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Using Self-Regulated Strategy Development for Written Expression with Students with Attention Deficit Hyperactivity Disorder

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This review assessed the use of self-regulated strategy development (SRSD) for teaching written composition strategies to students with attention deficit hyperactivity disorders. We examined the participants and the settings in which SRSD has been used, the writing strategies tested, genres addressed, and the effects of SRSD on outcome measures. Though only 27 participants were included in the studies located, they were generally representative of the population of students with ADHD. Only a small number of writing strategies were tested with students with ADHD, and the great majority of studies focused on essay writing. SRSD had marked effect on outcome measures. After instruction, compositions were more complete, longer, and of higher quality. Planning time and writing time also increased. Directions for future research and implications for practice are discussed.

Keywords: Written expression, self-regulated strategy development (SRSD), writing instruction, attention deficit hyperactivity disorder (ADHD), literature review.

Attention-deficit/ hyperactivity disorder (ADHD) is the most commonly diagnosed psychological disorder of childhood (Barkley, 2006). From 5% to 8% of children between the ages of 6 and 17 are diagnosed with attention-deficit/ hyperactivity disorder (Pastor & Reuben, 2008). These children frequently experience difficulties with academics (Barry, Lyman, & Klinger, 2002; Reid, 2012). Students with ADHD generally score lower on tests of achievement and academic performance than nondisabled peers (Birchwood & Daley, 2012; Carlson & Tamm, 2000; Frankenberger & Cannon, 1999) and also are more likely to experience higher rates of suspensions and expulsions, grade retention and drop out of school than their nondisabled peers (Barkley, 2006). Recent research suggests that writing may be one of the most common areas of academic difficulty for students with ADHD; as many as 65% of students with ADHD meet the qualifications for a learning disability in the area of writing (Mayes & Calhoun, 2006, 2007).

It is not surprising that writing may be difficult for students with ADHD because students with ADHD frequently exhibit deficits with many of the skills required for good writing. Students with ADHD are less likely to spend time planning

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their compositions before they write, even when specifically prompted (De La Paz, 2001; Jacobson & Reid, 2010). As a result, their written compositions are more likely to be poorly organized, may not consider their potential audience for the composition, and may be shorter in length (see Re, Pedron, & Cornoldi, 2007). In addition, many students with ADHD struggle to use language effectively to express ideas or create coherent compositions (Purvis & Tannock, 1997; Tannock, Purvis, & Schachar, 1993). Compositions written by students with ADHD are significantly poorer than controls in syntactic complexity, length, and use of descriptive language (Re et al., 2007). Overall, written compositions of students with ADHD are shorter, lack essential elements (e.g., topic sentence), and are lower in holistic quality (De La Paz, 2001; Jacobson & Reid, 2010; Lienemann & Reid, 2008).

Current models of ADHD conceptualize it as a disorder of self-regulation (Barkley, 2006), with impairments in behavioral inhibition as a core deficit area. Behavioral inhibition, briefly, is the ability to inhibit the initial and immediate response to stimuli; to continue to hold that response in check past the immediate reaction point; and to protect this response holding pattern from both internal and external distractions. This impairment may make it difficult for individuals with ADHD to maintain attention on writing tasks, as they can be distracted by either external or internal stimuli. With this theoretical basis in mind, it is not surprising that many students with ADHD display writing deficits.

Executive function (EF) and working memory (WM) are also impaired in students with ADHD (Barkley, 1997). EF are complex cognitive processes that serve to guide ongoing, goal-directed behaviors such as goal-setting and planning; organization of behaviors over time; flexibility; attention and memory systems that guide our behaviors; and self-regulatory processes including self-monitoring (Meltzer, 2007). WM includes, among other functions, maintaining and processing information in short-term memory, a task necessary to establish and maintain links between different ideas or content.

For students with ADHD, deficits in EF and WM can result in problems adopting a planful, strategic approach to tasks (Barkley, 2006). For example, Tant and Douglas (1982) found that development of effective strategies for the mastery of complex material was likely to be inhibited in students with ADHD. Additionally, students with ADHD were less aware of the purpose and use of strategies, were less likely to identify optimal strategies to complete a task, and used less effective and less effortful study strategies when compared to controls (Hamlett, Pelligrini, & Conners, 1987; O'Neill & Douglas, 1991). These findings suggest that the strategic problems experienced by students with ADHD may not be solely related to a lack of knowledge of strategies but may be due to failure to employ effective strategies or put forth the effort required to execute them (O'Neill & Douglas, 1991). This in turn suggests that strategy instruction may be effective for students with ADHD, especially in areas like writing where these students strategic behavior is limited and often ineffective (De La Paz, 2001; Jacobson & Reid, 2010).

