2007

In search of the optimal cueing schedule in self-monitoring of attention with typically developing children

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IN SEARCH OF THE OPTIMAL CUEING SCHEDULE IN SELF-MONITORING OF ATTENTION WITH TYPICALLY DEVELOPING CHILDREN

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Arts

in

The Department of Psychology

by
Amanda M. Dahir
B.S., University of Florida, 2003
December, 2007

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Self-Monitoring of Attention (SMA) is a behavioral technique in which an individual assesses whether or not a target behavior (e.g. off-task behavior) has occurred and then records the result. In this study, two components were manipulated in a SMA procedure: the use of a tactile prompt and the schedule at which prompts are delivered. While SMA is a well-established intervention for increasing on-task behavior and decreasing problem behavior, standardizing the procedures has received little to no research. The current study examined the length of the cueing interval and compared different percentages of an individual's inter response time (IRT) (50% IRT, 100% IRT, and 200% IRT) during a SMA procedure with typically developing children using a tactile cueing prompt (via MotivAider™). This study showed that basing the cueing interval on IRT alone in a SMA procedure was not effective in decreasing levels of off-task behavior; however, contingent rewards (CR) alone (M = 9.9%), as well as CR with IRT cueing (M = 8.6%) had a significant effect in reducing off-task behavior from a mean baseline percentage of intervals of 42.5% for all three participants.

INTRODUCTION

Difficulty attending to academic tasks and completing work are often cited as classroom problems characteristic of many students. An intervention that clearly has proven to be effective in managing self-regulation skills in both typically developing students as well as students with learning disabilities is self-monitoring (Lloyd & Landrum, 1990; Mace & Kratochwill, 1988). Self-monitoring, sometimes referred to as self-regulation, has been shown to improve student academic performance, and is critical in both child development and learning (Harris, 1982; Zimmerman & Schunk, 1989). Beginning in the 1970's, studies began emerging examining the use of self-monitoring techniques in the academic arena (Ballard & Glynn, 1975; Bolstad & Johnson, 1972; Broden, Hall, and Mitts, 1971; Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973); more specifically, they examined the potential usefulness of implementing self-monitoring techniques within regular education classrooms.

Self-monitoring is a particularly alluring intervention because it has been shown to assist students in working independently (Burke, 1992), is often less intrusive than teacher-managed interventions (Fantuzzo, Polite, Cook, & Quinn, 1988), enhances students' control of their learning, and may be more effective than interventions managed primarily by the teacher (DuPaul & Stoner, 2002). Frederick (1977) found that students who are on task more do better in school than those who are not. Additionally, Rosenshine (1979) found that the amount of time students spend academically engaged in the classroom is an important correlate of academic achievement as measured by standardized tests. While this may seem obvious, this was the first time this relationship between academic engaged time and performance on standardized tests was demonstrated empirically.

Self-monitoring has also been demonstrated as an effective behavioral intervention. Studies have examined using self-monitoring as part of an intervention package to help teachers deal with difficult-to-teach (DTT) students within the regular education setting. For example, Fuchs, Fuchs, and Bahr (1990) and Fuchs, Fuchs, Bahr, Fernstrom, and Stecker (1990) found that DTT students increased both on-task behaviors and task productivity when using self-monitoring. The teachers' perceptions of the DTT students' manageability and tolerance levels also increased while students used self-monitoring. In addition, the teachers perceived the intervention to be both acceptable and practical for use in their classrooms. Some of the most pronounced effects shown by self-monitoring procedures are: increased on-task behavior, decreased disruptive behavior, increased productivity, as well as its utility across many different subject areas. A few studies have examined the acceptability of self-monitoring interventions by using teacher ratings (Fuchs et al., 1990; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999), but most of the self-monitoring studies do not collect this sort of data.

Fuchs and colleagues (1990) administered questionnaires after completing a Behavioral Consultation (BC) model on problem behavior of students in mainstream classrooms in order to examine how the teacher, consultant, as well as the student felt about various features of the intervention implementation. Some of the items on the questionnaire included: was the project effective, was the project worth doing, and was the technical assistance helpful. Fuchs et al. (1990) found that all of the experimental groups rated the project as effective, worthwhile, and felt that the technical assistance was very helpful. Shimabukuro et al. (1999) also found that self-monitoring interventions have a high rate of teacher acceptability; they attributed this to the fact that self-monitoring is easily implemented with minimal demands on teacher time, as well as minimal modification of a teacher's curriculum is necessary. Many treatment plans are not implemented and the reasons teachers give for not implementing them are that the intervention takes up too much time or the teacher could not incorporate the intervention into their daily schedule. If an intervention does not require much teacher time and the intervention can be easily implemented, then the intervention is more likely to be adopted and potentially benefit the student.

Self-monitoring consists of defining a target behavior, assessing whether it has occurred, and recording the result of the previous component (Nelson, 1977; Nelson & Hayes, 1981). The two primary dependent variables of self-monitoring which have been examined in educational research are on-task behavior and academic productivity (Reid, 1996). Problems maintaining on-task behavior are addressed by using a self-monitoring of attention (SMA) procedure, while problems in academic productivity are typically addressed by using a self-monitoring of performance (SMP) procedure. The accuracy of student recording is also a major dependent variable that has been examined in order to ensure that the data that is being collected accurately reflects the child's performance (Reid, 1996); although some argue that a high degree of accuracy is not necessary to get a positive treatment effect (DuPaul & Stoner, 2002; Hallahan, Lloyd, Kauffman, & Loper, 1983; Hallahan, Lloyd, & Stoller, 1982).

Cueing Schedules

For both the SMA and SMP procedures, a cueing schedule is typically used where the participant will hear an audible cue at varied times which prompts them to ask themselves either: (a) "was I paying attention?" and record the result (SMA) or (b) "how much work have I completed?" and record the result (SMP).

