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# The Impact of Self-Monitoring Paired with Positive Reinforcement on Increasing Task Completion with a Student Diagnosed with Autism Spectrum Disorder: A Case Study

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**Abstract.** It is not uncommon for students diagnosed with Autism Spectrum Disorder to struggle with the ability to self-regulate on-task behavior and translates into failure within an academic setting. This case study implemented a single-subject withdraw design with repeated measures to evaluate the impact of self-monitoring paired with positive reinforcement on the task completion for a student diagnosed ASD. Results indicated that self-monitoring paired with positive reinforcement increased the student's homework completion each time the intervention was presented.

**Key Words:** Self-Monitoring, Self-Regulation, Task Completion, Autism Spectrum Disorder, Math, Stimulus Preference Assessment

## Introduction

The rise in teacher accountability paralleled with the increase in the number of students diagnosed with Autism Spectrum Disorder (ASD) entering classrooms has made it critical for teachers to identify evidence-based practices (EBP) that can be used with consistence. This is particularly challenging in the field of special education when working with students diagnosed with ASD when it is considered common knowledge that what is effective for one individual diagnosed with ASD may not work at the same level of impact for another individual with a diagnosis of ASD (Lerman, Vorndran, Addison, & Kuhn, 2004). This dichotomy highlights the importance for special education teachers to have knowledge of many EBP to implement with various students as well as how to adapt the practices for different environments and for different students with similar struggles. Students diagnosed with ASD often have similar struggles in their inability to independently self-regulate on-task behaviors for non-preferred tasks (Hume, Plavnick, & Odom, 2012;

Rafferty & Raimondi, 2009). Therefore, it comes with no surprise that on-task behavior is often cited as a primary reason for the already struggling student's failure to complete academic task demands (Falkenberg & Barbetta, 2013; Axelrod, Zhe, Haugen, & Klein, 2009).

An identified evidence-based intervention that increases on-task completion for students diagnosed with disabilities is the use of self-monitoring (State & Kern, 2011; Axelrod, Zhe, Haugen, & Klein 2009; O'Reilly et al., 2002). Self-monitoring is designed to teach students to maintain control of personal behavior by using a multi-step process of self-observing, self-evaluating, and then self-reinforcing (State & Kern, 2011). It is a flexible intervention that can be adapted to meet the specific academic and behavioral needs based on the individual's developmental and cognitive level (e.g. using pictures for a child who cannot read). Research has consistently demonstrated that the use of self-monitoring results in an immediate increase of on-task behavior for students, thus increasing their level of task completion (Falkenberg & Barbetta, 2013; Bialas & Boon, 2010; O'Reilly et al. 2002; Trammel & Schloss,1994). Students without disabilities and with disabilities have a higher probability of developing independent self-monitoring skills when consistently taught how to self-motivate and self-evaluate. This leads to a greater potential for the functional skill to generalize increasing independency. Yet, because students diagnosed with ASD often have deficits in the ability to attend to low-preferred tasks (Hume, Plavnick, & Odom, 2012) the use of self-monitoring may be dismissed.

It is not uncommon for students diagnosed with ASD to have difficulty attending to specific tasks as a result of a deficiency in the brains ability to properly utilize their metacognitive functions (also known as executive-functions) that aid in such areas as self-regulate behaviors, problem solving, organization, and self-evaluation (Hume, Plavnick, & Odom, 2012; State & Kern, 2011; Loftin, Gibb, & Skiba, 2005; Solomon, Goodlin-Jones, & Anders, 2004). However, evidence from research suggests that the use of self-monitoring is an EBP that has the capability to bridge the gap between the metacognitive skills and task demands for individuals with disabilities (Mithaug & Mithaug, 2003; Morrison et al., 2001; Rafferty, & Raimondi, 2009; Solomon, Goodlin-Jones, & Anders, 2004; Trammel & Schloss, 1994).

Despite whether and individual has a disability or not, for greater probability of self-monitoring behavior to be maintained and eventually generalized the administration of a reinforcing stimulus must follow the correct self-monitoring behavior (Mithaug & Mithaug, 2003). The implementation of a highly preferable reinforcing stimulus following the demonstration of a targeted behavior will increase the probable frequency rate of the target behavior occurring again in the future under similar stimulus conditions (Cooper, Heron, & Heward, 2007). For the reinforcing stimulus to maintain its effectiveness it is best to intermittently administer back-up reinforcers. This schedule of administrating reinforcement establishes a greater control over the possibility of satiation (Alberto & Troutman, 2013; Cooper, Heron, & Heward, 2007). Loftin et al. (2005) express, "To ensure success when first beginning an intervention, frequent reinforcement is recommended. Offering a choice among preferred reinforcers increases the likelihood of a successful intervention" (p. 12 - 13).

Identifying potential highly preferred reinforcers for individuals diagnosed with specific disabilities, such as ASD, might prove difficult. Fisher et al. (1992) developed a stimulus preference assessment (SPA) called paired-choice (also called forced-choice) to identify potential reinforcing stimuli. The evidence from Fisher et al. (1992) suggests that the paired-choice SPA is an effective procedure for any individual (i.e. severe and profound disabilities, mild disabilities, or without a disability).

The paired-choice SPA pairs various stimuli together and repeatedly present the paired stimuli to the individual in alternating orders. Data are collected on the frequency of what is defined as approach behaviors versus non-approach behaviors to the presented stimuli. After multiple presentations of the paired stimuli, the stimuli that is approached with greater frequency is identified as the highly preferred reinforcer while the remaining items that are approached 80% of the time or more are identified as back-up reinforcers.

When an individual with a disability or without a disability is at the acquisition stage of learning self-monitoring it is essential to pair the intervention with a highly reinforcing stimulus. This pairing increases the internal consistency of self-monitoring and provides the opportunity for individuals to increase personal responsibility for behavior strengthening the individual's understanding of the relationship between his or her behavior and the consequences that follow.

Evidence has indicated that individuals with ASD are capable of high achievement when the proper interventions are implemented (Rafferty, & Raimondi, 2009; Mithaug & Mithaug, 2003; Morrison et al., 2001). Therefore, the purpose of this study is to examine the impact of positive reinforcement paired with self-monitoring on the completion of note-taking and homework with a student diagnosed with ASD. A single-subject withdrawal design with repeated measures is used to examine the functional relationship between self-monitoring paired with reinforcement and task completion.

## Methods

A single-subject withdraw design ($A_1$-$B_1$-$A_2$-$B_2$-$A_3$-$B_3$-$A_4$) was used to assess the impact of self-monitoring, paired with positive reinforcement, to increase homework (HW) completion and note-taking (NT) completion for an individual diagnosed with ASD in a pullout secondary math class. A withdraw design with repeated measures design was selected for its simplistic ability to identify a cause-effect relationship through its repeated design and periodic removal of the intervention (Cooper, Heron, & Heward, 2007). The data for the study were collected for a total of 50 instructional days. During each baseline condition the data were collected for 5 instructional days. During the intervention conditions data were collected for 10 instructional days.

**Participant**

The participant in the study was a 15-year-old male diagnosed with ASD. At the time of the study, the participant's current psycho-educational evaluation indicated that he received special education services in the pullout classroom for 20% of the day and services in the inclusive education classroom for 80% of the day. His evaluation scores indicated that he is capable of retaining 90% to 100% of what he hears and sees but has deficits in written communication, oral communication, and task completion.

Two special education teachers collected data for the study. At the time of the study both teachers combined had a total of 7 years of experience in the field of special education. The primary special education teacher taught the pullout class while the second special education teacher collected reliability data.

**Setting**

The study took place in a rural public high school with a student enrollment of 1,048. Data were collected in a pullout secondary math classroom with 9 other students who received special education services. The class duration was 70-m and met 5 days a week. The class began each day with a set of opening problems that reviewed previously taught mathematical skills, followed by the instruction of new content with guided notes, guided practice, and then concluded with independent practice. The class grading procedure stated that all students received full credit for assignments based on completion and not based on accuracy. Students would receive a zero on assignments if they did not attempt the work, did not turn in the work, copied a peer's HW, wrote answers that were determined non-mathematical in nature (e.g. 2+2 = yes), or a combination of the aforementioned.

**Dependent Variables**

The dependent variables were the student's HW and NT completion. At the start of each class session the student was provided with guided notes with fill-in-the-blanks that he was expected to complete during the guided lecture. NT was calculated by adding the number of blanks filled in on the guided notes divided by the total number of blanks, multiplied by 100. The percentage of HW completion was calculated by dividing the number of completed problems on all assignments for the class session (completed meaning all of the work was attempted to be answered based on the class policy) divided by the total number of problems to be completed on all assignments for the class session, multiplied by 100.

Prior to the study the student had an average of 60% in the class (according to the school policy, failing was a score of 64% and below), and had scores of zeros on 10 out of 21 assignments during an 8-week period. Likewise, he had not turned in 48% of his assignments for the first 2 nine-weeks of the school year. During the same time period, his peers had an average grade of 81% with an average of 5 out of 21 assignments with scores of zeros.

**Procedures**

A paired-choice stimulus preference assessment (SPA) was administered prior to the collection of the data following the procedures used by Fisher et al. (1992). A list of 5 potential reinforcers for the SPA was identified through a parent interview: (1) Nintendo Game Boy, (2) Twix, (3) Snickers, (4) 3-Musketeers, and (5) Milky-Way candy. The two stimuli approached 80% or more during all trials of the SPA were identified as reinforcers. An approach was scored if the subject made physical contact with the stimuli using his hands. The SPA was conducted one time prior to the collection of the first baseline data. The results of the SPA indicated Snicker's candy as the stimulus with the greatest potential to reinforce the targeted behaviors and the Nintendo Game Boy as the second stimuli (the back-up reinforcer).

The special education teacher and an additional special education teacher, who was brought into the classroom during the study, collected the data during all sessions. It was established by the primary special education teacher prior to data collection that the student's completion goal for his HW and NT was 75% based on the objective goal of WH completion in the student's Individual Education Plan (IEP). Data were collected for 50 instructional school days, graphed, and analyzed within conditions and across conditions (Figure 1). A frequency count measured the number of blanks filled in on guided notes and the on number of problems completed on the homework.

**Baseline (A).** During each baseline condition data were gathered for 5 instructional days on the student's completion of HW and NT. A training session on how to use the self-monitoring forms was administered at the conclusion of the fifth day of the first baseline condition. The student was provided a folder to keep the self-monitoring data sheets in and directed to keep the folder in an easily accessible location within the classroom (a filing cabinet behind the teacher's desk was used in the study). The student was allowed to continue to use the self-monitoring form in the subsequent baseline conditions if he chose to but no reinforcement or verbal redirection was provided for its use. The student elected to not use the self-monitoring form during each baseline condition.

**Intervention (B).** During each intervention condition data were collected for 10 instructional days. Each day during the intervention condition the student obtained the folder from the designated place within the classroom. At the conclusion of the class the student self-observed and self-evaluated for that day of the week in the identified columns labeled, "*Did I Take Notes Today?*" and "*What Assignments Do I have and did I complete them?*" If the task was completed for each column, a check mark was placed in a small box in the bottom corner of that column. If the task was not completed, an *X* was placed in the provided box in the column. Both teachers independently recorded the student's task completion behavior and self-monitoring behavior using the same form that the student was provided.

After all columns were filled in, the student and the two teachers simultaneously compared data to measure the fidelity of the self-monitoring. The teachers initialed that day of the week's column if they agreed that the student self-observed, self-evaluated, or completed both actions correctly. If they disagreed with the student's documentation or with each other they did not initial the column.

If the student self-observed and self-evaluated correctly a smiley face sticker was placed on that day's column to reinforce the documentation process and the student was provided the choice between a Snickers candy bar or free time to play with his Nintendo Game Boy (approximately 15-m of access time). If the student inaccurately self-evaluated he was still provided the smiley face sticker but given verbal redirection and denied access to the candy or video game system. If the student did not complete both the self-evaluating and self-recording accurately verbal redirection was administered and no sticker, candy, or video game system were provided.

**Reliability.** The additional teacher collected data on interobserver reliability and procedural reliability. Interobserver reliability was calculated using the point-by-point method by comparing the primary special education teacher's data with the additional teacher's data. Procedural reliability data were collected by using a task analysis checklist. A minimum score of 90% was required to establish interobserver reliability and a minimum score of 95% was required to establish procedural reliability. Both the interobserver reliability and the procedural reliability for this case study was 100%.

## Results

Data collected were analyzed within each condition and across conditions. Results indicate that the student's NT and HW completion increased each time self-monitoring parried with a positive reinforcement was implemented. The student's NT and HW completion scores decreased each time self-monitoring parried with positive reinforcement was removed (Figure 1).

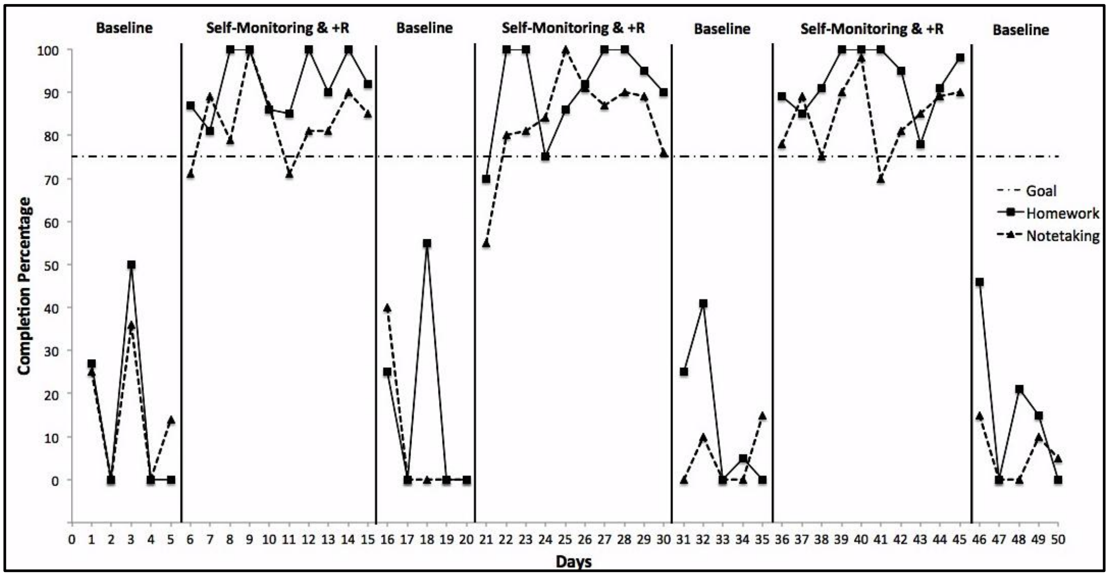


**Figure 1: Homework Completion and Note-Taking Completion Using Self-Monitoring**

**Data Analysis within Conditions**

The data collected were analyzed within each condition through the use of the calculated mean of HW completion and NT, the data variability, and the use of split-middle tend analysis. The level of variability was determined based on the calculated stability range of the data. The data were considered stable if 80% of the data within the condition fell in a +/- 20% range of the mean score.

**Baseline ($A_1$)**. The calculated mean for the first baseline condition for the student's HW completion was 15.4% (range: 0% - 50%). The calculated mean for the first baseline condition for NT completion was 15% (range: 0% - 36%). The calculated stability of the data for HW completion and NT completion had high variability. The percentage of stability for HW completion was 0% (range: 12.3% - 18.5%) and for NT completion was 20% (range: 12% - 18%). Using the split-middle trend analysis, the trend for both HW completion and NT were decelerating.

**Intervention ($B_1$).** The calculated mean of the student's HW completion for the first intervention condition was 92.1% (range: 81% - 100%). The calculated mean for NT completion with the intervention condition was 83.4% (range: 71% - 100%). The calculated stability of the data for both HW and NT completion had low variability. The percentage of stability for HW completion was 100% (range: 73.7% - 100%) and for NT completion was 100% (range: 66.7% - 100%). Using the split-middle trend analysis, the trend for both HW completion and NT were accelerating.

**Baseline ($A_2$).** The calculated mean for the second baseline condition for the student's HW completion was 16% (range: 0% - 55%). The calculated mean for baseline condition for NT completion was 8% (range: 0% - 40%). The calculated stability of the data for HW completion and NT completion had high variability.

The percentage of stability for HW completion was 0% (range: 12.8% - 18.2%) and for NT completion was 0% (range: 6.4% - 9.6%). Using the split-middle trend analysis, the trend for both HW completion and NT completion were decelerating.

**Intervention ($B_2$).** The calculated mean of the student's HW completion for the second intervention condition was 90.8% (range: 70% - 100%). The calculated mean for NT completion with the second intervention condition was 83.3% (range: 55% - 100%). The calculated stability of the data for both HW and NT completion had low variability. The percentage of stability for HW completion was 100% (range: 62.6% - 100%) and for NT completion was 80% (range: 66.7% - 99.9%). Using the split-middle trend analysis, the trend for both HW completion and NT were accelerating.

**Baseline ($A_3$).** The calculated mean for the third baseline condition for the student's HW completion was 14.2% (range: 0% - 41%). The calculated mean for the baseline condition for NT completion was 5% (range: 0% - 15%). The calculated stability of the data for HW completion and NT completion had high variability. The percentage of stability for HW completion was 0% (range: 11.4% - 17%) and for NT completion was 0% (range: 4% - 6%). Using the split-middle trend analysis, the trend for both HW completion and NT completion were decelerating.

**Intervention ($B_3$).** The calculated mean of the student's HW completion for the third intervention condition was 92.7% (range: 78% - 100%). The calculated mean for NT completion with the third intervention condition was 84.5% (range: 70% - 100%). The calculated stability of the data for both HW and NT completion had low variability. The percentage of stability for HW completion was 100% (range: 74.2% - 100%) and for NT completion was 100% (range: 67.6% - 100%). Using the split-middle trend analysis, the trend for both HW completion and NT were accelerating.

**Baseline ($A_4$).** The calculated mean for the fourth baseline condition for the student's HW completion was 16.4% (range: 0% - 46%). The calculated mean for the baseline condition for NT completion was 6% (range: 0% - 15%). The calculated stability of the data for HW completion and NT completion had high variability. The percentage of stability for HW completion was 20% (range: 13.1% - 19.7%) and for NT completion was 20% (range: 4.8% - 7.2%). Using the split-middle trend analysis, the trend for both HW completion and NT completion were decelerating.

**Data Analysis across Conditions**
Data were collected on the student's HW completion and NT completion for 50 instructional days. The trend was calculated for analysis across conditions using least-squares regression. The mean scores of each condition and the rapidity of behavior change from one condition to the next were assessed.

The trend across the study was a positive acceleration for HW completion and NT completion. The student's mean HW completion increased from each baseline condition to intervention condition by 76.4% (HW baseline = 15.5%; HW intervention = 91.9%). Similarly, the student's mean NT completion increased from each baseline condition to intervention condition by 75.2% (NT baseline = 8.5; NT intervention = 83.7%).

The immediacy of change from the difference between the ordinate values of each intervention condition to the last data point of each baseline condition for HW completion increased by 92% (baseline = 0%; intervention = 92%), 70% (baseline = 0%; intervention = 70%), and 89% (baseline = 0%; intervention = 89%) and for NT it increased by 57% (baseline = 14%; intervention = 71%), 15% (baseline = 40%; intervention = 55%), and 78% (baseline = 0%; intervention = 78%). Each time the intervention was withdrawn, HW completion decreased by 67% (baseline = 25%; intervention = 92%), 70% (baseline = 0%; intervention = 70%), 90% (baseline = 0%; intervention = 90%), and 52% (baseline = 46%; intervention = 98%). Likewise, NT completion decreased by 35% (baseline = 40%; intervention = 85%), 55% (baseline = 0%; intervention = 55%), 63% (baseline = 15%; intervention = 78%), and 75% (baseline = 15%; intervention = 90%).

## Conclusion

The purpose of this study was to examine the impact of self-monitoring paired with positive-reinforcement on increasing HW completion and NT completion for a student diagnosed with ASD in a pullout math course. Based on the evidence of this study the goal for HW completion and NT rate increased for the student during each intervention condition and decreased each time the intervention was removed. The goal was for the student to achieve a 75% completion rate for both variables during the intervention conditions. This goal was achieved for 97% of the intervention condition days for his HW completion and for 87% of the days for NT completion

The increase in the percentage of completion from the baseline data to the intervention data and then the decrease in percentage when the intervention was removed, suggests that a possible functional relationship exists between at least one of the independent variables of self-monitoring and positive reinforcement and the dependent variable of task completion. The analysis of the data does not confirm with confidence that the increase in completion of both HW and NT was because of the self-monitoring. Rather, it does suggest that the increase may have been because of the preferred reinforcer used during each intervention condition. This conclusion is established because during each baseline condition the student was provided access to the self-monitoring forms but was not reinforced for using them. It was observed that the student elected to not use the forms and the data collected indicates that the completion rate decreased during each baseline condition but increased once the intervention was reintroduced. Yet research suggests that the use of a reinforcer is necessary for self-monitoring to be effective for students with disabilities (Koegel, Singh, & Koegel, 2010). Therefore, the evidence of this study adds further affirmation to previous research that the intervention of self-monitoring paired with reinforcement increases the probability of achieving a high level of independence for individuals with disabilities such as ASD.

**Future Studies**

This study requires further replication across settings and individuals to establish a stronger functional relationship as well as an extinction process to fade out the reinforcement to establish if a functional relationship exists between self-monitoring and task completion. Similarly, future studies may want to consider using more than one assignment at a time to potentially increase the stability of the data and provide more training for students on self-monitor.

The completing of a given task is an expectation for students with disabilities and without disabilities in the educational classroom. Students who learn the reinforcing value of self-monitoring can learn to generalize this skill to other academic areas and eventually adapt it for functional skills. Thus, it is advantageous to the individual student, teacher, and society to understand potential strategies that may increase the frequency of an individual's ability to properly complete a given task.

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