 1, one can see that P1's GPA ranged from a low of 44% in baseline to a high of 78% just after entering the maintenance phase. His academic productivity behavior indicates he appeared to struggle most of all three participants during the maintenance phase as evidenced by his significant dip in academic productivity composite scores and subsequent 66% grade average heading into the final week of the study. However, according to his teacher he made a concerted effort on his

final individual project, completing it on time and earning an A. This coupled with a high B on his final exam brought his final English Honors grade to a "B".

Participant 2's GPA ranged from a low of 52% in baseline to a high of 72% during the maintenance phase and heading into the final week of the study. In spite of maintenance phase academic productivity scores that were lower than the other two participants and a number of absences during the final weeks of the study, P2 managed to garner a passing GPA of 68% heading into his final exam. Earning a mid-level C on his final exam brought his final grade to 74%.

Participant 3's GPA range demonstrated the greatest range with a low of 42% in baseline to a high of 90% heading into the final week of the study. P3's academic productivity composite scores appeared to be the most erratic of the three participants during the maintenance phase. Near the end of the first week of his maintenance phase, P3 informed the researcher that he was suffering from severe "senioritis" and that he was doing his "best to hold things together". Although P3 dropped out of the A grade range heading into final exam week, he scored a mid-level A on his final exam resulting in his earning an "A" for the course.

Multiple Baseline Graphs

Overlap is the percentage of data in one phase that overlaps with data in the prior phase (Kratochwill et al., 2010a). The greater the overlap, the less support for concluding the manipulation of the independent variable was effective. On the other hand, the less overlap the better it is for the researcher trying to demonstrate an effect (Kratochwill et al., 2010b;

Kratochwill et al., 2013a). By integrating and comparing the information produced from the multiple assessments referenced above, conclusions can be made about the existence of a functional relationship between the independent and dependent variables contained in this study (Horner et al., 2005).

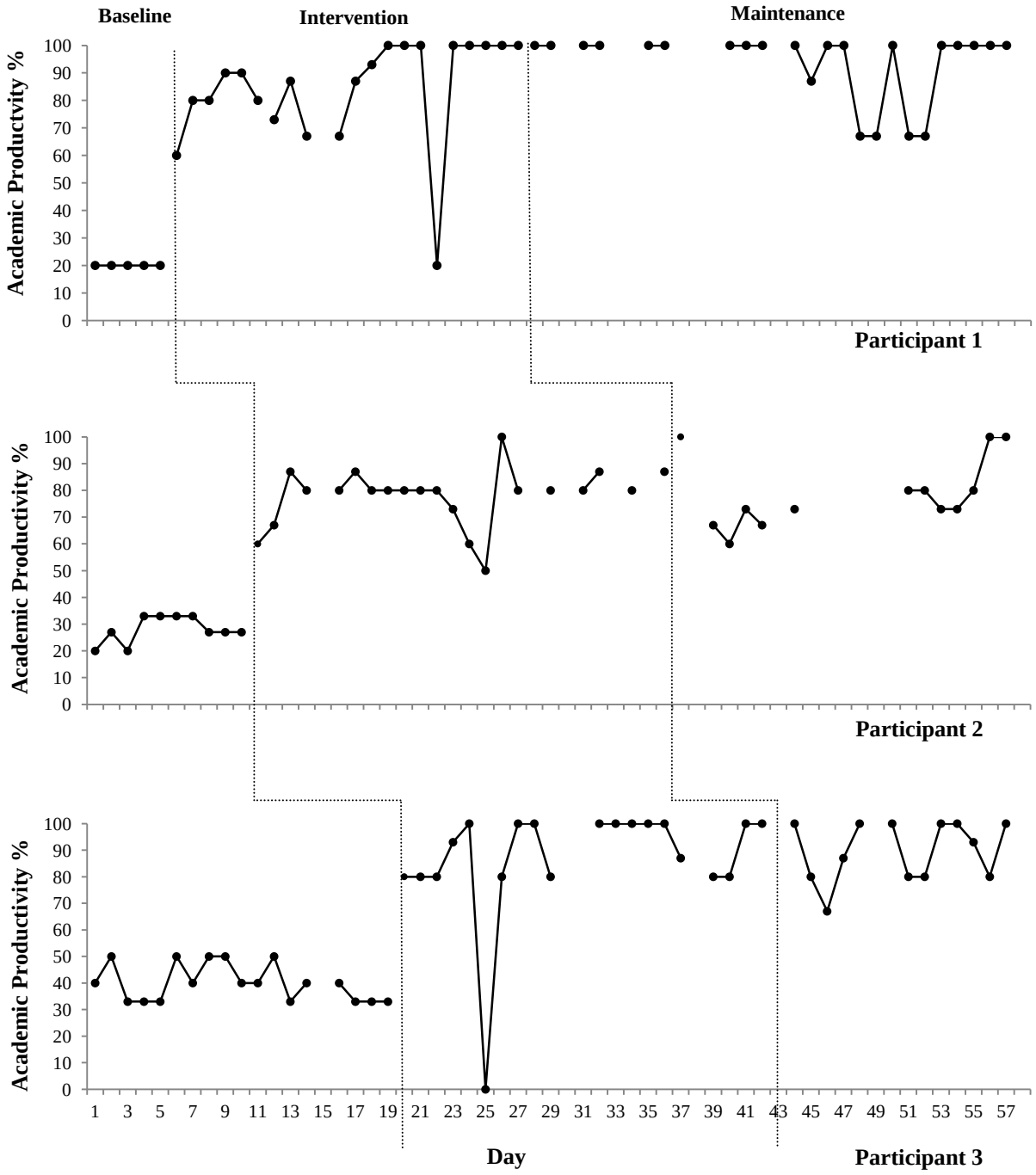
Data were graphed after each session and used in the visual analysis of the primary dependent measure to judge whether or not a functional relationship existed between the independent and the dependent variables (Gast, 2010; see Figure 3). Although there are a number of statistical measures available to single-subject design applied researchers, it's considered standard procedure to analyze single-subject research by way of systematic visual analysis of data within and across conditions (Horner et al., 2005). Academic productivity behavior data is presented in the three-phase multiple baseline graphs in Figure 3.

Readers are directed to the review the data contained in three multiple baseline graphs with phase change lines in Figure 3 as well as the data contained in Tables 1, 2 and 3 as reference points for the discussion to follow. Using Kratochwill's (2010) Criteria for Demonstrating Evidence of a Relation Between an Independent Variable and an Outcome Variable, as a comparison tool, it appears this study met the criteria for *Strong Evidence* of a causal relation between the independent variable (i.e., the self-monitoring treatment intervention package) and the outcome variable of a marked improvement in academic productivity behavior and academic productivity composite scores as seen in Table 1.

Via visual analysis of the multiple baseline graphs in Figure 3, one can see clear evidence of an intervention effect based on the following observations:

- a consistency of level, trend and variability within each phase,
- a rapid immediacy of the effect (i.e., low latency) of the treatment intervention package (independent variable) on the academic productivity behavior (dependent variable) every time treatment intervention package was introduced to a participant as treatment commenced,
- a consistency of the data across all phases demonstrative of a treatment effect, and
- an almost negligible and at times non-existent proportion of overlap of the data (discussed in more detail in the Effect-Size Estimates section below) between the baseline phase and both intervention and maintenance phases across all three student-participants.

Figure 3: Multiple Baseline Graphs for Participant 1, Participant 2 and Participant 3



Descriptive Statistics and Effect-Size Estimates

Changes in mean, median and mode level, variability (see Table 2; Gast, 2010) as well as immediacy of effect/latency, percentage of non-overlapping data points, and consistency of data patterns across similar phases (Kratochwill et al., 2010a) were analyzed for each study participant. As mentioned earlier, this study also employed Scruggs and Mastropieri's (1998) and Gast's (2010) approach for measuring the effect of single subject design studies by calculating PND (Gast, 2009; Gresham & Lopez, 1996; Horner et al., 2005; Horner, Swaminathan, Sugai, & Smolkowski, 2012).

To calculate effect size, the researcher observed the graphed data between conditions and determined a range of data-point values of the baseline condition. Next the number of data points in the intervention condition was counted along with the number of data points in the intervention condition that fell outside the range of values of the baseline condition. Then the researcher divided the number of data points in the intervention condition that fell outside the range of data points of the baseline condition by the total number of data points in the intervention condition and multiplied the quotient by 100. The final product is the PND (Gast, 2010). Gast (2010) states that the higher the PND, the greater the impact (i.e., effect) of the intervention on the target behavior.

The PND calculations for this study are presented in Table 3. The researcher used Scruggs and Mastropieri's (1998) criteria to extrapolate the meaning of the PND scores. PNDs of 90% or higher represent a large effect; 70% to 90%, a medium effect; and 50 to 70%, a small

effect. The large effect size results across the board in this study are further evidence of a treatment intervention effect for all three participants.

Table 2: Descriptive Statistics for P1, P2 and P3

Baseline	**P1**	**P2**	**P3**
Mean	20	28	39
Median	20	33	40
Mode	20	30	33
Standard Deviation	0	5	6
Variance	0	25.77	36.64
Range	No Range	20-33	33-50
Intervention	**P1**	**P2**	**P3**
Mean	84	78	87
Median	87	80	90
Mode	100	100	100
Standard Deviation	20	11	23
Variance	381.66	121.50	507.26
Range	20-100	50-100	0-100
Maintenance	**P1**	**P2**	**P3**
Mean	94	79	90
Median	100	80	80
Mode	100	73	100
Standard Deviation	13	13	11
Variance	164.13	176.58	128.86
Range	67-100	60-100	67-100

Table 3: Percentage of Non-Overlapping Data Points (PND) for P1, P2 and P3

Participant	Baseline-Intervention PND	Effect Size
1	95%	Large
2	100%	Large
3	95%	Large

What Work's Clearinghouse Standards

In the section entitled, "Criteria for Designs That Meet Evidence Standards" in Krotochwill, et al. (2010, pp. 14-15), the authors define What Works Clearinghouse' criteria for single subject designs (SCD), to *Meet Evidence Standards*. The criteria listed below are taken verbatim from Krotochwill, et al. and appear below along with the researcher's opinion as to whether or not the current study meets or does not meet What Works Clearinghouse criteria:

1. *The independent variable (i.e., the intervention) must be systematically manipulated, with the researcher determining when and how the independent variable conditions change…* If this standard is not met, the study *Does Not Meet Evidence Standards* (p. 14).
    - In this study, the independent variable (i.e., the self-monitoring treatment intervention package) was systematically and directly manipulated by the researcher over the course of the four weeks of the treatment intervention phase and indirectly during the maintenance phase. The operative word in maintenance phase is "indirect" because with the exception of reporting to the researcher's office to retrieve a WM2 and an academic productivity behavior tracking sheet for the day, participants assumed the majority of the

responsibility during the maintenance phase for using the WM2, completing their tracking sheets, and submitting both to their classroom teacher at the end of their target class each day. Student-participants were still required to report weekly to the researcher's office to complete their self-graphing worksheets and review their progress for the week. As reported earlier in this study, finding time to make the weekly meetings a priority during maintenance became a challenge due to a flurry of activities included end-of-the-year assemblies, senior class functions, and Florida standardized testing season activities. Still, it is the opinion of the researcher that this study met the evidence standards under Item 1.

2. *Each outcome variable must be measured systematically over time by more than one assessor, and the study needs to collect inter-assessor agreement [referred to as inter-rater reliability or IRR in this study] in each phase and on at least twenty percent of the data points in each condition (e.g., baseline, intervention) and the inter-assessor agreement must meet minimal thresholds*…If this standard is not met, the study *Does Not Meet Evidence Standards*. (p. 15).

   - As mentioned in the Methods chapter, inter-rater reliability (IRR) scores were calculated using an event recording, point-by-point method approach (see Figure 1; Gast, 2010). To calculate an IRR score, the researcher first added up the total number of times two raters agreed on ratings between their individual rating forms on a point-by-point basis (i.e., item-by-item). This number is then divided the total the number of agreements plus disagreements between the two raters. The resulting quotient is multiplied by 100 to

generate the IRR score. All IRR scores are reported in Table 7.

The research strongly suggests to have more than one person measure the dependent variable in a multiple baseline study (e.g., teacher and researcher, researcher and student, teacher and student) and that IRR be calculated for at least 20% of all sessions within each phase (Gast, 2010; Horner et al., 2005; Kratochwill, et al, 2010). The current study exceeded this directive (see Table 1). According to Gast (2010) and Kratochwill, et al (2010), minimal acceptable IRR scores range from .80 to .90. The current study exceeded this directive also and met the aforementioned evidence standards (see Table 1).

3. *The study must include at least three attempts to demonstrate an intervention effect at three different points in time or with three different phase repetitions*…If this standard is not met, the study *Does Not Meet Evidence Standards* (p. 15).
    - This study met evidence requirements by demonstrating an intervention effect at three different points in time across 9 different phase repetitions.
4. *For a phase to qualify as an attempt to demonstrate an effect, the phase must have a minimum of three data points* (p. 15).
    - This study met the requirement of having at least three data points per phase by having a range of 5-23 data points across all 9 phases of the study. Therefore, study met the aforementioned evidence standards regarding the required number of data points.

Social Validity Data

In addition to being deemed effective within the confines of a research study, successful treatment interventions should also demonstrate value, social validity that is, for the potential consumer as reported by current consumers (Schwartz & Baer, 1991). Those who support the concept of social validity posit that it matters little whether or not the treatment is deemed successful or effective by researchers if the participants, their significant others and the professionals who may someday employ the treatment with future students, patients, or clients fail to find it useful, helpful, productive, socially valid, if you will (Gast, 2009; Gresham & Lopez, 1996; Horner et al., 2005; Horner, Swaminathan, Sugai, & Smolkowski, 2012).

A social validity questionairre designed to document parents, teachers and student participant's perception of the value of the self-monitoring treatment intervention package for improving academic productivity behavior was administered to teacher's, parent's, and students at the close of the academic productivity behavior data collection portion of the study (see Appendices G, H and I, respectively). Even though results in this study are thus far encouraging, the question still remains as to the value of the intervention. Therefore, in spite of the positive effect the treatment intervention in this study had on the academic productivity behavior (and academic outcomes) of the participants, if this study's participants, parents and teachers do not consider the intervention useful and effective then the study is in essence, socially invalid. Wolf refers to this "So what if it worked?" factor as social validity and proposes that social validity measures be included in all research designs as a matter of course.

Thus, in order to judge of the social validity of the treatment intervention package in this

study, the researcher developed three Likert-style social validity survey questionnaires and administered them to all three study participants, their teachers and their parents (see Appendices G, H and I, respectively). These nine individuals will, by way of their responses, judge whether or not the treatment intervention is socially valid. In creating the social validity instruments, the researcher adapted the social validity questionnaire framework employed by Lo, (2003). All three student participants, their mothers and their target class teacher also answered the open-ended questions included on the social validity questionnaire. An analysis of results from the social validity questionnaire follows.

All three student-participants answered "Yes" to Items 1-10 on the social validity instrument (see Table 4) with a few exceptions. First, P1 and P3 indicated "Maybe" the program helped them to remember to submit their homework more often. This item referred to submitting homework for their target class on a regular basis. The other exceptions were P3's "Maybe" responses for Items 4 and 5 that dealt with completing and submitting classroom-based work, respectively, and Item 10 that referred to using the self-monitoring treatment intervention package to improve performance in other classes.

The open-ended questions of the participant's social validity instrument (see Table 4) generated a wide variety of responses. When asked, "What did you learn from this project?" (see Item 11), P1 pointed out that the treatment intervention helped him with one of his bigger problems, writing homework and other assignments down in his planner and turning in his homework. For the same item, P2 commented, "I can work harder if I put my mind to it." P3 commented that for him the WatchMinder2 was a "constant reminder" like a teacher riding his

back with the watch taking the place of the teacher, but instead of being on his back, it was on his wrist helping him keep watch over what he was doing in class, reminding him to stay on task, and to write in his planner and turn in his homework.

In response to Item 12, "What did you like best about the program?" P1 said, "Overall, the best thing was probably the fact that I did jump up in actually doing my work." P2 enthusiastically responded, "The watch was probably the most neatest thing. I've never heard of a watch that vibrates or has memos on it…that was nuts!" P3 was slightly more reserved, stating, "It's really difficult to say. I mean it's not that I don't like it. I'm kind of like in the neutral zone." In contrast to Item 12, Item 13 read, "What did you not like about the program?" P1 and P2 found nothing they disliked, however, P3 offered, "I'm not really a watch-wearing person, so just the fact that I had something on my wrist kind of bothered me."

When offered the opportunity to offer their suggested changes, if any, for improving the program (see Table 5), P2 and P3 had no suggestions. In stark contrast, P3 shared that the intervention should have functioned that same way as his IEP did. When the researcher pressed for further explanation, P3 clarified that there should be "like a coach that also helps along with it. Maybe a coach for like certain periods of time like at the beginning or end or something like that. I liked the graphing part and I would have liked to have done more of that than just weekly."

Finally while P2 and P3 replied that they had nothing else to say about the program (see Table 5, Item 15), P1 suggested making aspects of the intervention less "drab" by adding more "luster", making it "a bit more fun". He further explained, "…you're gonna need something that

will draw [students] them in. It doesn't have to be like a carrot on a stick but it just (pause)…not so much sugar coat it, but make it just a little more visually appealing or aesthetically pleasing or something. Like if you have to take the watches and paint them yellow. I mean, that drab, black color on your wrist everyday…you know?"

Overall, it appears the value of the self-monitoring treatment intervention package in effecting a positive change in each participant's academic productivity skills proved to be socially valid for this group of student participants. However, the student-participants make up only one-third of the social validity "panel of judges" that will ultimately assist the researcher in determining the overall social validity of the self-monitoring treatment intervention package. An analysis and comparison of teachers and parents social validity responses is next.

Table 4: Student Social Validity Data with Open-Ended Responses

Student Participant Social Validity Items	P1	P2	P3
1. The program helped me stay on task during class.	Yes	Yes	Yes
2. The program helped me improve my academic productivity in class.	Yes	Yes	Yes
3. The program helped me to write in my planner more often.	Yes	Yes	Yes
4. The program helped me to complete any work I was assigned in class (e.g., worksheets, group work, quizzes/exams, etc.).	Yes	Yes	Maybe
5. The program helped me to remember to submit work I completed in class (e.g., worksheets, group work, quizzes/exams, etc.).	Yes	Yes	Maybe
6. The program helped me to complete my homework more often.	Yes	Yes	Yes
7. The program helped me to remember to submit my homework more often.	Maybe	Yes	Maybe
8. The program helped me to be more productive in class.	Yes	Yes	Yes
9. I feel the intervention program would benefit other students who have trouble staying on task and maintaining their academic productivity.	Yes	Yes	Yes
10. I would like to use the program again to help me do better in some of my other classes.	Yes	Yes	Maybe

Open-Ended Social Validity Questions	Participant 1	Participant 2	Participant 3
11. What did you learn from this project?	"It helped me mostly with actually writing down all of the stuff in my planner. I mean that was my bigger problem and it was more or less direct help that did help me with turning in the homework the times that I missed it but other than that when I didn't miss it it was just from writing it down in the planner less so the watch that I was using. I am not sure that I noticed it was on my hand after about two weeks. "	"I can work harder if I put my mind to it."	"I learned from this project that if I have a constant reminder ya know almost kind of like having a teacher on my back the whole time-you know that the watch is basically the "teacher" and instead of on my back its on my wrist, um, ya know, just basically keeping me in watch of what I do. Ya know if I'm off-task ya know remind me, hey get back on task and stuff (pause) and also like hey, write in your planner, turn in your homework."
12. What did you like best about the program?	"Overall the best thing was probably the fact that I did jump up in actually doing my work."	"The watch was probably the most, neatest thing. I've never heard of a watch that vibrates or has memos on it…that was nuts!"	"It's really difficult to say. I mean it's not like I don't like it. I'm kind of like in the neutral zone."
13. What did you not like about the program?	"Personally I didn't find anything wrong with it. "	"There wasn't really anything that I disliked actually."	"I'm not really a watch-wearing person, so just the fact that I had something on my wrist kind of bothered me."
14. If you were in change, what would have you changed about the program?	"Added something maybe like how you did with the IEP part, not just this, but also the IEP adding something like a coach that also helps along with it. Maybe a coach for like certain periods of time like at the beginning or end or something like that. I liked the graphing part and I would have liked to have done more of that than just weekly.	"Nothing really, pretty fine in my book."	"Nothing, nothing."

Open-Ended Social Validity Questions	Participant 1	Participant 2	Participant 3
15. Is there anything else you want to say about the program?	"It could use some luster. It shouldn't be all like drab. I think you could try to make it a bit more fun because I know I'm a little more high-functioning compared to a lot of people that this would be used with but with other people you're gonna need something that will draw them in. It doesn't have to be like a carrot on a stick but it just (pause) not so much sugar coat it, but make it just a little more visually appealing or aesthetically pleasing or something. Like if you have to, take the watches and paint them yellow. I mean that drab, black color on your wrist everyday…you know?"	"Nothing really."	"Nothing, I'm fine."

All target class teachers agreed that low academic productivity was a problem behavior and an appropriate and important area on which to focus intervention (see Table 5). They also unanimously agreed that the self-monitoring treatment intervention package, as used for remediating deficient academic productivity behaviors, was appropriate and important and further, that they noticed meaningful increases in the participant's academic productivity after implementation of the intervention (Item 4). However, that is the extent of the mutual agreement between the three professionals as P2's teacher indicated she did not notice meaningful improvements in P2's homework submission rate (Item 5). P2's teacher also responded "Neutral" to 50% (Items 5-10) of the statements on the teacher version of the social validity questionnaire and this after directions to select "Neutral" only as a last resort. Even so, P2 passed the target class with a final grade of 74%. This and other issues regarding P2 and his teacher will be addressed in the Discussion chapter.

Even though there are some differences across responses on the teacher social validity questionnaire, 78% of the teacher responses fell in the "Agree"-"Strongly Agree" range. The researcher considers this strong enough evidence to claim a strong measure of social validity support for the teacher segment of the social validity panel of judges.

Table 5: Teacher Social Validity Data with Comments and Suggestions

Teacher Social Validity Items	P1	P2	P3
1. The target problem behavior of low academic productivity for this student is an appropriate and important area on which to target intervention.	Strongly Agree	Strongly Agree	Agree
2. The intervention consisting of a self-monitoring treatment intervention package designed to target deficient academic productivity behaviors for this student is appropriate and important.	Strongly Agree	Strongly Agree	Strongly Agree
3. I noticed meaningful increases in the student's on-task behavior after the implementation of the intervention.	Strongly Agree	Neutral	Strongly Agree
4. I noticed meaningful increases in the student's academic productivity after implementation of the intervention.	Strongly Agree	Agree	Strongly Agree
5. I noticed meaningful improvements in the student's submission of homework assignments after the implementation of the intervention.	Agree	Disagree	Strongly Agree
6. I noticed meaningful improvements in the student's submission of classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.) after the implementation of the intervention.	Agree	Neutral	Strongly Agree
7. I noticed meaningful improvements in the student's use of the planner to record homework assignments.	Strongly Agree	Neutral	Agree
8. I believe the self-monitoring package consisting of the WatchMinder2, self-recording form, and graphing worksheet helped the student to self-monitor their academic productivity behaviors.	Strongly Agree	Neutral	Strongly Agree
9. I plan on continuing to use the self-monitoring package with this student because it is effective.	Strongly Agree	Neutral	Strongly Agree
10. I would like to use all or parts of the self-monitoring package with other struggling students because I believe it will help them to improve their on-task and academic productivity behaviors.	Strongly Agree	Neutral	Strongly Agree
Please include any comments or suggestions you may have about the treatment intervention package on the back of this social validity survey.			
The self-monitoring program was stellar. [P1] grew immensely in staying focused and on-task! The planner was beneficial as assignments were right there. No questions. Late assignments were much less, although still present. Thanks!!!"	Participant 1's Teacher		
"I think that your 1:1 efforts with [P2] is primarily responsible for the increase in grade. I'm just not sure that the watch itself was the reason for the window of time that his grades improved."	Participant 2's Teacher		
"[P3] has significantly increased productivity as compared to when I first taught him."	Participant 3's Teacher		

Fifty-five percent of the social validity ratings observed on the parent (all mothers) version of the social validity questionnaire were “Strongly Agree”, 39% were “Agree”, and 6% were “Neutral” (see Table 6). The two neutral scores came from P3’s mother on Items 8 and 9, improved ability in completing and submitting homework, respectively. As was the case with the student social validity results, these results illustrate very strong social validity support for the intervention used in this study. Combined with the strong social validity support from the majority of the target classroom teachers, the overall results demonstrate overwhelming social validity support for the self-monitoring treatment intervention package as it was utilized for addressing low academic productivity behavior for the three participants in this study.

Table 6: Parent Social Validity Data with Comments and Suggestions

Parent Social Validity Items	P1	P2	P3
1. Before the study, I felt that my child needed some behavioral support to be more successful at school.	Strongly Agree	Strongly Agree	Agree
2. Before the study, I felt that my child needed some academic support to be more successful at school.	Strongly Agree	Strongly Agree	Agree
3. I feel that teaching my child to monitor and record his academic productivity behaviors is a useful and appropriate way to reduce my child's classroom problem behaviors.	Strongly Agree	Strongly Agree	Agree
4. I feel this program helped to reduce my child's off-task behaviors and improve his academic productivity behaviors.	Agree	Strongly Agree	Agree
5. I feel this program helped my child to become more responsible for his classroom behavior.	Strongly Agree	Strongly Agree	Agree
6. I noticed meaningful improvements in my child's submission of classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.) after the implementation of the intervention.	Agree	Strongly Agree	Agree
7. I feel my child improved in his ability to complete and submit classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.).	Strongly Agree	Strongly Agree	Agree
8. I feel my child improved in his ability to complete his homework.	Agree	Agree	Neutral
9. I feel my child improved in his ability to submit his homework.	Agree	Strongly Agree	Neutral
10. I am glad my child participated in this self-monitoring program.	Strongly Agree	Strongly Agree	Agree
11. I would like my child to continue using the self-monitoring program at school.	Strongly Agree	Strongly Agree	Agree
12. I would recommend this treatment approach to parents of children with low academic productivity.	Strongly Agree	Strongly Agree	Strongly Agree
"This made a big difference. I wish we had started something like this sooner. I've wanted something like this all along for him because if you don't stay on him he will get real lazy. Thanks you for helping him"	Participant 1's Mother		
"Thank you! This really was an answer to prayer. He passed his math class because of it and I am so glad he was able to be a part of the study. He has been the happiest I have seen him be in a long time and I think its because he felt successful."	Participant 2's Mother		
"I am so proud of him. He worked so hard and this really made him stay on top of things. Thank you so much."	Participant 3's Mother		

CHAPTER FIVE: DISCUSSION

Interpretation of Results

A multiple baseline across participants design was used in this study to measure the effect of a self-monitoring treatment intervention package (independent variable) on the academic productivity behavior (dependent variable) of three high school students with autism spectrum disorder. This design is commonly used in single-subject design studies to generate inferences about the likelihood the measured trait is generalizable to the greater population of subjects a study's participants represent (Gast, 2009; Horner et al., 2005; Horner, Swaminathan, Sugai, & Smolkowski, 2012). As of this writing, no investigation exists in the literature that studied the effect of a self-monitoring treatment intervention package on the academic productivity behavior of high school students with ASD who are primarily being educated in the general education setting.

Single-subject research studies that are able to demonstrate clear control of threats to internal validity can lay claim to the existence of a functional relationship between manipulation of the independent variable and observed changes in the dependent variable (Kratochwill et al., 2010). Such was the case in this current study in which the findings indicated the self-monitoring treatment intervention package significantly impacted classroom academic productivity behavior of all participants (i.e., inter-subject replication. Prior to this study, all three participants' academic productivity behavior scores (a daily composite consisting of the percentage of homework assignment and classroom-based work completed and submitted and

the accuracy and rate of planner documentation of homework) were distressingly low student participants were either failing their respective general education course (e.g., P1 and P3) or very close to it (e.g., P2). Upon initiation of the intervention, all student participants demonstrated a marked and immediate increase in academic productivity behavior which continued throughout the intervention phase. After moving into the maintenance phase, all participants were able to maintain the treatment effect as evidenced by the fact that their academic productivity composite scores never returned to baseline levels, nor did they dip below the lowest score recorded during the treatment intervention phase.

Social validity results from this study strongly supported the utility and effectiveness of the treatment intervention package for the participants, parents and teachers who participated in the study. Study-participants overwhelmingly saw the validity of the treatment intervention package as evidenced by the number of "Agree" and "Strongly Agree" responses across all three participants. With a few exceptions (see Table 5), teachers also indicated their social validity support for the treatment intervention package. Two of the three teachers indicated their strong support for using all or parts of the self-monitoring package with other struggling students because they believe it will help them to improve their academic productivity behavior. Finally, parents also indicated their strong social validity support for the intervention with all parents at least agreeing that they 1) were glad their child participated in the self-monitoring program, 2) would like their child to continue using the self-monitoring program at school, and 3) would recommend the treatment approach used in this study to other parents of children with low academic productivity.

Results from this study have both theoretical and practical significance. Theoretically, O'Hearn, Asato, Ordaz, and Luna's (2008) research explained that the plasticity of the brain allows for a "prolonged window for effective treatment" (p.1124). They support the practice of targeted interventions designed to improve executive function tasks for individuals with ASD. The outcome data from the current study adds credibility to the theory of brain plasticity and the idea that it is never too late to try to improve the executive function skills such as self-monitoring in the ASD student population. The findings from this study also substantiate the effectiveness of integrated approaches proposed in the literature using self-recording instruments and self-evaluation tools (Holifield et al., 2010). Recent research also suggests that the ideal time and place to experiment with and develop these abilities should be once the student sets foot on their high school campus (Adreon & Durocher, 2007; Hewitt, 2011).

The current study offers support for the concept of training students from the ASD population using an integrated approach beginning at the start of a student's high school career. The results of this study have practical significance in that they demonstrate that a targeted self-monitoring treatment intervention package can effect a positive change in the academic productivity behavior of students with ASD. Addressing executive dysfunction in this population of students is not an easy task, but this study demonstrates that it is possible to use a combination of assistive technology and tracking instruments to improve the self-monitoring skills of students with ASD. Teachers and therapists (e.g., speech-language pathologists, occupational therapists, behavior analysts) should not be shackled by their own past experiences or personal belief system that students on the spectrum are incapable of being successful in the

general education curriculum. There are many studies that run counter to such a line of thinking. The current study is no exception and clearly points to the fact that this population of students can develop self-monitoring skills when treatment interventions are implemented with fidelity.

In the current study, the researcher used assistive technology (e.g., WatchMinder2), self-recording instruments (e.g., Paper-and-Pencil Academic Productivity Recording Form) and self-evaluation tools (e.g., Paper-and-Pencil Performance Self-Graphing Worksheet). The practical significance and application of the findings from this study can be used to further substantiate claims in the literature that self-monitoring systems are valid and appropriate for use with the ASD population in general education classroom settings (Coyle & Cole, 2004; Wilkinson, 2008) The treatment package designed for this study sought to replicate components of Amato-Zech et al. (2006) and Legge et al.'s (2010) studies, both of which investigated the effects of a waist worn timed vibrating prompt device, similar to the WatchMinder2, on the self-monitoring (i.e., on-task) behavior of students with language/learning disabilities and ASD, respectively.

Results from this research are also consistent with findings that investigated the effect of self-monitoring interventions on academic-based outcome behaviors in students with autism spectrum disorder (Ferguson et al., 2005; Holifield et al., 2010; Myles et al., 2007). However, unlike studies such as the multiple baseline across settings investigations of Ferguson et al. (2005) and Myles et al. (2007), the multiple baseline across participants design in this study allowed for comparison of performance and replication across a homogenous group of participants thereby addressing any potential concern as to whether or not the target intervention would be successful with similarly functioning high school aged students with ASD. In their

studies, the aforementioned authors used a PDA (personal digital assistant) device to increase the self-management/self-monitoring behaviors of their participant, Ferguson et al. (2005) and Myles et al. (2007) make the point that "The unobtrusive quality of the PDA makes it an ideal support in educational settings. It can increase students' independence and decrease reliance on the teacher and other educational professionals" (Myles et al., 2007, p. 99). The same can be said of the WatchMinder2. The stealth nature of the WatchMinder2 combined with the one page academic productivity behavior recording form and the performance graphing worksheet formed a triadic treatment intervention package that participants used to self-manage their academic performance via daily self-monitoring and weekly performance tracking of their academic productivity behavior in the most surreptitious manner possible in a high school environment.

According to Agran, King-Sears, Wehmeyer, and Copeland (2003), self-management normally pertains to some arrangement of the following approaches: self-monitoring (i.e., self-observation, self-recording), self-evaluation, and self-reinforcement. However, only the self-monitoring and self-evaluation aspects of Agran, et al. (2003) were incorporated into this study. Consequently, the a priori decision not to include a contingency reward system or reinforcement plan is something that makes this study unique compared to previous designs. It was hypothesized that by improving one's academic productivity behavior, one's academic outcomes would also improve and that this would be a reward in itself. By not controlling for rewards a more authentic learning context may have been created.

It was well documented in the literature review chapter of this study that executive function deficits and their frontal lobe involvement are an inherent factor in the lives of

individuals with ASD. The results of this study mean that similar interventions may lead to superior academic performance and increased self-esteem as indicated by the participants. If the student with ASD is ever to become more independent, less reliant on others to fill in for their self-monitoring deficits, then for the time being it will have to come down to the assistive technology that is available in tools like the WatchMinder2 or smart phones or mini-computers or any other technological device that can stand in the gap for their inherent neurological deficits This study is important because academic productivity of students with ASD by improving their self-monitoring skills in an authentic learning environment has not previously been empirical validated. . It is unique in that all the participants represented a homogenous group of participants who were fully included in the general education classroom setting for all of their coursework. It is also unique from a design perspective due to the absence of a contingency reinforcement system for compliance within the parameters of the treatment intervention package.

Threats to Interval Validity

According to Kratochwill et al. (2010), the structure of single case design (SCD) studies allows SCD researchers to address major threats to internal validity in much the same way as group randomized controlled trial designs. Effect replication and phase repetition are key components in shoring up internal validity and dealing with the many threats to internal validity inherent in SCD design studies. Overall, this study met What Works Clearinghouse criteria for "Criteria for Designs that Meet Evidence Standards" (Kratochwill et al., 2010, pp. 14-15) as well

as the "Criteria for Demonstrating Evidence of a Relation Between and Independent Variable and an Outcome Variable" (Kratochwill et al., 2010, pp. 16-17). However there were a few threats to internal validity that warrant further explanation.

There is a possibility that there was selection bias in this study. Selection bias refers to the idea that "Systematic differences between/among conditions in participant characteristics could cause the observed effect" (Kratochwill et al., 2010, p. 8). The specific concern is that researchers sometimes select a participant to begin treatment based on the real or perceived "need" "rather than on a randomly determined basis" (p. 8) or on the basis of which participant has the most stable and predictable trend line and less variability in data in baseline. In this study, participants were selected to begin treatment on 1) the basis of whether or not they were displaying a stable and predictable trend in baseline and 2) their level of academic performance. Indeed, because all three participants were at risk for failing their target class and further, failing their senior year, the researcher moved participants into treatment based on "real" academic need. At the time of "selection" and now in hindsight, this was an ethical choice and one that now appears to have been the most appropriate for the participants although the same cannot be said regarding the potential detrimental effect it may have on internal validity.

Instrumentation is another potential threat to the internal validity of this study due to the fact that "The conditions or nature of a measure might change over time in a way that could be confused with an intervention effect" (Kratochwill et al., 2010, p. 11). The researcher held a steady course in implementing a simplistic, yet highly structured, procedurally strict treatment intervention package (see Appendix A) over the nearly12-week duration of the study. However,

because a high rate of inter-rater reliability scores were collected during treatment (i.e., no less than 60% during intervention and no less than 40% average during maintenance across all three participants), the extra attention could have possibly had a reactivity effect on a participant's academic productivity composite scores. Observer/Rater drift may have influenced academic productivity scoring outcomes and class grades in P3's case. For instance, P3's classroom teacher had to be reminded on occasion to adhere to the accommodations addressed on the IEP and refrain from giving P3 too much leeway with regard to submission deadlines. As the researcher discussed with her many times, "It's an accommodation, not an advantage."

Another potential instrumentation threat to internal validity could be the actual points earned by participants during completion of the daily academic productivity behavior recording forms. There was indeed potential for the earning of points for completion and submission rates of homework assignments and classroom-based work and planner documentation rate and accuracy to inadvertently become an external reinforcer to participants. In short, it is possible the points themselves clouded the results by introducing an uncontrolled variable into the study. However, the high number of inter-rater reliability scores collected should have helped to offset any potential negative effect earning points would have had on the internal validity of the study.

Observational bias may have wielded some influence over P2's academic productivity scores and class grades. In contrast to P3, P2 did not receive his IEP accommodations on a regular basis and sometimes not at all. After trying unsuccessfully to get his IEP case manager involved (recall the earlier "wearing out their welcome" observational statement), the researcher sought assistance from the ESE Department Chair at the high school who promptly saw to it that

P2 began receiving his IEP accommodations of decreased workload, extra time to complete assignments, extra time to complete quizzes and tests and the opportunity to take quizzes and tests in a separate location (i.e., quiet classroom or office of another teacher) on a regular basis. Accommodation adherence occurred approximately halfway through the second week (Day 18) of P2's intervention phase and continued thereafter until the completion of the study.

Next, several design assumptions warrant cautious interpretation of the results and discussion of their potential threats to the internal validity of the study. First, the researcher assumed consistent pedagogy across classrooms. Although P2's teacher was aware of P2's deficits as a student with ASD and the need to comply with P2's accommodations as indicated on his IEP, neither of these things appeared to be at the forefront of the teacher's approach to instructing P2 when dealing with the academic challenges that came up over the course of the study. As a result, P2's performance with the intervention might have been more stable had the researcher been more proactive and not as concerned with inadvertently influencing the experimental control of the study. In lieu of becoming directly involved with P2's accommodations issues, the researcher met with the ESE department head to discuss concerns about the teacher's inconsistent implementation of P2's accommodations. Shortly after this conversation, P2 began receiving accommodations such as testing in an alternate location and extra time to complete quizzes and tests although the accommodations of shortened assignments and extra time to complete assignments were still inconsistently implemented. To avoid similar situations, researchers would be wise to check an educator's level of knowledge of ASD and their facility with implementing accommodations in the classroom in order to level the playing

field across all study participants.

A second design assumption which may be seen as a threat to internal validity is a teacher's prior experience with a participant and the effect such "experience" may have on the experimental control of a study was not a controlled variable. In P1's case, he had his English Honors teacher for two previous courses so by the time he walked through her classroom door, she had the equivalent of two semesters experience with his executive function deficits, especially his poor self-monitoring skills. However, P1 responding quickly to the treatment intervention and did not allow his past behaviors to take over for the duration of his English Honors course. Not to say there weren't instances of maladaptive classroom behavior, but they didn't appear to take hold and trigger a negative response from the target classroom teacher.

Limitations of the Current Research

This study is not without its limitations. First, researchers, educators, and clinicians should refrain from making any broad generalizations to the ASD population regarding the potential effectiveness of the self-monitoring treatment intervention package employed in the current study to other students with ASD. This is due in part to the small sample size (n = 3) but it is also inappropriate to make generalizations to the ASD population given the wide variety of behaviors found in individuals on the autism spectrum.

In order to prevent a reaction effect resulting in a loss of experimental control and to control for the potential of a Hawthorne Effect, the researcher refrained from attaching the watch to participants during the baseline phase. As a result, another limitation was created in that since

the WatchMinder2 (WM2) was not attached to the participant's wrists during baseline, could just the mere physical presence of the WM2 on the participant during the intervention have been enough to trigger an increase in performance? Because the WM2 was not on the participant's wrists during baseline, external reviewers may question whether the whole of the self-monitoring treatment intervention package was responsible for the sudden and marked improvement in academic productivity behavior (see Figure 3), the novelty of the sudden presence of the watch during the initial days of the intervention phase could serve as an alternative explanation for the positive change that was documented from baseline to treatment, or if there was indeed a Hawthorne Effect.

Next, since the researcher had the sole responsibility for implementing the procedures of the study, there is the issue of potential for bias by the principal investigator within the present study. External reviewers may call attention to the possibility that participants were motivated by the additional attention from the researcher and especially so with regard to P1 and P3 who, prior to the commencement of the study, were already being served by the researcher in the county's speech-language impaired program.

Another limitation of this study has to do with the broadness of the intervention package. Of the three parts of the treatment intervention package, the daily implementation of the WatchMinder2 and the Paper-and-Pencil Academic Productivity Recording Form were the easiest and most consistently implemented of this triadic treatment approach. For example, the researcher and at least one of the participants (i.e., Participant 1) found it difficult to find the time to complete the Performance Graphing Worksheet once he entered the maintenance phase. This

may have been due in part to the hectic environment created by end of the year assemblies, senior class functions and the Florida standardized testing season that began a few weeks into P1's maintenance phase. Still, even though the researcher attempted to explain that his performance was expected to regress during the maintenance phase, Participant 1 believed that his performance decreased as a result of decreased contact with the researcher during maintenance.

The far-reaching nature of the self-monitoring treatment intervention package in this study also limits its usefulness with younger populations of students with ASD and those with lower intellectual or academic abilities. Still, individual components of the package such as the performance graphing worksheet or a combination of the WM2 and the academic productivity recording form might make for an acceptable intervention for younger groups of students with ASD.

Finally, requiring participants to come to the researcher's room placed constraints on the researcher's ability to implement the study efficiently. In hindsight, a performance self-graphing feature should have been added to the participant self-recording form. Doing so would have eliminated the need to determine a time slot at the end of every week for graphing weekly academic productivity performance. It would have also put the responsibility for graphing academic productivity behavior where it should be: squarely on the shoulders of the participant. Participants would also have had this critical piece of feedback and visual support directly under their daily control and in front of them. The researcher could have then devote more time during the weekly intervention phase meetings with participants to activities like reviewing the weekly

data and identifying areas of concern regarding homework and classroom-based work completion and/or problems with consistent planner documentation of academic tasks.

Recommendations for Future Research

Based on the growing reality the students with ASD are and will continue to be an integral part of the general education classroom, more single subject design studies such as the present one need to be undertaken. It's important to note that many researchers consider the multiple baseline design to be one of the most ethical designs for single subject research because a treatment withdraw phase is not required for successful implementation of the design (Gast, 2009; Horner et al., 2005) Still, the nature of the design dictates that some participants may wait much longer than others to receive a treatment that could indeed be beneficial to them and therein lay the ethical dilemma. Future applied research should "triage" the baseline situation in order to determine which participant is in greatest need of the treatment intervention, especially when more than one participant is demonstrating a stable and predictable trend line in the baseline condition. This addresses the ethical dilemma of withholding treatment from a participant who may immediately benefit from the intervention under study, but unfortunately it is a proverbial two-edged sword in that it opens the door to selection bias as this researcher discovered.

Researchers interested in replicating the current study may want to control for any potential sensory issues related to the WM2 such as having to wear the watch around one's wrist for whole class period and receiving a vibrating prompt every ten minutes Also, are there any

potential stigmatizing effects of wearing such a large sports watch size style, or is there negative attention called to the participant by what initially is a loud vibrating sound as the participant is prompted, and what if any are the negative aspects of the color of the watch which currently comes in one color, black? This researcher did not account for any of these issues but participant comments relative to wearing the watch and its black color were made on the open-ended question segment of the participant social validity survey questionnaire (see Table 4). Future researchers are urged to address potential sensory and stigma issues during participant selection using a combination of parent interviews, file review and results from sensory-based batteries.

Another recommendation for future research is to investigate the effect of a self-monitoring treatment intervention package on the classroom interaction and participation skills of students with ASD. There are many assistive technology devices on the market that could be used as part of an intervention package. For instance, there is currently a device that is used in training situations where having the training supervisor in the same situation as the trainee would prove detrimental to the training. The device involves a small wireless lapel microphone and wireless in-the-ear transmitter. The lapel microphone allows the trainer to eavesdrop on the training situation and offer real-time suggestions, comments, and directives to the trainee through the wireless in-the-ear transmitter. Such technology could assist therapists in modeling, shaping, expanding and enhancing the classroom interaction and participation skills of all individuals on the autism spectrum.

Future research should focus on gleaning the maximum amount of data from each participant by combining single subject designs. For example, a multiple baseline across

participants and settings design could investigate the impact of a self-monitoring intervention treatment or package across participants and across settings (e.g., math class and English class, various school settings, different vocational training sites, etc.) thereby generating copious amount of data for analysis. An additional consideration for future studies would be to contrast self-monitoring of attention-to-task with self-monitoring of academic productivity across participants utilizing an alternating treatments design.

Finally, there is a need for more multiple baseline across participants, settings and/or behaviors studies that investigate the effect of self-monitoring treatment intervention packages on the self-monitoring behaviors of students with ASD in the general education classroom. Inclusion is not disappearing from the education arena any time soon. Applied and basic researchers need to provide parents, teachers, therapists, school psychologists, and administrators who are the consumers of their research with research-based practices for helping students with ASD succeed in the general education setting. Fifteen more years should not pass before the ASD research community takes up the challenge and addresses Ozonoff's 1998 call to engage in these types of investigations.

Conclusion

Despite calls in the literature for studies focused on executive dysfunction remediation (Ozonoff, 1998; Ozonoff & Schetter, 2007)and publication of meta-analyses suggesting self-monitoring strategies and targeted intervention can play a key role in supporting the academic success of students with ASD (Lee et al., 2007; McDougall, 1998) there is a surprising paucity

of research investigating the effects of self-monitoring interventions for the this population of students, who frequently find themselves placed in the general education classroom setting, particularly at the secondary level.

Although it appears the research community continues to ignore the current gap in the literature, the need for more applied research studies on secondary-level students with ASD in general education classrooms has not escaped the eye of researchers like Lee et al. (2007). In their meta-analysis of research regarding self-management/self-monitoring interventions for students with ASD, the aforementioned authors reported that even though more than half of the studies they reviewed were conducted in school settings, not one took place in a general education classroom setting. Furthermore, Lee et al. found no study that used self-management/self-monitoring methods to increase academic performance in students with ASD who primarily received their education in the general education classroom.

Hopefully this study will be the first of many to begin addressing the gap in the literature and the need for research-based practices and treatment intervention for use with students with ASD who are primarily being instructed in the general education setting. Indeed, without a concerted effort by applied researchers to this end, general educators will continue to struggle with, guess at, and operate on hunches using their self-designed approaches to teach students with ASD. Without such research, this population of students runs the risk of missing out on what the world has to offer them and in turn, the world runs the greater risk of missing out on what they have to offer it.

APPENDIX A: STEP-BY-STEP TREATMENT PROTOCOL NARRATIVE

Step-by-Step Treatment Protocol Narrative

Start Time: _____

In this training you are going to spend some time learning about some things you can do to help yourself to become more academically productive. Specifically, you are going to learn the following:

- *a way to remember to pay attention during class.*
- *a way to remember to show or submit homework to your teacher that you completed the night before.*
- *a way to remember to hand in work you complete during class time including small group work, quizzes and tests before you leave class.*
- *a way to remember to write homework assignments and other "to-do" responsibilities down in your planner before you leave class every school day.*
- *a way to keep track of your progress regarding 2, 3, and 4 above by graphing your academic productivity performance.*

To help you learn how to submit homework, turn in class work and write down homework assignments and other "to-do" responsibilities in your planner, you will use a device called the WatchMinder2 (WM2). The WM2 is a simple wristwatch that can easily be programmed to set up vibrating reminders and display special messages to remind you to stay on task and to follow through with certain responsibilities during your class period. You will wear this on your wrist. Every so often you are going to feel a vibrating pulse at which time you look at the watch's face for a message. If the message says, "ONTSK?" you will ask yourself "Am I am on-task?" If you are on task, you are doing one or more of the following:

- *You are looking at the teacher when they are lecturing.*
- *You are taking notes when the teacher is lecturing.*
- *You are not doing anything that is unrelated to your _____ class such as reading a book, doing work for another subject, doodling on a piece of paper, etc.*
- *You are participating in small group work with other students.*
- *You are working quietly at your desk.*

As I stated, when you feel the watch vibrate you will look at it and if it says "ONTSK?" then you are to honestly evaluate whether or not you are on task. If you believe you are not on task, then make every attempt to do what others are doing or ask your teacher what you should be working on. The important thing is to stay on task by doing some of the productive on task academic behavior I just mentioned.

There are other messages that may appear when the watch vibrates. If the message says "HMWORK", then you are to hand in or show evidence of your partial or fully completed homework assignment to your teacher as soon as possible. However, try not to interrupt the lecture or the class. After you hand in or show evidence of last night's homework, circle "Yes" in response to Item 1 under the **Homework Completion and Submission** *section on your* **Student Paper-and-Pencil Academic Productivity Recording Form**. *Since a "Yes" is worth one point, write down the number 1 in the adjacent score column. Then for Item 2 you will circle the percentage that best represents the percentage of homework you completed. For example, if you completed 5 out of 10 assigned homework problems then you would circle 50% because you completed half of the total number of item, or 50%. Since a 50% completion rate is worth two points, write down the number 2 in the adjacent score column. Add up these two numbers and you can see that you have earned three out of five points for the* **Homework Completion and Submission** section. *If you do not submit or show any evidence of fully or partially completing homework from the night before, then you will receive 0/5 points for the* **Homework Completion and Submission** *section on your* **Student Paper-and-Pencil Academic Productivity Recording Form**.

Another message that will appear when the watch vibrates is "CLWORK?" If you see this message, then you are to submit or show evidence of fully or partially completing class work that you have been working on during class. Again, take care not to interrupt the lecture or class when doing this. After you submit or show evidence of your fully or partially completed class work, circle "Yes" in response to Item 3 under the **Classroom-Based Work** *section on your* **Student Paper-and-Pencil Academic Productivity Recording Form**. *Since a "Yes" is worth one point, write down the number 1 in the adjacent score column. Then for Item 4 you will circle the percentage that best represents the percentage of classroom-based work you completed in class. Classroom-based work includes things such as individual work, small group work, whole class work, quizzes and exams. For instance, if you submit a quiz with 14 out of 20 questions answered, then you would circle 75% because you completed 70% of all possible quiz items and the closest percentage without going over is 75%. Since a 75% completion rate is worth three points, write down the number 3 in the adjacent score column. When you add up your scores you will see that you have earned four out of five points for the* **Classroom-Based Work** section. *If you do not submit or show evidence of fully or partially completing your classroom-based work, then you will receive 0/5 points on for the* **Classroom-Based Work** *section on your* **Student Paper-and-Pencil Academic Productivity Recording Form.** *Note: Your teacher may direct you to take it home as homework, thus you will record it as homework in your student planner. Also, if you have an extra time accommodation on your individual education plan (IEP), then work with your teacher to take it home as homework that night, but 1) remember to circle how much you completed in class and remember to record this as homework in your planner. We will discuss how to record homework assignments and other academic tasks in the next section.*

The last type of message that will appear when the watch vibrates is "PLANNR". When you see this message you are to immediately record the day's homework assignment in your planner. It may be a good idea to let your teacher take a look at what you have written in your planner to ensure that you accurately record the subject assignment/homework on the correct day in your planner, the correct chapter/worksheet/task, all in legible enough handwriting that your teacher can easily read it. Be sure to use the **Planner Documentation** *section of your* **Student Paper-and-Pencil Academic Productivity Recording Form** *as a checklist. You will earn one point for every "Yes" answer you circle for a total of 5 points for the* **Planner Documentation** *section (Items 5-9) on your* **Student Paper-and-Pencil Academic Productivity Recording Form.** *Thus, if you write the correct subject name for the homework assignment on the correct day and you also write the correct chapter and the homework items therein to be completed but your writing is not legible enough for your teacher to easily read, then you will earn a score of four out five possible points for the* **Planner Documentation** *section of your* **Student Paper-and-Pencil Academic Productivity Recording Form.** *Remember, if you do not bring your planner to class, you will receive 0/5 points for the* **Planner Documentation** *section that day.*
Next, for Item 10a you will rate your level of on task behavior during the class period by *circling the percentage range that best represents the amount of time you were on-task during class. Please be honest in your self-assessment. If you were on-task less than 75% of class, then under Item 10b write down what do you believe was/were the underlying cause(s) for your off-task behavior(s) during class today? Don't forget to list the type and frequency of off-task behavior(s) you engaged in during* ***today's class period.***

Finally, at the end of every week we will meet to graph your academic productivity performance. Let's take a look at that right now. See **Appendix F**.
Remember, all of this is designed to help you improve your self-monitoring skills and good self-monitoring skills lead to good self-management skills, which lead to less people in your life telling you what to do throughout the day.
Do you have any comments or questions?
If you do not have any further comments or questions, then that concludes our training session for today.

End Time: _____

APPENDIX B: STEP-BY-STEP TREATMENT PROCEDURAL FIDELITY CHECKLIST FOR VIDEO-RECORDED TREATMENT SESSIONS AND INTER-OBSERVER AGREEMENT CALCULATION WORKSHEET

Part I: Treatment Procedural Fidelity Checklist for Video Protocol

Directions: Please view the video recording of the training session involving the researcher and one of the participants. Your task is to provide documentation that each one of the steps below was covered during the intervention training session. If you observe the step, then circle "Yes", and if not, circle "No". At the end of the video, please pair up with the other trained observer and complete Part B of this form.

Step-By-Step Procedures	Circle Yes or No	
Did the researcher begin with a statement of the overall objective of the training session followed by a list of five detailed objectives for the training session?	**Yes**	**No**
Did the researcher explain the significance of the "ONTSK?" prompt, how to respond to it, and ways the participant can demonstrate on-task behavior?	**Yes**	**No**
Did the researcher explain how the WM2 works (e.g., When watch vibrates, participant looks at watch face and responds to prompt.)?	**Yes**	**No**
Did the researcher explain how to respond to the "HMWORK" WM2 vibrating prompt by either producing evidence of his completed homework or handing it in for a grade followed by circling the most appropriate responses (yes/no, percentage of homework completed) on the **Student Paper-and-Pencil Academic Productivity Recording Form?**	**Yes**	**No**
Did the researcher explain how to respond to the "CLWORK" WM2 vibrating prompt by either producing evidence of his completed classroom-based work (e.g., individual work, small group work, quiz, or exam) or handing it in for a grade followed by circling the most appropriate responses (yes/no, percentage of classroom-based work completed) on the **Student Paper-and-Pencil Academic Productivity Recording Form?**	**Yes**	**No**
Did the researcher explain to the student participant how to appropriately respond to the "PLANNR" prompt by writing their homework assignment in their student planner paying special attention to entering the homework assignment or academic task on the correct day, writing down the correct chapter/worksheet/task as well as the correct homework problems or academic tasks, and the importance of writing legibly.	**Yes**	**No**
Did the researcher explain to the participant that the participant is free to ask their teacher to review their planner entry for accuracy?	**Yes**	**No**
Did the researcher explain how to document their level of on-task behavior by circling the percentage that most closely represents the amount of time they were on-task during their target class.	**Yes**	**No**
Did the researcher explain how the student participant is to graph their academic productivity behavior using the **Participant Paper-and-Pencil Graphing Worksheet**?	**Yes**	**No**
Did the researcher ask the student participant if they had any comments or questions and if so, did the researcher entertain the participant's comments and/or questions before concluding the training session?	**Yes**	**No**
Totals		

Part II: Inter-Observer Agreement Point-by-Point Method Form for Observation of Video-Taped Treatment Session

Directions: After viewing the treatment video and completing the above checklist, you and another trained observer will compare your ratings on a point-by-point basis. You will then add up the total number of agreements between your two forms. This number will be divided by the sum of total number of agreements plus the total number of disagreements. The resulting quotient is then multiplied by 100 to determine the Inter-Observer Agreement (IOA) percent agreement between the two trained observers.

IOA Between the Two Trained Intervention Procedure Training Observers:

$$\frac{Agreements}{Agreements + Disagreements} \times 100 = Percent\ Agreeement$$

Calculation Area: _____

Write the IOA Score here: _____

APPENDIX C: RESEARCHER/TEACHER PAPER-AND-PENCIL ACADEMIC PRODUCTIVITY RECORDING FORM

Researcher/Teacher Paper-and-Pencil Academic Productivity Recording Form

Researcher-Teacher/Class:_____ **Student:** _____

Date: _____

Directions: You are to collect data on this student's academic productivity behaviors of Homework Completion, Classroom-Based Work, Planner Documentation and On-Task Behavior. Please circle the most appropriate answer and feel free to elaborate wherever you deem necessary. The researcher will collect these forms at the end of every school day for the duration of the study.

Item	Please circle your	Score
Homework Submission & Completion		
Did the student submit or show evidence of his fully or partially completed homework assignment? *Note:* If the student did not submit or show evidence of his fully or partially completed homework assignment, then he will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	
Please circle the percentage of homework the student completed for today's class.	**<25% - 0 points** **25% - 1 point** **50% - 2 points** **75% - 3 points** **100% - 4 points**	
	Homework Submission and Completion Score	**/5 = _____%**
Classroom-Based Work		
Did the student submit or show evidence of his fully or partially completed classroom-based work (individual work, small group work, whole class work, quiz, exam) today? *Note:* If the student did not submit classroom-based work today even though he was expected to then he will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	
Please circle the percentage of classroom-based work the student completed today.	**<25% - 0 points** **25% - 1 point** **50% - 2 points** **75% - 3 points** **100% - 4 points**	
	Classroom-Based Work Score	**/5 = _____%**
Planner Documentation		
Did the student write the correct subject name for the homework assignment or academic task to be completed? *Note:* If the student did not bring their planner, they will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	
Did the student write the homework assignment or academic task on the correct day?	**Yes - 1 point** **No - 0 points**	
Did the student write down the correct chapter, or worksheet, or task?	**Yes - 1 point** **No - 0 points**	

Did the student write down the correct homework problems or academic tasks to be completed?	**Yes - 1 point** **No - 0 points**	
Is the student's writing legible enough that you can read what the student has written?	**Yes - 1 point** **No - 0 points**	
	Planner Score	**/5 = _____%**
	Total Academic Productivity Score	**/15 = _____%**
On Task Behavior		
Circle the percentage that best represents the amount of time the student was on-task during class today.	**<25% 25% 50% 75% 100%**	
If the student was on-task less than 75% of today's class, what do you believe was/were the underlying cause(s) for the off-task behavior(s) you witnessed during class today? Don't forget to list the frequency and type of off-task behavior(s) you observed during **today's class period**.		

APPENDIX D: PARTICIPANT PAPER-AND-PENCIL ACADEMIC PRODUCTIVITY RECORDING FORM

Participant Paper-and-Pencil Academic Productivity Recording Form

Student: _____ Teacher/Class: _____

Date:_____

Directions: You will be taking data on your academic productivity behaviors of Homework Completion, Classroom-Based Work, Planner Documentation and On-Task Behavior. Please circle the most appropriate answer and feel free to elaborate wherever you deem necessary. The researcher will collect these forms at the end of every school day for the duration of the study.

Item	Please circle your	Score
Homework Submission and Completion		
Did you submit or show evidence of your fully or partially completed homework assignment? *Note:* If you didn't submit/show evidence of your fully or partially completed homework assignment, then you will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	
Please circle the percentage of homework you completed for today's class.	**<25% - 0 points** **25% - 1 point** **50% - 2 points** **75% - 3 points** **100% - 4 points**	
Homework Submission and Completion Score		**/5 = _____%**
Classroom-Based Work		
Did you submit or show evidence of your fully or partially completed classroom-based work (individual work, small group work, whole class work, quiz, exam) today? *Note:* If you didn't submit/show evidence of classroom-based work today even though you were expected to then you will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	
Please circle the percentage of classroom-based work you completed today.	**<25% - 0 points** **25% - 1 point** **50% - 2 points** **75% - 3 points** **100% - 4 points**	
Classroom-Based Work Score		**/5 = _____%**
Planner Documentation		
Did you write the correct subject name for the homework assignment or academic task to be completed? *Note:* If you did not bring your planner, then you will receive 0/5 points for this section.	**Yes - 1 point** **No - 0 points**	

Did you write the homework assignment or academic task on the correct day?	**Yes - 1 point No - 0 points**	
Did you write down the correct chapter, or worksheet, or task?	**Yes - 1 point No - 0 points**	
Did you write down the correct homework problems or academic task(s)s to be completed?	**Yes - 1 point No - 0 points**	
Is your writing legible enough that your teacher can read what you have written?	**Yes - 1 point No - 0 points**	
Planner Documentation Score		**/5 = _____%**
Total Academic Productivity Score		**/15 = _____%**
On Task Behavior		
Circle the percentage that best represents the amount of time you were on-task during class today.	**<25% 25% 50% 75% 100%**	
If you were on-task less than 75% of today's class, what do you believe was/were the underlying cause(s) for your off-task behavior(s) during class today? Don't forget to list the type and frequency of off-task behavior(s) you engaged in during **today's class period**.		

APPENDIX E: RESEARCHER /TEACHER-PARTICIPANT ACADEMIC PRODUCTIVITY BEHAVIOR INTER-RATER RELIABILITY SCORING FORM

Researcher/Teacher-Participant Academic Productivity Behavior Inter-Rater Reliability Scoring Form

Directions: During the intervention and maintenance phases, the researcher and teacher, respectively, will compare the data from their Researcher/Teacher Paper-and-Pencil Academic Productivity Recording Form (see Appendix C) to the data on the Student Paper-and-Pencil Academic Productivity Recording Form (Appendix D) on a point-by-point basis across the Homework, Classroom-Based Work Planner Documentation and On-Task Behavior sections of their respective forms.

The researcher will then add up the total number of agreements between the two forms and divide this sum by the sum of total number of agreements plus disagreements between the two forms. The resulting quotient will then be multiplied by 100 to determine the Inter-Rater Reliability Score (IRR) between the researcher and the participant or the teacher and the participant for the individual items sections of Homework Completion, Classroom-Based Work, and Planner Documentation.

$$\frac{Agreements}{Agreements + Disagreements} \times 100 = Percent\ Agreeement$$

Academic Productivity Behavior Researcher-Student IRR Score _____

Academic Productivity Behavior Teacher-Student IRR Score _____

APPENDIX F: PARTICIPANT PAPER-AND-PENCIL PERFORMANCE GRAPHING WORKSHEET

Participant Paper-and-Pencil Performance Graphing Worksheet

Name: _____ Class/Teacher: _____ Date: _____

Directions: This worksheet will be used to graph your Academic Productivity behaviors for the areas of Homework Completion, Classroom-Based Work and Planner Documentation. At the end of each week, add up the total number of times you submitted homework and classroom-based work and divide each by the total number of possible times you could have submitted homework and classroom-based work, respectively. Multiply this quotient by 100 and the result will be the total percentage score for each. Write the date and this percentage in the cells to the right of "Date" and shade in the correct number of squares above the Homework Completion and Classroom-Based Work cells in order to graphically represent your academic productivity behaviors for these two items.

You will calculate a performance percentage for your Planner Documentation behavior by determining the total number of times you correctly documented homework assignments in your planner by the total number of times you were required to document homework or no homework in your planner. Multiply this quotient by 100 to obtain a total percentage score for your Planner Documentation behaviors. Write the date and this percentage in the cells to the right of "Date" and shade in the correct number of squares above the Planner Documentation cell in order to graphically represent your academic productivity behavior for this item. To determine your Academic Productivity Composite Score for the day, add up the total number of earned points and divide by the total number of possible points for the day and multiply the quotient by 100 to obtain a percentage. Write this percentage in the appropriate space and graph the score. The total number of possible points may vary based on whether or not you were assigned homework (i.e., directly assigned homework or incomplete class work that became homework).

Finally, you will calculate your average percentage of on-task behavior for the week. To do this, add up all of your **On Task Behavior** results for the week and divide by the total number of times you took this data. Multiply the resulting quotient by 100 to obtain your average percentage of on task behavior for the week.

Be sure to enter the date and use a different colored pencil of each week. Not to worry, you will complete this graphing worksheet during your weekly follow-up sessions with your speech-language pathologist.

Date																														
Percentage	100																													
	90																													
	80																													
	70																													
	60																													
	50																													
	40																													
	30																													
	20																													
	10																													
Item		Homework Completion	Classroom-Based Work	Planner Documentation	Academic Productivity Composite	On-Task Behavior		Homework Completion	Classroom-Based Work	Planner Documentation	Academic Productivity Composite	On-Task Behavior		Homework Completion	Classroom-Based Work	Planner Documentation	Academic Productivity Composite	On-Task Behavior		Homework Completion	Classroom-Based Work	Planner Documentation	Academic Productivity Composite	On-Task Behavior		Homework Completion	Classroom-Based Work	Planner Documentation	Academic Productivity Composite	On-Task Behavior

Weekly Averages:

Homework Completion _____ **Classroom-Based Work _____**

Planner Documentation _____ **On-Task Behavior _____**

Academic Productivity Composite _____

APPENDIX G: TEACHER SOCIAL VALIDITY QUESTIONNAIRE (ADAPTED FROM LO, 2003)

Teacher Social Validity Questionnaire

Teacher: _____ Student: _____ Date: _____

This questionnaire consists of 10 items. For each item, you need to indicate the extent to which you agree or disagree with each statement. Please indicate your response to each item by circling one of the five responses to the right.

1.	The target problem behavior of low academic productivity selected as an intervention for this student are appropriate and important.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2.	The interventions of self-monitoring of academic productivity behaviors selected for this student are appropriate and important.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3.	I noticed meaningful increases in the student's on-task behavior after the implementation of the intervention.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4.	I noticed meaningful increases in the student's academic productivity after implementation of the intervention.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5.	I noticed meaningful improvements in the student's submission of homework assignments after the implementation of the intervention.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
6.	I noticed meaningful improvements in the student's submission of classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.) after the implementation of the intervention.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7.	I noticed meaningful improvements in the student's use of the planner to record homework assignments.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8.	I believe the self-monitoring package consisting of the WatchMinder2, self-recording form, and graphing worksheet helped the student to self-monitor their academic productivity behaviors.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9.	I plan on continuing to use the self-monitoring package with this student because it is effective.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10.	I would like to use all or parts of the self-monitoring package with other struggling students because I believe it will help them to improve their on-task and academic productivity behaviors.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

APPENDIX H: PARENT SOCIAL VALIDITY QUESTIONNAIRE (ADAPTED FROM LO, 2003)

Parent Social Validity Questionnaire

Parent's name: _____ Date of completion: _____

Child's name: _____

INSTRUCTIONS: This questionnaire consists of 10 items. For each item, you need to indicate the extent to which you agree or disagree with each statement. Please indicate your response to each item by circling one of the five responses to the right.

1.	Before the study, I felt that my child needed some behavioral support to be more successful at school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2.	Before the study, I felt that my child needed some academic support to be more successful at school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
3.	I feel that teaching my child to monitor and record his academic productivity behaviors is a useful and appropriate way to reduce my child's classroom problem behaviors.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
4.	I feel this program helped to reduce my child's off-task behaviors and improve his academic productivity behaviors.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
5.	I feel this program helped my child to become more responsible for his classroom behavior.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7.	I noticed meaningful improvements in my child's submission of classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.) after the implementation of the intervention.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8.	I feel my child improved in his ability to complete and submit classroom-based work (e.g., worksheets, group work, quizzes/exams, etc.).	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
9.	I feel my child improved in his ability to complete his homework.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
10.	I feel my child improved in his ability to submit his homework.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
11.	I am glad my child participated in this self-monitoring program.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
12.	I would like my child to continue using the self-monitoring program at school.	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

APPENDIX I: PARTICIPANT SOCIAL VALIDITY QUESTIONNAIRE (ADAPTED FROM LO, 2003)

Participant Social Validity Questionnaire

Student: _____ Interviewer: _____ Date: _____

"I have some questions to ask you. I just want to know how you feel about the self-monitoring program. So relax and tell me how you feel."

1.	The program helped me stay on task during class.	Yes	Maybe	No
2.	The program helped me improve my academic productivity in class.	Yes	Maybe	No
3.	The program helped me to write in my planner more often.	Yes	Maybe	No
4.	The program helped me to complete any work I was assigned in class (e.g., worksheets, group work, quizzes/exams, etc.).	Yes	Maybe	No
5.	The program helped me to remember to submit any work I completed in class (e.g., worksheets, group work, quizzes/exams, etc.).	Yes	Maybe	No
6.	The program helped me to complete my homework more often.	Yes	Maybe	No
7.	The program helped me to remember to submit my homework more often.	Yes	Maybe	No
8.	The program helped me to be more productive in class.	Yes	Maybe	No
9.	I feel the intervention program would benefit other students who have trouble staying on task and maintaining their academic productivity.	Yes	Maybe	No
10.	I would like to use the program again to help me do better in some of my other classes.	Yes	Maybe	No

11. What did you learn from this project?

12. What did you like best about the program?

13. What did you not like about the program?

14. If you were in change, what would have you changed about the program?

15. Is there anything else you want to say about the program?

APPENDIX J: PARTICIPANT INTELLIGENCE AND ACHIEVEMENT TEST DATA

Participant Intelligence Test Composite Scores

Intelligence Test	Participant 1	Participant 2	Participant 3
RIAS Composite Intelligence Index	138 Significantly Above Average (February 2008, Age 12-7)	110 Above Average (April 2005, Age 11-2)	121 Moderately Above Average (April 2008, Age 13-0)

Participant Peabody Individual Achievement Test (PIAT) Scores

	General Information	Reading Recognition	Reading Comprehension	Total Reading	Mathematics	Spelling	Total Test
Particpant 1 Age: 17-7							
Raw Score	96	97	98	195	94	93	478
Standard Score	121	123	123	126	109	103	119
Percentile Rank	92	94	94	96	73	58	90
Grade Equivalent	>12.9	>12.9	>12.9	>12.9	>12.9	>12.9	>12.9
Age Equivalent	>18-11	>18-11	>18-11	>18-11	>18-11	>18-11	>18-11
Particpant 2 Age: 19-0							
Raw Score	90	94	93	187	93	90	460
Standard Score	104	102	100	102	105	95	103
Percentile Rank	61	55	50	5	63	37	58
Grade Equivalent	>12.9	12.6	12.5	>12.9	>12.9	10.6	>12.9
Age Equivalent	>18-11	>18-11	18-8	>18-11	>18-11	16-2	>18-11

	General Information	Reading Recognition	Reading Comprehension	Total Reading	Mathematics	Spelling	Total Test
Particpant 3 Age: 17-11							
Raw Score	92	97	95	192	97	92	473
Standard Score	112	123	110	117	117	101	116
Percentile Rank	79	94	75	87	87	53	86
Grade Equivalent	>12.9	>12.9	>12.9	>12.9	>12.9	12.2	>12.9
Age Equivalent	>18-11	>18-11	>18-11	>18-11	>18-11	18-11	>18-11

APPENDIX K: UNIVERSITY OF CENTRAL FLORIDA INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Patrick M. Craanen**

Date: **June 21, 2013**

Dear Researcher:

On 6/21/2013, the IRB approved the following minor modifications to human participant research until 02/12/2014 inclusive:

Type of Review:	IRB Addendum and Modification Request Form
Modification Type:	Study title has been changed to: "The Effect of a Self-Monitoring Treatment Intervention Package on the Academic Productivity of Three High School Students with Autism Spectrum Disorder." The original study title was: "The Effect of a Tactile Self-Monitoring Prompt on the Academic Productivity Behavior of Three High School Students with Autism Spectrum Disorder." In addition, the teacher and researcher will not be outfitted with a WatchMinder2 timed tactile-prompting device. A revised protocol has been uploaded in iRIS.
Project Title:	The Effect of a Self-Monitoring Treatment Intervention Package on the Academic Productivity Behavior of Three High School Students with Autism Spectrum Disorder
Investigator:	Patrick M Craanen
IRB Number:	SBE-13-09089
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

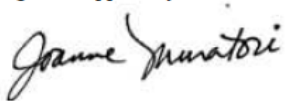
If continuing review approval is not granted before the expiration date of 02/12/2014, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 06/21/2013 01:50:58 PM EDT



IRB Coordinator

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