The use of varied cueing procedures in self-monitoring was examined during the early years of self-monitoring. Glynn and Thomas (1974) advocated for the use of cues within self-monitoring procedures and found that using a higher rate of cueing actually increased on-task behavior. Of the various ways cues are implemented, most use auditory cues either with or without headphones. Other, less utilized, techniques have used visual cues (Prater, Hogan, & Miller, 1992), external cues (usually implemented by the teacher), idiosyncratic cues (the student is touched on the shoulder) (Maag, DiGangi, & Rutherford, 1992), and tactile cues via MotivAider (Amato-Zech et al., 2006). Regardless of which instrument was used during implementation, all found marked increases in on-task behavior.

The MotivAider is an electronic pager-like device that emits a tactile prompt (vibration) to self-monitor. It is easy and safe to use and can be programmed to any length of time on either a regular or intermittent schedule. The MotivAider is a fairly new product (2000) that serves as an alternative to other more intrusive prompting methods in self-monitoring procedures. While it is still very new and has yet to be empirically validated, it does seem to make a lot of sense. It may even prove to be more practical and feasible than current prompting techniques (i.e. audible timers).

Among the SMP literature, cues have been implemented on varying schedules. A study conducted by Lloyd, Bateman, Landrum, and Hallahan (1989) examined SMP using a variable interval schedule (range 10-90 seconds), and Roberts and Nelson (1981) examined SMP using a 5 minute variable interval schedule. It should be noted that in SMP, there is a major procedural difference that warrants consideration. Some studies ask the students to assess their productivity during sessions, while others ask them to assess their productivity upon completion of a session. The major issue of concern here is that monitoring during the task performance subtracts from the work production that you are trying to improve. Time that is spent counting and recording data is time that is not spent to improve productivity. Therefore, when evaluating whether an

SMP procedure was effective or not and to what degree, one should be aware of the different procedures and how they may affect the treatment outcome.

Of the studies which employed SMA, there was also great variability as to the cueing schedules used, with most of schedules being selected arbitrarily. In a 2005 study by Harris, Friedlander, Saddler, Frizzelle, and Graham done with students with attention-deficit/ hyperactivity disorder (ADHD), a 45-s variable interval (VI) (range 10-90s) schedule was used, while Rock (2005) used a five minute fixed interval (FI) cueing schedule. Rock's (2005) study used an array of four different timing devices from which the participant was allowed to choose each day. These included: a travel alarm with snooze, a personal watch with alarm function, classroom clock mounted on wall, and an egg timer.

Amato-Zech, Hoff, and Doepke. (2006) trained with a FI-2 minute audible cue, so they could verify that the student was recording when they were prompted to do so. After training, they switched to a FI-1 minute cue that was a vibration (via MotivAider®). They then decided that FI-1 minute cues were too intrusive and switched to a FI-3 minute schedule. The rationale for the particular interval lengths was not provided.

SMA vs. SMP

SMA involves instructing a student to self-assess whether or not they are paying attention (on-task) and then to record the result when cued to do so (Reid, 1996). Hallahan and colleagues' SMA procedures are the most commonly cited (Hallahan, Lloyd, Kosiewicz, Kauffman, & Graves, 1979) and is the procedure that will be employed in the current study.

SMP involves instructing students to self-assess some aspect of academic performance and to self-record the results (Reid, 1993; Reid & Harris, 1989). During SMP there is a permanent product of whatever assignment the student is working on in order to record the number of problems or steps the student has completed until the self record step. The self-assessment component may occur either during work sessions (usually using an auditory cue) or after the work session (without the use of cues). In a 1996 review of the self-monitoring literature with students with learning disabilities, Reid found that on-task behavior is the single most common dependent variable reported in self-monitoring research in school settings; 22 out of 23 studies examined on-task behavior as the dependent variable. By and large, SMA has demonstrated profound effects across a broad age range and across instructional settings. Reid also found that a positive treatment effect has been found for participants of many ages with the majority of self-monitoring studies involving participants between the ages of 9 and 11 years, but noted studies that have found positive effects for students as young as 7 years (Hallahan et al., 1979) and as old as 18 years (Blink & Test, 1987).

There have been mixed empirical findings as to which intervention (SMA or SMP) is superior. First, some studies have shown no difference between SMA and SMP when increasing on-task behavior (Harris, Graham, Reid, McElroy, & Hamby, 1994 [Experiment 1 and 2]; Lloyd et al., 1989; Reid & Harris, 1993). Second, some studies have shown no difference in the rate and/or amount of work produced for either approach (Harris et al., 1994 [Experiment 2]; Lloyd et al., 1989; Rooney, Polloway, & Hallahan, 1985). Lastly, some studies have shown SMP to be superior to SMA in both accuracy and academic productivity (Maag, Reid, & DiGangi, 1993).

Supporters of SMA claim that implementation of such an intervention is simple and very practical. Further, the differences between SMA and SMP are so small that they do not meaningfully affect academic achievement (Lloyd & Landrum, 1990). Supporters of SMP believe that targeting productivity (versus on-task behavior) improves the chances of directly increasing academic responding. SMP supporters criticize the supposed link between on-task behavior and achievement claiming that on-task behavior is independent of achievement. Few studies have examined the effects produced by each intervention concurrently.

Rock (2005) was the first study to concurrently employ both SMA and SMP procedures by creating a combination SMA and SMP intervention (i.e. ACT-REACT). The ACT-REACT strategy employs a six-step combination SMP + SMA approach to self-monitoring where the steps are as follows: Articulate your goals, Create a work plan, Take pictures, Reflect using self-talk, Evaluate your progress, and ACT again (Rock, 2005). By using this combined approach, Rock (2005) found ACT-REACT to be an effective intervention for increasing both academic productivity and academic engagement in children with and without exceptionalities.

The empirical literature is inconclusive regarding the superiority of SMA versus SMP; however, there is a large body of literature arguing one is superior to the other for one theoretical reason or another. Given that evidence supporting one approach over the other is inconclusive and that studies that have employed both procedures concurrently have found that both procedures had positive treatment effect with no statistically significant differences in treatment effects, the current investigation will employ a SMA only approach. The aim of the current study is not to add to the already well established body of literature on the efficacy of self-monitoring procedures (both SMA and SMP), but is to improve upon the procedures of this already well established intervention.

According to the U.S. Department of Education (1990), a large percentage of students with LD spend the majority of their education (over 80%) in the regular education classroom. There is also an emphasis on inclusion models of education which are said to improve students' functioning in mainstream education (Reid, 1996). It is known that task-oriented behavior improves teachers' perceptions of a students' educability level (Keogh, 1983) and self-monitoring has been shown to improve on-task behaviors in general education classroom settings (Maag et al., 1992; Maag et al., 1993).

At present, we know that SMA is a very effective behavioral intervention; however, it is not known why we use the cueing intervals that we do or which intervals might be more effective. Some studies base their cue schedule on previous literature, while others simply decide the cue schedule arbitrarily. The present study aims to discover the optimal length of time between cues during SMA to maximize on-task behavior.

METHOD

Participants and Setting

Three first grade typically developing students within a general education classroom in East Baton Rouge Parish Public School were selected to participate in this study. All students were referred by their teacher as having "work habit problems" (WHP). Students who were excluded from the study included any student not identified as having work habit problems as well as any student with a LD diagnosis. Written parental consent as well as student assent was obtained for all students participating in the study.

The students who were identified by their teacher as having WHP were additionally assessed using the Conners' Teacher Rating Scale-Revised Long© (CTRS-R:L), which is an instrument that uses observer ratings (from teacher) to evaluate problem behavior in children and is typically used to assess ADHD in children. CTRS-R:L includes 59 items on a number of different scales. In order to meet inclusionary criteria, the participant needed to score nine or greater on both of the DSM IV™ symptoms subscales of inattentive and hyperactive-impulsive symptoms. These two subscales are used to help identify children/adolescents who are "at risk" for ADHD. Additionally, behavioral observations (during baseline) indicated that all three participants were chronically disengaged during independent seatwork at least 40% of the time.

Participant one, George, was a 7 year old, African American male who had a pre-assessment reading score of 29 words per min (wpm) on attempt number one (e.g. without rewards) and 76 wpm on attempt number two (e.g. with rewards) indicating that there was a lack of motivation to read his best during attempt number one.

Participant two, Frank, was a 6 year old, African American male who had a pre-assessment reading score of 80 wpm on attempt number one (without rewards) and 104 wpm on attempt number two (with rewards) also indicating that there was also lack of motivation to read his best during attempt number one.

Participant three, Jeff, was a 6 year old, African American male that had a pre-assessment reading score of 0 wpm on attempt number one (without rewards) and 2 wpm on attempt number two (with rewards). Given that Jeff's reading skills were not at grade level, his task was different than the first two participants. During session he completed cover, copy, and compare math worksheets while George and Frank worked on reading worksheets during all session(s).

All sessions were conducted in a quiet room available in the student's school under the supervision of the experimenter or an assistant. All rooms contained chairs and a table/desk for the student and consultant. This setting was an empty room, the library, or the cafeteria (when not in use). Times when the sessions were conducted varied and were determined by the teacher. It should be noted that although times varied, the participant worked on the same subject (i.e. math, science, reading) during every session.

Screening and Materials

Following teacher referrals for WHP, inattentive/hyperactive/impulsive symptoms were verified based on CTRS-R: L. All participants completed a pre-intervention reading screening. For the pre-intervention screening in reading, basic CBM reading probes were used. During the independent seat work during all experimental sessions, Resnick and Hyatt's (1993) Reading Comprehension Series (A, AA, B, BB) was used. After the pre-screening session, the participant was allowed to choose a tangible reward contingent on beating their previous score (e.g. attempt one). For example, if the participant scored 30 wpm on the first attempt of reading a passage, they would need 31 or more wpm on the second attempt in order to earn the reward.

The reward box contained stickers, pencils, and toys etc. These rewards were available during certain experimental condition in which the contingencies were provided (described below). The various contingencies were explained to the participant prior to the start of each session. Further, when rewards were available the reward box was made visible; whereas when rewards were not available, the reward box was placed out of sight.

During the current investigation, the MotivAider was used to cue the participant to self-monitor during many of the experimental conditions. The MotivAider is a pager-like device that attaches to a pocket, belt, or a waistband and emits a tactile pulsing vibration in order to cue the participant to monitor their behavior. When cued (via the MotivAider) participants recorded whether (or not) they were paying attention via a paper-and-pencil recording system.

One of the major criticisms of SMA lies in the practicality of implementing the prompts to self monitor behavior, the MotivAider allows for much less intrusive implementation and may prove to be both more practical for use within the classroom than traditional verbal/audible prompts. Intuitively, the MotivAider seems like an appealing solution to this problem; however, there has not been enough research evaluating the efficacy of using the MotivAider for the purposes of SMA to claim it is effective. The current investigation is the second known study to analyze the effectiveness of the MotivAider for increasing on-task behavior in a SMA procedure.

Dependent Measure

For SMA, "off-task" behavior was measured using a whole interval recording strategy. Off-task behavior was operationally defined as when the participant eyes are diverted from the work materials. Data collector(s) monitored the participant's eye gaze. If the participant was looking at their work, they were scored as "on-task", but if they were looking anywhere else it was scored as “off-task”. Eye rubbing and putting their head down was scored as “off-task”. Off-task behavior was recorded using partial interval recording within 10-s intervals.

Experimental Design

A multielement design was implemented for all three participants. The visual inspection of the relationships of the data paths representing each of the three conditions as well as data analysis were used to make comparisons as to which proved to be the most effective conditions during SMA.

Procedures and Data Collection

There were three experimental phases involved in this study. The specific experimental phases and conditions are described in detail next.

Baseline. Pretreatment data for off-task behavior was collected. Participants were told to work at the beginning of an independent instruction period. The independent instruction period was broken down into three separate 10 minute sessions with small breaks between sessions. Observational data was kept on the inter response time (IRT) from on-task (must be established for three seconds) to off-task behavior. The next IRT was scored from when the student is on-task for three seconds until off-task behavior occurs. No prompts to establish on-task behavior were administered during the entire baseline period. IRT data was taken during all baseline sessions. Additionally, a whole interval recording system was used to measure baseline levels of off-task behavior where if a student is on-task for the an entire 10 second interval, it was scored; however, if the student was off-task for any portion of that 10 seconds, the interval was not scored. Whole interval recording was conducted concurrently along with the IRTs.

Training SMA. Prior to all experimental conditions, a variation of a procedure based on Hallahan, Lloyd, Kauffman, and Loper (1983) was used to train participants how to accurately self record. The process is described as follows:

1. An individual conference was held between therapist and the participant discussing the importance and meaning of paying attention.
2. The student was informed that s/he was going to begin using a procedure that would help them pay attention better.
3. The student was taught to ask, “Was I paying attention?” immediately upon feeling a tactile vibration from a timer (i.e. MotivAider). A momentary time sampling procedure (MTS) was used where the time between tones (used for training only) was varied among the conditions and the Inter Response Time (IRT) was manipulated as follows: 50% IRT, 100% IRT, and 200% IRT.
4. The participant was also taught to self-record whether s/he was on-task when the tone sounds. Recording is tallied on a sheet where they score a point under either “yes” or “no” column. Tally sheets were collected and changed after three 10-minute sessions (daily)*.

* Measures of accuracy were not used to train participants, as it has been found that high degree of accuracy is not necessary for effects of SMA to occur (DuPaul & Stoner, 2002; Hallahan et al., 1983; Hallahan, Lloyd, & Stoller, 1982). However, independent observers scored observational data for all participants using the interval scoring system (as previously described) for all conditions.

Experimental Phases

There were three different phases that were examined in this study and are described as follows: Phase 1- cueing schedule based on IRT (as established in baseline); Phase 2- cueing schedule based on IRT + contingent rewards; Phase 3- alternating treatment between cueing schedule based on IRT + contingent rewards and contingent rewards only.

50% IRT. During this condition, the participant self-monitored their on-task behavior in the way described above; however, the time between cues was calculated by using 50% of their median IRT. For example, if the participant's IRT was determined to be 120 seconds, Condition I (C1) would be 50% of 120 or 60 seconds.

100% IRT. During this condition the participant self-monitored their on-task behavior in the way described above; however, the cues were based upon the median IRT which was established during each individual student's baseline. For example, if the participant's IRT was 120 seconds, Condition II (C2) would be 100% of 120 or 120 seconds.

200% IRT. During this condition, the participant self-monitored their on-task behavior in the way described above; however, the time between cues was 200% IRT. For example, if the participant's IRT was 120 seconds, Condition III (C3) would be 200% of 120 or 240 seconds.

50% IRT + CR. During this condition, the participant self-monitored their on-task behavior the same way they did during the previous C1 phase; however, during this phase, the participant had the opportunity to earn rewards. Rewards were earned by scoring 80% or lower of the median rate of off-task behavior as established during the previous phase; the primary data collector's data was used to determine whether or not the reward was earned.

100% IRT + CR. During this condition, the participant self-monitored their on-task behavior the same way they did during the previous C2 phase; however, during this phase, the participant had the opportunity to earn rewards. Rewards were earned by scoring 80% or lower of the median rate of off-task behavior as established during the previous phase; the primary data collector's data was used to determine whether or not the reward was earned.

200% IRT + CR. During this condition, the participant self-monitored their on-task behavior the same way they did during the previous C3 phase; however, during this phase, the participant had the opportunity to earn rewards. Rewards were earned by scoring 80% or lower of the median rate of off-task behavior as established during the previous phase; the primary data collector's data was used to determine whether or not the reward was earned.

True Baseline. This condition served as a return to baseline in order to establish experimental control.

IRT + CR. During this condition, the MotivAider was programmed with the best IRT cueing schedule (as determined from the previous phase). Additionally, contingent rewards were used. Rewards were earned based on the same criterion as established earlier (e.g. the participant needed to score 80% or fewer intervals of the median rate of off-task behavior as established during phase one where the primary data collector's data was used to determine qualification).

CR Only. During this condition, the MotivAider was not used. Contingent rewards were used alone. Rewards were earned based on the same criterion as established earlier (e.g. the participant needed to score 80% or fewer intervals of the median rate of off-task behavior as established during phase one where the primary data collector's data was used to determine qualification).

This study was completed over approximately five months. Every assessment was administered to each participant during independent seat work.

Inter-observer Agreement and Treatment Integrity. Inter-observer agreement (IOA) was determined by having two independent persons score sessions and compare their data. IOA reliability was calculated using percentage agreement in which the number of agreements is divided by the number of agreements plus disagreements, and multiply the resulting number by 100%. IOA was collected for approximately 52% of all sessions and was a mean 93% (range 72%-100%).

Treatment integrity was assessed with a four-item checklist detailing specific steps of the procedural intervention (e.g. IV manipulation). An example of a question on the checklist is, "did the therapist administer instructions to the participant prior to the start of session?" The primary data collector (varied) conducted measures of treatment integrity which was collapsed over all sessions for each participant. Treatment integrity was collected for 40% of all sessions and was as 100%.

RESULTS

Figures 1 - 3 depict each participant's off-task behavior throughout the experiment from baseline through the intervention conditions.

Participant One

During baseline, George had a mean percentage of off-task behavior occurred during 28% of the intervals. During 50% IRT condition, there were elevated levels of off-task behavior indicating that when cued at 50% of the IRT, the target behavior actually worsened. During the 100% IRT and 200% IRT conditions, the target behavior slightly improved, but not significant enough to indicate a clean effect (25% and 20% respectively).

During all phase 2 conditions, George's level of off-task behavior decreased markedly (50% IRT + CR - 8%; 100% IRT + CR – 15.33%; 200% IRT + CR – 14.33%) indicating that the addition of rewards had a significant effect in the reduction of off-task behavior. During the final phase of the study, true baseline, George's levels of off-task behavior returned to near baseline levels (e.g. 21%). During the final two conditions of phase three, IRT + CR and CR only, George maintained low levels off-task behavior (12.17% and 9.5% respectively). This last finding indicates that both conditions which contained contingent rewards had a significant effect in the reduction of off-task behavior, while the condition that manipulated the cueing schedule alone (e.g. without rewards in phase 3) did not have such an effect.

Participant Two

During baseline, Frank's mean percentage of off-task behavior occurred during 59% of the intervals. During 50% IRT there were elevated levels of off-task behavior indicating that when cued at 50% of the IRT, consistent with George's findings, the target behavior worsened.

During 100% IRT and 200% IRT, the target behavior slightly improved, but not significant enough to indicate an effect (53.3% and 55% respectively).

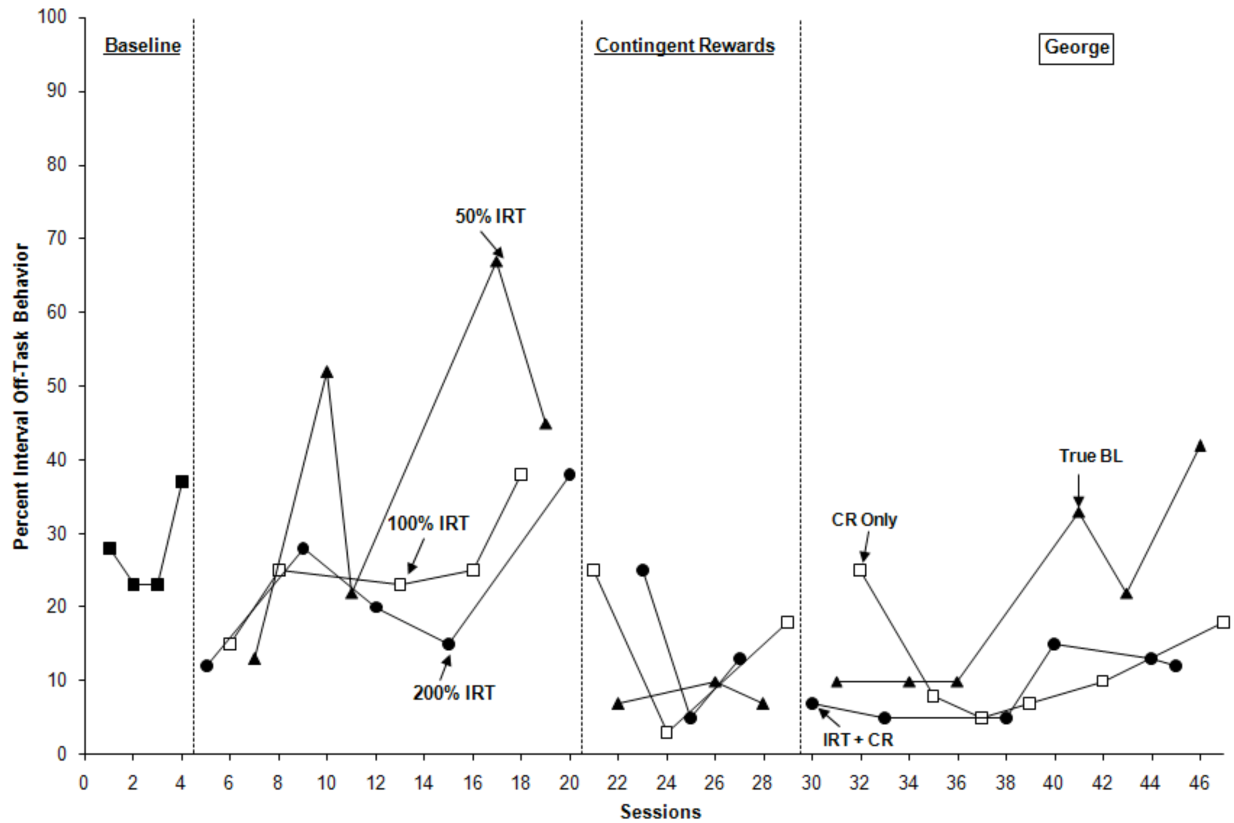

Figure 1. Results for George. Mean percent of intervals off-task behavior per phase and condition.

During all phase 2 conditions, Frank's level of off-task behavior decreased markedly (50% IRT + CR - 28%; 100% IRT + CR – 19.67%; 200% IRT + CR – 14.33%) indicating that the addition of rewards had a significant effect in the reduction of off-task behavior. During the final phase of the study, true baseline, Frank's level of off-task behavior returned to near baseline levels (e.g. 49%). During the final two conditions of phase three, IRT + CR and CR only, Frank maintained low levels off-task behavior (18% and 15% respectively). This last finding indicates that both conditions which contained contingent rewards had a significant effect in the reduction of off-task behavior, while the conditions that manipulated the cueing schedule alone (e.g. without rewards) did not have such an effect.

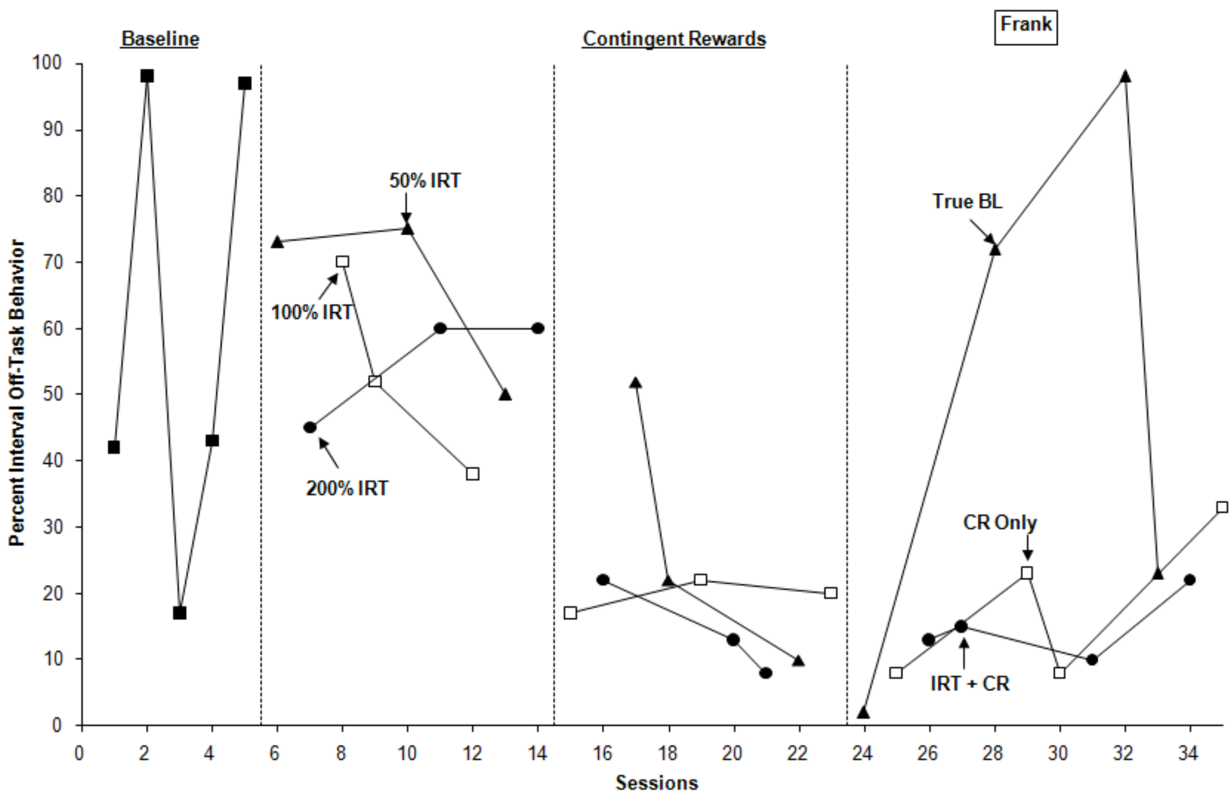

Figure 2. Results for Frank. Mean percent of intervals off-task behavior per phase and condition.

Participant Three

During baseline, Jeff's mean percentage of off-task behavior occurred during 40% of the intervals. During all three conditions in phase one (e.g. 50% IRT, 100% IRT, and 200% IRT), Jeff's levels of off-task behavior increased. This accelerating off task behavior was more dramatic than the similar result that occurred at the 50% IRT for George and Frank.

During all phase 2 conditions, Jeff's level of off-task behavior decreased markedly (50% IRT + CR - 10%; 100% IRT + CR – 12.33%; 200% IRT + CR – 26.25%) indicating that the addition of rewards had a significant effect in the reduction of off-task behavior. During the first condition of the final phase of the study, true baseline, Jeff's levels of off-task behavior returned to near baseline (e.g. 41%). During the final two conditions of phase three, IRT + CR and CR only, Jeff maintained very low levels off-task behavior (6% and 5% respectively). This last finding indicates that both conditions which contained contingent rewards had a significant effect in the reduction of off-task behavior, while the condition that manipulated the cueing schedule alone (e.g. without rewards) did not have such an effect.