Strategy instruction using the Self-Regulated Strategy Development (SRSD) model (Harris & Graham, 1996) has the potential to improve the writing skills of students with ADHD. With this approach, students are explicitly taught specific writing strategies (usually strategies for planning, composing, or revising), the knowledge

needed to use these strategies, and procedures for regulating these strategies, the writing process, and their behavior. Instruction is designed to promote students' ownership and independent use of writing and self-regulation strategies (Harris, Graham, Brindle, & Sandmel, 2009). Students are treated as active collaborators in the learning process and the role of effort in learning is emphasized. The level and type of feedback and instructional support provided are adjusted to be responsive to students' needs, gradually shifting responsibility for strategy use from teacher to student. Instruction is criterion- rather than time-based (although this has not been the case in all studies), as students move through each instructional stage at their own pace, not proceeding to later stages until they have met initial criteria. The stages of instruction include developing the background knowledge needed to use the target writing strategies, describing the target writing strategies and establishing the rationale for each step of the strategy, memorizing the steps of the strategies, modeling how to use these strategies and accompanying self-regulation procedures such as goal setting and self-monitoring; supporting students' movement to independent use of the writing strategies and self-regulation procedures, and facilitating maintenance and generalization of strategy use.

The SRSD approach addresses many of the deficits in EF and WM. First, the SRSD model addresses the WM deficits that are common in students with ADHD by teaching strategies to automaticity, and scaffolding practice with prompts, cues, and organizers, reducing demands on WM (Lienemann & Reid, 2008). In addition, many students with ADHD do not have flexible, effective strategies in their repertoire. By explicitly teaching strategies through a model such as SRSD, students may be able to develop a collection of effective strategies for addressing academic tasks. Third, self-regulation strategies are explicitly taught. Self-regulation strategies have been shown to be effective in improving maintenance of effort and focus (Reid, Trout, & Schartz, 2005), areas where students with ADHD frequently struggle. Finally, students with ADHD often experience problems establishing goals, holding goals in mind, and directing behavior to achieve goals (Barkley, 1997; Kliegel, Ropeter, & Mackinlay, 2006). To address these difficulties, goal setting is explicitly taught and modeled during SRSD instruction, and progress toward student's goals are monitored throughout instruction. This helps students with ADHD understand the need for a goal, see progress toward a goal, and keep the target goal in mind.

The purpose of this review was to assess the use of SRSD for teaching written composition strategies to students with ADHD. We examined four questions:

1. What were the characteristics of participants with ADHD?
2. What were the instructional settings in SRSD studies?
3. What writing strategies were taught and what writing genres were addressed?
4. What were the effects of SRSD instruction on writing outcomes?

Method

Articles included in this review met the following criteria: (a) published in peer-refereed journals; (b) used a true- experiment, a quasi-experiment, or single subject design; (c) targeted or included disaggregated data on students identified as having ADHD; (d) used the SRSD instructional model; and (e), included data on

some aspect of writing performance (e.g., length, quality) as a dependent variable. There were no restrictions on participant's age or settings (i.e., school or alternate education placement). Studies that taught some aspect of writing but did not include outcome data on writing measures (e.g., Rogevich & Perin, 2008) were excluded from this review. There were no limitations on publication dates.

A search for prospective journal articles meeting the above criteria was conducted using the following procedure. First, the PsycINFO and Academic Search Premier data- bases were searched. Keywords used to identify appropriate journal articles were *ADHD,* or *attention deficit* in combination with *writing, written expression, story, essay, composition, or self-regulated strategy development.* Second, ancestral searches were performed on journal articles meeting the inclusion criteria by checking citations. Third, we conducted a cited reference search using the Web of Science to identify studies that had cited studies that met the inclusion criteria. Finally, we conducted an author search in the PsycINFO and Academic Search Premier data-base of all authors who had published studies that met the inclusion criteria.

Calculation of Effect Sizes

We located no true- or quasi-experiments assessing the effects of SRSD on the writing of ADHD students. However, we did locate single subject design studies that tested such effects. To measure the effects of SRSD on the outcome measures in these studies, we used percent non-overlapping data (PND; Scruggs, Mastropieri, & Casto, 1987). PND is a commonly accepted measure for assessment of effect sizes in single-subject design that has been used in several previous meta-analysis of single subject writing intervention research (e.g., Graham, 2006; