Self-Monitoring of Attention Versus Self-Monitoring of Academic Performance:

Effects Among Students with ADHD in the General Education Classroom

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A counterbalanced, multiple-baseline, across-subjects design was used to determine if attention and performance monitoring had differential effects on the on-task and spelling study behavior of 6 elementary students with attention-deficit/hyperactivity disorder (ADHD) in the general education classroom. Both self-monitoring of attention and self-monitoring of performance had positive effects on students' on-task and spelling study behaviors. While improvement in on-task behavior was comparable across the two interventions, self-monitoring of attention produced substantially higher gains in spelling study behavior among 4 of the 6 students. Although this is the first study in which differential effects of these 2 interventions have been investigated among students with ADHD, previous studies with students with learning disabilities (LD) have found that self-monitoring of performance tended to result in higher rates of spelling study than did self-monitoring of attention. Possible reasons for this difference among students with ADHD and those with LD are noted, as are directions for future research and recommendations for teachers regarding the implementation of self-monitoring interventions.

Historically, the ability to control and regulate one's behavior has been considered a desirable characteristic. The Scottish poet Robert Burns considered prudent, cautious self-control to be the root of wisdom, and William Penn, the founder of Pennsylvania, did not consider a person fit for commanding others who could not, in his words, command himself. Today, our ability to understand and regulate our own behavior is considered an important characteristic of human beings (Graham, Harris, & Reid, 1992; Kanfer, 1971, 1977).

In classroom situations, self-regulatory abilities can improve a student's academic performance and are a critical factor in child development and learning (Harris, 1982; Zimmerman & Schunk, 1989). Although self-regulatory abilities are desirable, their formulation is challenging for many children (Harris & Schmidt, 1997). For children with attention-deficit/hyperactivity disorder (ADHD), who exhibit significant problems with inattention, impulsivity and inhibition, and overactivity, the development of such skills is an even more formidable task (Semrud-Clikeman et al., 1999; Shimabukuro, Prater, Jenkins, & Edelen-Smith, 1999).

Approximately 3% to 5% of elementary-age students in the United States are diagnosed with ADHD. In classroom settings, these students often complete work at rates lower than expected, produce work of poorer quality than they are capable of, and have difficulty maintaining on-task behaviors or following through when given instructions (Barkley, 1990; Davies & Witte; 2000; Frick et al., 1991; Reif, 1993). Furthermore, as Barkley (1994, 1997) stated, children with ADHD are often impersistent while engaged in activities requiring self-regulation and find delay of gratification challenging. Because of their difficulties with inhibitory control, children with ADHD frequently fail to manage or control their behavioral responding (Shapiro, DuPaul, & Bradley-Klug; 1998). While students with ADHD usually perform in the average range on achievement tests, underachievement is common among them. The daily performance of these students on classroom tasks and homework is typically inconsistent and below that of their peers; up to 80% of students with ADHD have been found to exhibit academic performance problems (DuPaul & Stoner, 2002, 2003). Prospective follow-up studies of children

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with ADHD have found significantly higher rates of grade retention, placement in special education, and school dropout and lower high school grade-point average and enrollment in college (DuPaul & Stoner, 2003).

Although pharmacological interventions and behavior modification programs are most often used to improve classroom behavior among students with ADHD, research clearly indicates that those interventions are not sufficient for ameliorating these students' academic and social performance problems (DuPaul & Eckert, 1997; DuPaul & Stoner, 2003; Purdie, Hattie, & Carroll, 2002; Shapiro, Durnan, Post, & Levinson, 2002). Researchers have noted a need for interventions in the classroom that create additive effects beyond those established with medication to enhance educational outcomes for students with ADHD; important academic behaviors to target and assess include completion and accuracy of independent classwork and homework, as well as acquisition of skills taught in the curriculum (Purdieet al., 2002; DuPaul & Stoner, 2003).

Explicit development of self-regulation abilities may enhance the on-task and academic performance of these students (DuPaul & Stoner, 2002; Harris, 1982; Lam, Cole, Shapiro, & Bambara, 1994; Reid, 1996). Self-regulation interventions have been used successfully to help students with special needs regulate their behaviors while engaged in a wide range of tasks (cf. Fowler, 1986; Reid & Harris, 1993; Shimabukuro et al., 1999). These interventions assist students in working responsibly and independently (Burke, 1992), are often less intrusive than teacher-managed treatments (Fantuzzo, Polite, Cook, & Quinn, 1988), enhance students' control of their learning, and may be more effective than interventions managed primarily by the teacher (DuPaul & Stoner, 2002).

Self-Monitoring

Self-monitoring is a critical self-regulation process, as it affects both behavior and academic performance (Harris, 1986; Harris, Graham, Reid, McElroy, & Hamby, 1994; Shapiro et al., 2002). Self-monitoring typically consists of self-assessment and self-recording. Although self-assessment can be done alone, it works best for most students in combination with self-recording (Grahamet al., 1992). Self-monitoring is particularly efficacious when the targeted behaviors or the desired outcomes of the intervention are valuable to the student (Reid, 1993).

Educational research has focused primarily on two areas of self-monitoring: self-monitoring of performance (SMP) and self-monitoring of attention (SMA). Some research has also focused on self-monitoring of strategy use (Shapiro et al., 2002).

When students are taught to use SMP, they are encouraged to assess, evaluate, and record particular aspects of their academic performance (e.g., number of problems attempted or performed correctly, number of correct practices, time spent planning), thus concentrating on academic accomplishments (Harris et al., 1994). When taught SMA, students assess, evaluate, and record attentional behaviors, concentrating on increasing on-task behaviors (Hallahan & Sapona, 1983). Although both approaches involve self-assessment, the underlying rationales reflect a difference in focus: SMP assumes that growth in academic performance will increase on-task behaviors, whereas SMA supposes that increasing the amount of on-task behaviors will improve academic performance (Hallahan, Lloyd, Kneedler, & Marshall, 1982; Reid & Harris, 1993). The primary difference between the two centers on what students self-assess (Harris et al., 1994), and a primary research question is, Which is most effective with what students for what tasks?

Self-Monitoring Among Students with ADHD

The effectiveness of self-monitoring with children with ADHD has been addressed in only a few studies, often as part of multicomponent interventions, and no researchers have investigated whether SMA or SMP produces differential results for critical academic and behavioral outcomes (cf. DuPaul & Eckert, 1997). Shimabukuro et al. (1999) investigated the effects of self-monitoring of academic productivity and self-monitoring of accuracy on the academic performance and on-task behavior of three students with both learning disabilities (LD) and ADHD during independent class work in small-group settings. All three students increased their academic productivity and accuracy, and their on-task behaviors improved across all academic areas. Similarly, Edwards, Salant, Howard, Brougher, and McLaughlin (1995) found that self-monitoring paired with reinforcers improved both on-task behavior and percentage correct on a reading comprehension task among three elementary students with ADHD.

Davies and Witte (2000) examined the effectiveness of a multicomponent intervention approach that incorporated self-monitoring, peer feedback and support, and a group contingency among children with ADHD in a general education classroom setting. Students were trained by the teacher to understand the target behavior, and the teacher monitored the students' self-monitoring. Peer feedback was provided during group meeting sessions. The intervention decreased inappropriate talking-out behavior in all four students.

Hoff and DuPaul (1998) examined the efficacy of a self-management procedure that included self-monitoring to decrease disruptive behavior and aggression across multiple settings for three children who were at risk for later conduct disorder and were exhibiting characteristics of either oppositional defiance disorder or ADHD. The teacher initially rated the students' behavior and provided a backup reinforcer when earned. Then the students were taught to self-record their behaviors by matching the accuracy of their ratings to the evaluations of the teacher. The results indicated that the students decreased their level of disruptive behavior in both the classroom and recess environment closer to the levels of their

classroom peers and maintained these results in the absence of teacher feedback. Similarly, both Barkley, Copeland, and Sivage (1980) and Christie, Hiss, and Lozanoff (1984) found that self-monitoring interventions decreased inappropriate behaviors and improved on-task behavior among elementary students with ADHD.

Finally, Mathes and Bender (1997) assessed the effects of using self-monitoring procedures within a resource room setting to enhance the on-task behavior of three students with ADHD and emotional and behavioral disorders who were receiving pharmacological treatment. On-task behavior improved significantly for all the students, and the intervention was more effective in improving on-task behavior when both the self-monitoring and pharmacological interventions were used than when the pharmacological (methylphenidate) treatment was used alone.

Paucity of Research

Why has so little research been conducted on the potential of explicit development of self-regulation, including self-monitoring techniques, with students with ADHD? The paucity of such research is even more striking given the current conceptualization of ADHD as a disorder in the development of behavioral inhibition and self-regulation (also referred to as a dysfunction of executive functions; Barkley, 1997, 1998). One reason may be an early review by Abikoff (1985), who concluded that cognitive–behavioral interventions with a focus on self-management have not been particularly successful for students with ADHD. Since that paper was published, authors have noted that the myth continues to exist that self-instruction training is effective for students with ADHD, though research indicates that it is not (cf. Braswell, 1998; DuPaul, Eckert, & McGoey, 1997). Thus, authors have argued against the use of self-regulation techniques for students with ADHD (cf. Braswell, 1998).

There are problems, however, with the belief that developing self-regulation is not a promising technique for students with ADHD in spite of how logical it may seem for these students (Braswell, 1998). A more recent meta-analysis of cognitive–behavioral approaches to reduce hyperactive, impulsive, and aggressive behaviors in children and youth, in which Abikoff's (1985, 1991) methods and conclusions were reviewed, found more positive results than those reported by Abikoff at both posttest and maintenance (Robinson, Smith, Miller, & Brownell, 1999), particularly when intervention took place in the school environment rather than in training sessions outside the classroom setting—a weakness of many early studies. A further weakness of many early self-instructional training programs was the focus on global, complex social and problem-solving behaviors, rather than beginning with specific, more proximal target behaviors. Another important limitation of earlier research noted by Robinson et al. was the frequent reliance on the *Matching Familiar Figures Test*, rather than classroom tasks or behaviors, as an outcome measure.

Finally, as detailed by Harris and Schmidt (1998), early studies relied heavily on developing self-control through self-instructions. The equating of self-instructional training with development of self-regulation appears to have deterred further research on the variety of mechanisms that can be used to achieve self-regulation for differing target behaviors and outcomes. Thus, Harris and Schmidt (1997) argued for further research examining the specific effects of explicit development of self-regulation abilities, including self-monitoring, in the context of meaningful authentic tasks and situations where its use would make a difference; others have also argued for further research here (cf. Barkley, 1997, 1998; DuPaul & Stoner, 2003; Reid, Trout, & Schartz, in press). Further, as Barkley (1998) noted, children with ADHD do better when provided with frequent feedback. Self-monitoring techniques have the potential to provide ongoing, frequent, and immediate feedback that is highly contiguous with the target behaviors.

Differential Effects of SMA and SMP Among Students with LD

Because so little research has been conducted with students with ADHD, research with students with LD was important in informing the present study. Reid (1996) provided an in-depth review of research in self-monitoring with students with LD; here we briefly review only those studies in which researchers have examined the usefulness and differential effects of SMA and SMP with students with LD. Both the methods and findings from these studies are pertinent to the study reported here. Harris (1986) compared attention and performance monitoring on spelling performance with four elementary students with LD in a self-contained classroom. Both self-monitoring interventions resulted in considerable gains in on-task behavior, with little difference between the two conditions. However, all four students preferred SMP, and three students correctly practiced their spelling words more often when using this procedure.

Harris et al. (1994) expanded on the previous study by examining the effectiveness of self-monitoring on the attentional and academic performance of fourth- and fifth-grade students with LD in two separate experiments. In the first experiment, the effects on the spelling study behaviors of four students with LD was examined. In the second experiment, the two self-monitoring interventions were applied to story writing. Both attention and performance monitoring positively influenced students' on-task behaviors in each study. Performance monitoring helped the students more than attentional monitoring when practicing spelling words in the first study, and again in this study all of the students preferred SMP. Both SMA and SMP had a positive effect on the length and quality of students' stories in the second study; neither of

the self-monitoring conditions was consistently superior to the other.

Reid and Harris (1993) compared the effectiveness of attention and performance monitoring on spelling performance for 28 elementary students with LD. Students were first taught and directed to use a spelling study strategy. No differences between the two self-monitoring approaches were found in terms of on-task behavior. Correct practice of spelling words, however, was significantly higher in the SMP condition than in the SMA condition, and spelling scores on a maintenance test were significantly higher in SMP than in SMA.

In summary, research indicates the potential effectiveness of self-monitoring in enhancing on-task behavior and academic performance among children with LD, with far less research available with children with ADHD. Even less clear is the differential effectiveness of SMA versus SMP. Currently, there are no valid guidelines regarding which variable, attention or academic response, to monitor to obtain the most positive outcomes for either on-task behavior or academic performance (Reid & Harris, 1993; Harris et al., 1994). Although a few studies have indicated that performance monitoring may be more advantageous than attention monitoring for students with LD on selected tasks, few studies have involved students with ADHD exclusively and employed actual classroom tasks in general education classroom settings. This is surprising, as teachers must often instruct these students in the general education classroom with little or no special education support, and research has consistently shown SMA and SMP to be acceptable interventions easily implemented by teachers (Fraser, Belzner, & Conte, 1992; Reid, 1996). Furthermore, the efficacy of self-monitoring procedures might vary among students with ADHD as compared to students with LD.

Therefore, we examined the differential effectiveness of SMA versus SMP on on-task behavior and spelling study among elementary students with ADHD in the general education classroom. On-task and spelling study behaviors were chosen as the dependent variables, as these variables have been researched the most among students with LD. Finally, as done in previous studies, care was taken to ensure that students mastered an effective spelling study strategy before the self-monitoring interventions were initiated (cf. Harris et al., 1994). Research indicates that active practice and use of an efficient, systematic technique for studying unknown words improve spelling performance (Graham, 1999). Furthermore, teaching students to self-monitor either their on-task behavior or their spelling study will do little to improve their performance if they do not know how to learn unknown words.

Method

Setting

The study took place in an elementary school located in the suburbs of a large city in the Middle Atlantic States. The school served approximately 420 students and was situated in a mostly low- to middle-class neighborhood containing small brick houses and a nearby federally subsidized apartment complex. Nearly 50% of students qualified for free or reduced-price meals, and the school received Title 1 assistance. The population of the school was diverse (40% African American, 27% White, 15% Asian American, and 18% Hispanic), and student mobility rate was high (31%). The school included a Head Start program and 18 classrooms for children in Grades 1 through 5.

Educational services for students with special needs were provided through an inclusion model. Special education teachers worked directly in the general education classroom, conducting assessments, providing individual and small-group instruction, coteaching, setting up and implementing accommodations, and consulting with other teachers. To facilitate inclusion, general education classroom teachers designed their academic programs to meet the needs of all of their students, using differentiated enrichment activities. In this study, instruction was provided by the second and fourth authors in the students' usual classrooms or work areas. Both instructors had master's degrees in special education, and the second author was a special education teacher at this school.

Participants

The participants were six third-, fourth-, and fifth-grade students with ADHD. Each of the students had been diagnosed as ADHD by a physician, a neurologist, or a psychologist. All students received medication for their ADHD; those who took their medicine at school did so without problems throughout the study, and teachers did not note any problems with those students who took their medications at home not doing so. All six students were also identified by their teachers and the special education teacher as having difficulty sustaining attention and performance in the classroom, even with medication. In addition to problems with attention, teachers indicated that all of these children had severe difficulties with spelling, frequently receiving low grades or failing their spelling tests. Half of the students were African American; half were White.

Raven, a fourth-grade girl from a middle-class, two-parent home, was also identified as having depression and an obsessive–compulsive disorder. She took 10 mg of Paxil each day. Her teachers reported that she had difficulty completing written tasks, starting new assignments, and paying attention during class. Both parents and teachers noted that she experienced considerable anxiety about schoolwork.

Samuel, a fourth-grade boy from a middle-class, two-parent home, was further diagnosed as having Tourette's syndrome. He took 15 mg of Dexedrine during the school day. Teachers reported that he had difficulty following directions, working cooperatively with others, and completing class assignments and homework. They further indicated that he had difficulty with self-control, as he often called out in class and "chatted" during instructional lessons.

Ryis, a fifth-grade boy, lived with his parents in low-income housing. He took 20 mg of Ritalin during the school day. He received help from the special education teacher to improve his writing and organizational skills. His mother indicated that he struggled to complete homework, especially spelling assignments. As she noted, he seemed to "take forever to complete spelling tasks."

Thomas, a fifth-grade boy who lived part-time with each of his divorced middle-class parents, had also been diagnosed with Tourette's syndrome and multiple tic disorder. He did not take medication during the school day, due to excessive tics, but did take 20 mg of Imipramine at night. His teachers noted that he had difficulty completing written tasks, following directions, and staying on task. They further indicated that he was often unmotivated and experienced frequent mood changes. Like Ryis, Thomas received help from the special education teacher to improve his writing and organizational skills.

William, a fifth-grade boy, lived with his paternal grandmother in middle-income housing. He took 10 mg of Dexedrine a day. His teachers reported that he had difficulty following directions, staying on task, and completing assignments. Self-control was also a challenge for William, as he had frequent outbursts in class. He received help from the special education teacher for reading, math, writing, and organizational skills. Furthermore, teachers had implemented a behavioral contract to help him better manage his behavior.

Vanyel, a third-grade boy, lived with his mother in low-income housing. Although he was not consistently administered his medication at home, he took 10 mg of Ritalin during the school day. His teachers noted that he had difficulty sitting still, paying attention during instruction, and completing homework (especially spelling). They further noted that he was noncompliant, frequently called out during class, and constantly sought to gain teacher attention or approval. Vanyel's work was below grade level in both reading and math.

IQ scores on the *Wechsler Intelligence Scale for Children–III* (WISC-III; Wechsler, 1991) were available for four of the participants (Samuel, Ryis, Thomas, and Vanyel). Scores on the Verbal Scale ranged from 90 to 114, whereas scores on the Performance Scale ranged from 60 to 104. Such scores were not available for Raven and William, who were receiving services under 504. None of the students had additional special education diagnoses. The Writing Cluster score from the *Woodcock-Johnson Psycho-Educational Battery– Revised* (WJ-R; Woodcock & Johnson, 1989) was available for two of the participants who received help in writing from the special education teacher. Ryis's and Thomas's standard scores (M = 100, SD = 15) on this test were 85 and 82, respectively.

Tasks and Materials

Experimental procedures were implemented during the students' language arts period. Each morning, Monday through Thursday, students routinely spent 15 minutes studying their weekly list of spelling words. The list was developed by selecting up to 10 words that children misspelled when writing. On Monday, students selected five of these words to study. This approach was selected over more traditional spelling lists (i.e., each child studying the same list of commonly occurring words), because a list developed through self-selection of misspellings from writing should be more relevant and motivating for students (Graham, 1999).

Prior to the start of baseline, students were taught, and demonstrated proficiency in using, a modified version of the Fitzgerald spelling study procedure (Graham, 1983). They were told to use this strategy when studying their weekly list of spelling words. The method included six steps: (a) Look at the word, (b) close your eyes and spell the word aloud, (c) study the word again, (d) cover the word, (e) write the word three times, and (f) check to see if the word is spelled correctly. Throughout the experiment, participants had a chart listing the study strategy steps. If they completed the steps for all of their words, and time allowed, they started again with the first word. Any paper(s) used to complete spelling practices were placed in the student's spelling file at the end of the 15-minute study period.

Dependent Variable 1: On-Task

On-task behavior was operationally defined as occurring when a student (a) focused her or his eyes on the spelling list, practice paper, or self-monitoring tally sheet; (b) executed any step in the spelling study procedure; or (c) asked for help.

Observation Procedures. A momentary time sampling procedure was used to measure on-task behavior. At 3-second intervals during the final 10 minutes of each of the 15-minute spelling periods, participants were observed one at a time on a rotating basis. At the sound of a tone (heard over headphones), the appropriate student was observed and her or his behavior was coded as either on-task or off-task by the teacher. Each student was observed 50 times per session. Observations began 5 minutes after the start of the spelling period to allow students time to make the transition from the previous task to the spelling task. Neither the classroom teacher nor her aide interacted with participants during observations, unless a student requested help; this was to control for possible confounding effects due to social reinforcement.

Interobserver Agreement. Interobserver agreement checks, distributed randomly across all phases of the experiment, were made by a second trained observer for 33% of the spelling practice sessions. Prior to the start of data collection, the classroom teacher and the second observer demonstrated 95% or better interobserver agreement using the observation system in the participating teacher's classroom.

Percentage agreement reliability coefficients between the two observers were calculated by dividing the number of

agreements by the total number of observations, multiplied by 100%. Because off-task behavior became less frequent as experimental interventions were implemented, percentage agreement for nonoccurrence (i.e., number of agreements on nonoccurrence divided by number of agreements on nonoccurrence plus number of disagreements, multiplied by 100%) was also calculated. Interobserver agreement for occurrence of on-task behavior ranged from 85% to 99%, with a mean of 95%. Agreement for nonoccurrence ranged from 72% to 95%, with a mean of 87%. Interscorer agreement for the number of correct spelling words was 99%. Students rarely made counting errors; the errors that were made typically occurred when a large number of words had been written. Teacher counts, however, were used for data collection.

Dependent Variable 2: Academic Performance

Academic performance was operationally defined as the total number of words a student wrote correctly when practicing the items from his or her weekly spelling list during each spelling period (Harris, 1986).

Interscorer Agreement. After each spelling period, when participants were not in the room, the teacher collected the students' spelling files and counted the number of times each student correctly wrote words from his or her weekly spelling list. Each paper was independently checked by a second trained scorer. Percentage agreement between the two scorers was calculated in terms of the number of agreements divided by agreements plus disagreements, multiplied by 100%.

Student Interviews

Once both treatments had been administered, each participant was individually interviewed by the teacher to obtain data on perceived efficacy of treatments, preferences, and recommendations, as well as other feedback. They were asked the following questions: "What things did you like most about using the tones and graphing procedure to help you pay attention during spelling?" "What did you not like about using the tones and graphing procedure?" "What things did you like most about using the counting and graphing procedure to help you get more spelling practice done?" "What did you not like about the counting and graphing procedure?" "Which one, the tones and graphing or the counting and graphing, do you think helped you the most? Why?" and "If you were going to choose one of these procedures to teach to other kids, which one would you teach? Why?"

Procedure

A counterbalanced, multiple-baseline design was employed in this study. This design allows for comparisons of treatments across participants while controlling for possible confounding effects due to intervention order (Bailey & Bostow, 1979). Students were taught the self-monitoring interventions in pairs based on their class schedules, and the order of interventions was random, with the condition that one pair received the interventions in counterbalanced order to control for order effects.

Baseline. During baseline conditions, pretreatment data for on-task behavior and academic performance were collected until stability or a decreasing trend was established. As in subsequent conditions, participants were told to start work at the beginning of the 15-minute spelling period and were reminded to use the study procedure they were taught previously. Treatments were initiated so that students remaining in the baseline condition or other conditions could neither see nor overhear the instructions given.

Self-Monitoring of Attention. The SMA condition was based on procedures developed by Hallahan, Lloyd, Kauffman, and Loper (1983). First, during an individual conference, the special education teacher and the respective child discussed the importance and meaning of paying attention. The student was then informed that she or he was going to begin using a procedure that would help the child pay better attention. The student was taught to ask, "Was I paying attention?" immediately upon hearing a taped tone. During the SMA condition, the child heard the tone via a headphone connected to a tape player. Tones occurred at random intervals during the spelling period; the average interval was 45 s, with a range of 10 to 90 s. The child was further taught to self-record whether she or he was on task whenever the tone sounded. This was done by making a mark in either a "yes" or a "no" column on a tally sheet. Tally sheets were collected and changed daily. At the end of each spelling study period, the child graphed the number of times "yes" was marked. This graph was kept in the child's file. Although graphing has not typically been used in SMA treatments (see Harris, 1986, for an exception), it was included in the current study to control for possible motivational or feedback effects due to graphing, as graphing was a component of the self-monitoring of the performance condition.

These procedures were in place Monday through Thursday during each week of the SMA phase. No measure of student accuracy in recording on-task behavior was computed, as a high degree of accuracy is not necessary for the reactive effects of SMA to occur (DuPaul & Stoner, 2002; Hallahan et al., 1983; Hallahan, Lloyd, & Stoller, 1982). Students were required to follow the self-monitoring procedures and did so without difficulty.

Self-Monitoring of Performance. The SMP condition was based on procedures established by Reid and Harris (1989). With the exception of the monitoring procedure, the basic components of SMA and SMP were analogous, as were the methods used to teach students to use them. First, the spe-

cial education teacher and respective child discussed the meaning and importance of practicing spelling words. Next, the student was informed that he or she was going to begin using a procedure that would help him or her practice spelling words more. The child was then taught to count the number of times that weekly spelling words were practiced correctly. Counting occurred at the end of each spelling period. The student recorded the number of correct practices on a graph that was kept in his or her spelling file.

These procedures were in place Monday through Thursday during each week of the SMP phase. As in the SMA condition, no measure of student accuracy was kept. As in prior studies, however, inspection of participants' papers showed that their self-recordings were highly accurate (Harris, 1986; Reid & Harris, 1993). If students had been practicing the words incorrectly, which they did not do, the teacher would have instructed them to correct their work. Students were required to follow the self-monitoring procedures and did so without difficulty.

Results

On-Task Behavior

Figure 1 presents the daily on-task behavior for each student. Data are presented for baseline, SMA, and SMP. The order of treatments is reversed for the last two students to control for treatment order effects.

During baseline, mean on-task behavior for Vanyel, William, Thomas, Ryis, Samuel, and Raven was 48%, 48%, 82%, 62%, 51%, and 40%, respectively. As a group, students' on-task behavior during baseline averaged 55%. During the SMP phase, the six students' mean on-task behavior was 87%, 84%, 95%, 95%, 99%, and 91%, respectively. The group's on-task behavior during this phase averaged 92%. During the SMA phase, mean on-task behavior was 97%, 91%, 100%, 92%, 93%, and 91%, respectively. Together, the six students' on-task behavior averaged 94% during this phase of the study.

Thus, both SMA and SMP had a positive effect on each student's on-task behavior. Furthermore, there was little difference in the impact of SMP or SMA on on-task behavior, regardless of which occurred first. When SMP was presented first for four students, average on-task behavior was 91%; when SMA was first for two students, average on-task behavior was 92%. When either condition occurred second, students' average on-task behavior was 95% for both SMP and SMA. Finally, the increased stability in on-task behavior across these interventions is important to note, as marked instability of behavior is common among students with ADHD, even with medication.

Academic Performance

Figure 2 presents daily academic performance scores for each student (indicating the number of times a student engaged in active academic responding; i.e., correctly practiced a spelling word). Data are presented for baseline, SMA, and SMP, with the order of the interventions reversed for the last two students.

During baseline, the mean number of correct practices for Vanyel, William, Thomas, Ryis, Samuel, and Raven was 28, 29, 45, 48, 46, and 25, respectively. As a group, students' correct practices during baseline averaged 38. During the SMP phase, the six students' mean number of correct practices was 92, 68, 97, 94, 78, and 67, respectively. The group's correct practices during this phase averaged 83. During the SMA phase, mean number of correct practices was 103, 117, 129, 128, 84, and 121, respectively. Together, the six students' correct practices averaged 114 during this phase of the study.

Although both SMP and SMA had a positive impact on the number of correct practices completed by each student, SMA resulted in more correct practices for each child. In addition, SMA maintained its advantage whether it occurred before or after SMP. When SMA was first, total average correct practices were 103, versus 87 for SMP. When SMA occurred second, total average correct practices were 119, versus 73 for SMP.

Student Interviews

Following the implementation of both treatments, each student completed an exit interview. Four of the students indicated that they preferred the SMP condition. The primary reasons that they selected SMP were that it was fun (one student), you could say the words while you counted them (one student), and it did not involve tones (two students). One student liked both conditions because they both helped him, whereas another student preferred SMA because he liked to check whether he was on task.

When asked what they liked about the SMP procedure, students indicated that it helped them learn more words (three students) and practice more during the spelling period (two students). They also indicated that it was fun (three students), especially coloring the rockets. One student indicated that he liked to see how many times he correctly practiced words. In the only negative comments, one child indicated that it was "a first-grade thing to do," and another indicated that practicing words more did not help him "spell words" better.

With the SMA procedure, three of the students indicated that they liked hearing the beeps, with two of them noting that the beeps helped them stay on task. Another child indicated that he liked checking "yes" when he was on task and this helped him be more productive. Nevertheless, students were more negative about SMA than they were about SMP. Five of the six students provided negative feedback about SMA. Their criticisms included that it was boring (one student), the tones were distracting (two students) or ineffective (one student), and the act of checking on-task behavior stopped them from working (one student).

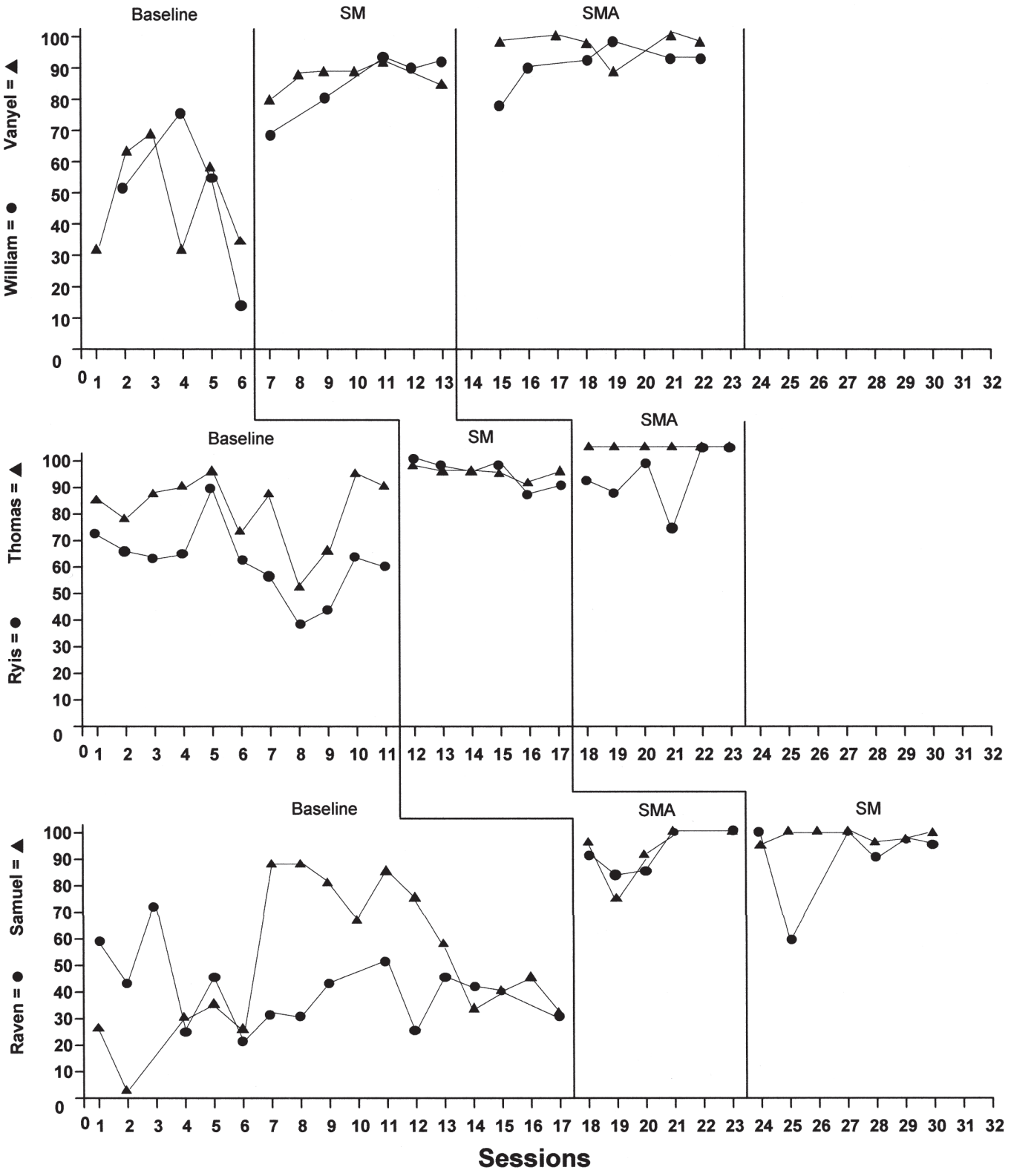

FIGURE 1. Percentage of intervals on task during self-monitoring of attention and performance.

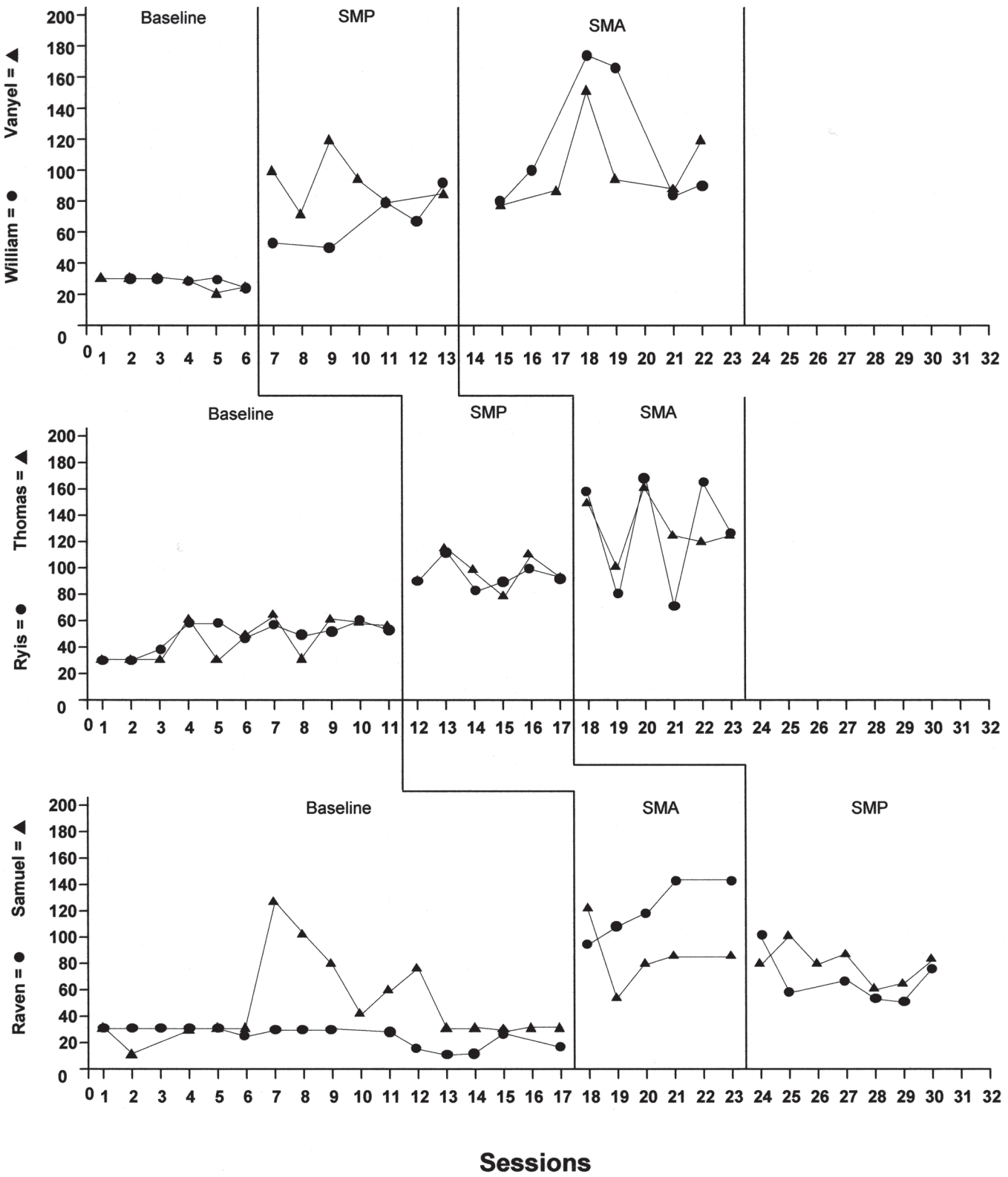

FIGURE 2. Number of correct spelling practices during self-monitoring of attention and performance.