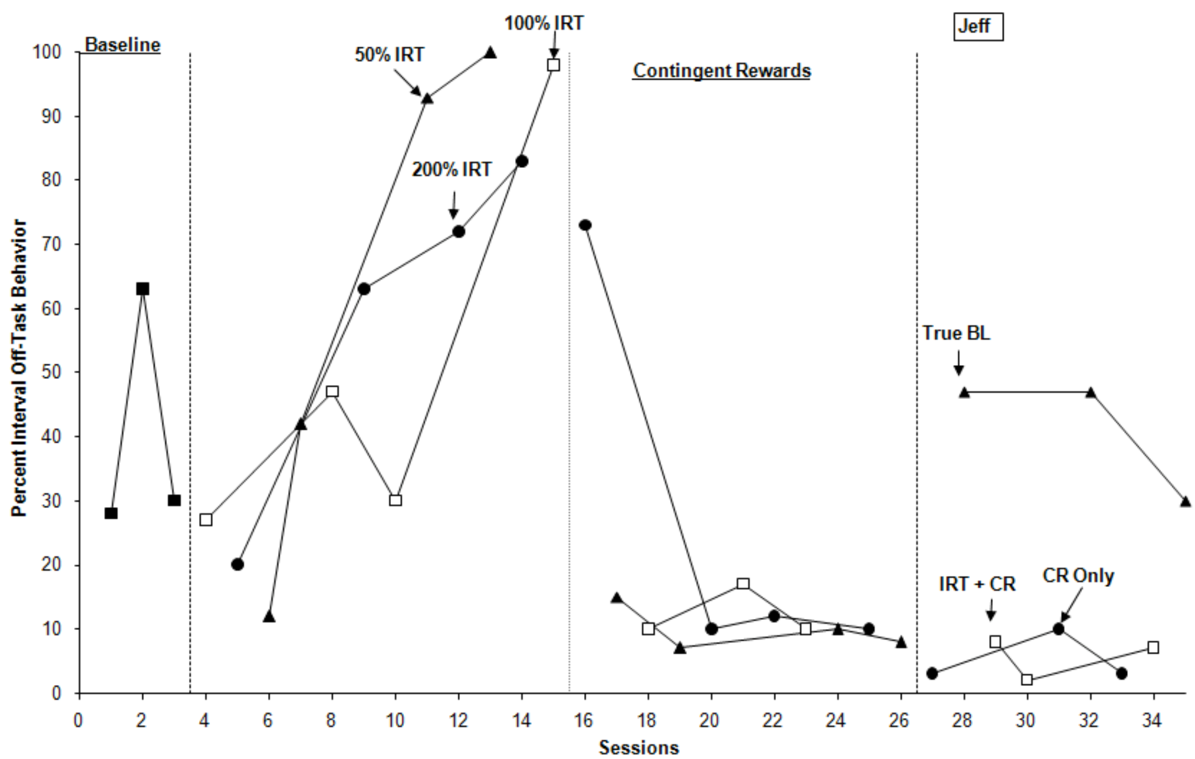

Figure 3. Results for Jeff. Mean percent of intervals off-task behavior per phase and condition.

Summary and Overall Findings

Overall, results were similar for all three participants. During the initial baseline observations, all three participants displayed moderate to high levels of off-task behavior (i.e. M = 44% of observed intervals, range 17-98%), although off-task behavior varied throughout baseline. During the first intervention phase, off-task behavior did not improve regardless of cueing schedule; in fact, in some cases, the cueing schedule actually increased off-task behavior. Figure 1-3 shows the percent of intervals of off-task behavior for the three participants. During the second intervention phase, off-task behavior decreased for all three participants across all three conditions (e.g. IRT cueing schedules) with insignificant differences between conditions (see Table 1 for exact figures). The first condition of the third phase (e.g. true baseline) was a return to baseline conditions and all three participants showed an increase in off-task behavior similar to that which was demonstrated in the initial baseline. While the second and third conditions of the third intervention phase (e.g. IRT + CR and CR only respectively) both showed a significant reduction in off-task behavior, the second condition (e.g. IRT cueing + CR) showed the lowest overall percent of intervals off-task behavior for the three participants (M = 8.6%).

Table 1

Mean percent off-task behavior for each participant, phase, and condition

	Baseline	**50% IRT**	**100% IRT**	**200% IRT**	**50% IRT+CR**	**100% IRT+CR**	**200% IRT+CR**	**True Baseline**	**IRT +CR**	**CR Only**
Participant										
George	27.8	39.8	25.2	20	8	15.3	14.3	21.2	12.2	9.5
Frank	59.4	66	53.3	55	28	19.7	14.3	48.8	18	15
Jeff	40.3	61.8	50.5	59.5	10	12.3	26.3	41.3	5.7	5.3
Total	42.5	55.9	43	44.8	15.3	15.8	18.3	37.1	8.6	9.9

DISCUSSION AND LIMITATIONS

The current study has several key findings. First, the time between prompts (as based upon an individual's IRT) did not improve on-task behavior during SMA procedure with typically developing students. Second, the use of contingent rewards alone (without IRT prompting) was effective in reducing off-task behavior. Third, contingent rewards plus IRT prompting (during all three schedules) did decreased off-task behavior, but it was not any more effective than contingent rewards alone.

The time between prompts (as based upon an individual's IRT) for self-monitoring was not effect in reducing off-task behavior; however, it should be noted that the use of the MotivAider was never tested without the prompting schedule simultaneously being manipulated. This finding should be interpreted with some caution, as the MotivAider is a relatively new prompting device that has not yet be empirically validated on its own without adding the additional component of schedule manipulation. Intuitively, a tactile cueing method such as the MotivAider may be more practical than other prompting methods for use in the classroom settings. If the MotivAider is just as effective as other prompting techniques, it can replace teacher prompting, be less intrusive than other audible prompting methods, and be less stigmatizing for those students who need to monitor their behavior; however, a study has yet to examine the efficacy of the MotivAider as opposed to other prompting techniques.

Secondly, contingent rewards (e.g. positive reinforcement) were effective for decreasing off-task behavior. While the fact that positive reinforcement is effective is not a novel finding, this study found that it still holds true within the self-monitoring context. Counter to previous studies in which on-task behavior increased despite the absence of tangible rewards (Amato-Zech et al., 2006), off-task behavior did not decrease during the self-monitoring alone phase (e.g.

Phase 1). Previously, several studies have found that you do not need external reinforcement in order to increase on-task [decrease off-task] behaviors (Shimabukuro et al., 1999). Many of these earlier self-monitoring studies claim that self-monitoring in itself lead to awareness of the target behavior which in turn leads to behavior change (i.e., reactivity) and that self-monitoring appropriate behavior may take on similar motivational properties as external rewards which supposedly provide reinforcement for behavior change (Nelson & Hayes, 1981). While having an external reinforcement contingency in place is not ideal for generalization, it does aid in training and can be faded later on. Students who show a lack of motivation to complete work or to who need to build fluency can be motivated to improve their target behavior using contingent rewards and it can later be faded out during generalization training.