Discussion

Both attention and performance monitoring had a positive impact on the spelling study behavior of the students with ADHD in this study, all of whom were taking medication. All six students demonstrated meaningful increases in on-task behavior when using either of the self-monitoring procedures. The increased stability in on-task behavior is also important, as students with ADHD frequently exhibit unstable behavior, and this issue needs further investigation in future studies. Furthermore, the increase in on-task behavior was comparable in both self-monitoring conditions, with neither one showing a clear advantage. The results for self-monitoring of performance, however, did indicate that for these six students, the two interventions had differential effects on the number of spelling words practiced correctly. Although both self-monitoring of attention and self-monitoring of performance resulted in meaningful increases in spelling practice over baseline performance, these students demonstrated a higher level of spelling practice in the SMA condition as compared to the SMP condition. For four students, the difference in the SMA condition was substantial; for two students, performance was comparable in the two conditions. No order effect for the two interventions was found for either on-task behavior or spelling practice.

In the postintervention interviews, four of the six students indicated that they preferred the SMP condition, one student preferred the SMA condition, and one student found the two equally acceptable and useful. While the students were somewhat more negative about the SMA condition in their comments, they did recognize that their performance improved in both conditions. Furthermore, they were willing to use both of the self-monitoring procedures.

The results of this study are significant for several reasons. First, this study is one of the first to demonstrate that self-monitoring interventions for students with ADHD can be implemented effectively in the general education classroom during a common classroom task. The special education teacher was familiar with both interventions and found them easy to implement; the general education teachers found both interventions acceptable. Thus, further research on multiple methods of increasing self-regulation abilities among students with ADHD is needed. As Barkley (1995) noted, the inattentive, disruptive, off-task, immature, and provocative behaviors frequent among many children with ADHD, even with medication, negatively affect both their academic and their social performance. Multimodal interventions that create gains beyond those achieved by medication and behavior modification are critical for these students (DuPaul & Stoner, 2003). Thus, keeping in mind the lessons learned from early study of cognitive–behavioral interventions with students with ADHD, significant investment in research in the development of self-regulation is warranted. Furthermore, this study adds to a body of research that indicates that previous conclusions that self-monitoring alone produces moderate to no behavior change were incorrect (cf. Harris et al., 1994; O'Leary & Dubey, 1979).

Differential effects of SMA and SMP among students with ADHD were investigated for the first time in this study. Four of the six students did substantially more spelling practice in the SMA condition than in the SMP condition, while improvements in on-task behavior were equivalent across the two conditions. It is interesting that this finding among students with ADHD differs in direction from that found with students with LD in previous studies. While more research is clearly needed, a few studies have found that SMP tends to be more advantageous than SMA among students with LD in terms of spelling practice and maintenance of spelling performance (Harris, 1986; Harris et al., 1994; Reid & Harris, 1993). There may be somewhat of an aptitude-by-treatment response with these two groups, as students with ADHD tended to do better on academic responding in the SMA condition whereas students with LD tended to do better in the SMP condition. As Barkley (1998) noted, ongoing, frequent, and immediate feedback tends to be important and effective for students with ADHD; it may be that the SMA intervention fits this need more strongly than the SMP intervention does for these students. This finding, however, begs replication and extension across other academic tasks.

Finally, we note that in the present study, self-monitoring was not combined with any form of external reinforcement and was effective. This is consistent with findings with students with LD (Reid, 1996). Much of the research involving self-monitoring among students with ADHD has included external reinforcement as a component (Reid et al., in press); the need for, or additive effects of, such reinforcement should be considered in future research and intervention design.

Limitations

An important limitation of this study is the lack of spelling achievement data, as has been the case in the previous single-subject design studies involving SMA versus SMP among students with LD (Harris, 1986; Harris et al., 1994). As in the previous studies, weekly spelling scores were not used as a dependent measure due to marked ceiling effects (students did well on their weekly tests after intervention) and ethical concerns. These students received individualized, functional-level spelling lists, and it was considered unethical and undesirable to significantly increase the difficulty level of the students' spelling words over the long term of this study to lower performance. The randomized group design used by Reid and Harris (1993) allowed for the collection of spelling performance data, with SMP resulting in significantly higher practice rates and greater maintenance of learned words. Further research among students with ADHD regarding the effects of SMA and SMP on spelling performance is clearly warranted.

Other limitations to the present study include the relatively short term of the intervention; although there is no reason to expect that the intervention would lose its effectiveness based on previous research (Reid, 1996), this needs to be in-

vestigated. In addition, the weaning procedure for external cues recommended by Hallahan, Lloyd, and Stoller (1982) was not implemented in this study, and future research needs to investigate effective weaning and maintenance of intervention effects, as well as support for generalization.

Conclusions

Until a richer database exists, teachers should carefully consider students' abilities, needs, and goals when deciding to use a particular self-monitoring procedure. They may need to try different self-monitoring procedures with differing tasks and situations to help determine what works best for an individual or a class. Teachers should, however, consider the use of self-monitoring procedures with students experiencing on-task or academic difficulties, as sufficient research indicates the efficacy of these approaches. As Harris et al. (1994) noted, regardless of the form of self-monitoring chosen, the procedures should be efficient, appropriate to the target behavior, acceptable to the student, minimally laborious or obtrusive, and relevant to the student's needs and goals.

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