A third finding was that, contrary to the findings in other self-monitoring studies, this study did not find that self-monitoring alone increased on-task behavior. It should be noted that the current study was not a direct replication of previous self-monitoring studies, but instead had the additional component of manipulating the cueing schedule. Glynn and Thomas (1974) found that cueing plus self-monitoring is more effective than self-monitoring alone. To date, the use of cues has been used in virtually all SMA procedures; therefore, it should not make SMA any less effective. Several studies were able to increase on-task behavior without the use of external rewards (Glynn & Thomas, 1974; Harris et al., 2005; Amato-Zech et al., 2006); however, none of these studies were conducted with typically developing participants. In the Rock (2005) study external rewards were used with only one participant; there was no explanation as to why external rewards were added for only one participant. Perhaps some students lack motivation to improve their on-task behavior, thus in order to improve on-task behavior within SMA external rewards may be necessary for some students but not others. In the current study, self-monitoring was eventually able to decrease off-task behavior, but only when paired with contingent rewards in Phase 3 of the study. This finding indicates that SMA was effective when paired with CR, but (as we also discovered during Phase 3) it was also found that CR *without* IRT prompting was just as effective or more so in reducing off-task behavior.

A fourth point that warrants discussion is that the schedule at which prompts were emitted did have an effect on off-task behavior. Although we were not able to decrease off-task behavior by only manipulating the cueing schedule, we did see off-task behavior *increase* when the prompting occurred too frequently (i.e. over prompting). Although this does not tell us exactly what prompting schedule we should use, it does indicate that if we use a self-monitoring procedure that involves prompting, we should not prompt at or below a student's median IRT.

To date, this is the second self-monitoring study that involved the use of the MotivAider that the author is aware of (see Amato-Zech et al., 2006). Although both studies used the MotivAider there were many differences between the two studies. Neither study tested the validity of the MotivAider itself against other prompting techniques. Another key difference between the studies that used the MotivAider were the participants under investigation; in the current study typically developing students from regular education classroom settings were examined, whereas in the Amato-Zech et al. study participants were all in special education.

While the findings of the current investigation are promising, further investigation is needed to validate which facets of the self-monitoring procedure yields the highest rates of on-task behavior and whether or not you can obtain similar results in the reduction of off-task behavior with CR alone (i.e. without SMA).

There are several limitations in the current study that should be discussed. First, baseline rates of off-task behavior were not stable. Second, the procedures of the three participants varied slightly. Third, no check for generalization to other settings or people was conducted. I will examine each limitation individually.

The first limitation to this study was the unstable rate of baseline behavior. While George's baseline rate of off-task behavior was stable, both Frank and Jeff's were not. Prior to the start of the study, off-task behavior was known to be a highly variable behavior which is influenced by many things; therefore, it was decided that the median data point would be used to determine all the phase change criteria for off-task reduction. By using a measure such as the median, you can control some of the variability that occurs for data that has outliers which may distort the data. For example, when given the following data points: 99, 20, 20, 20, 20, you have a mean of 35.8%, but a median of 20%. Data point one is an unusually high data point (i.e. 99) that, if included, may skew the data. Whereas, when you calculate the median the unusually high data point does not have an effect, because the median (as used in this case) reflects how the participant typically responds.

The second limitation is in reference to Jeff's procedures only. During Jeff's preliminary assessment in the analogue setting, high levels of off-task behavior were not observed. A "distraction" was added to all phases and conditions of Jeff's procedures in order to more closely resemble the natural classroom environment. The distraction that was used was a movie for which the participant claimed to have a preference (e.g. *Scooby Doo 2*). The presence of the movie created a competing schedule for which the participant had to choose to either (a) pay attention to his work or (b) watch the movie and be off-task. Jeff's results parallel what was found in the other two participants and went from a mean baseline off-task percent intervals of 40.3%, reduced to just 5% during the final condition of phase 3.

The third limitation concerned the lack of generalization probes to additional settings and people. Being that this is one of the first of its kind to empirically examine particular aspects of self-monitoring procedures, it was conducted in an analogue setting. This study sought out to examine the cueing schedule in which prompts were emitted in a self-monitoring study. Given that no study the author could identify thus far has examined this, it needed to be conducted in a well controlled environment. Once the controlling variables are identified, they would then need to be tested in other environments and with other therapists (e.g. program for generalization).

FUTURE RESEARCH

This is only the second known study that has examined the use of the MotivAider in self-monitoring. The results of this study have raised some more questions surrounding SMA and its procedures. The following are a few areas which are in need of further investigation: exploration of the prompting method (i.e. tactile via the MotivAider and beyond) that is the most effective at decreasing off-task behavior, the cueing schedule which yields the lowest rate of off-task behavior and whether prompting is necessary in a SMA procedure, generalization and maintenance strategies to transfer effects of self-monitoring into the natural environment, and the use/role of contingent rewards in self-monitoring. Future research should examine the use of the MotivAider as compared to other prompting methods (i.e. audible timers, teacher initiated prompts, visual prompts, etc), and separately examine the schedule for which prompts are emitted. It was discovered that prompting too frequently is counterproductive; the prompting schedule which yields the highest rate of on-task behavior is yet to be determined. Also, programming for generalization with self-monitoring over time and across settings needs further research and additional research is also needed to determine what ages the MotivAider may be most useful for.

In summary, SMA is still recognized as an effective behavioral technique in the reduction of problem behavior as well as the increase in on-task behavior [decrease in off-task behavior]; however, there is still a lot of research that needs to be done in order to fine tune the procedures in order to optimize results.

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VITA

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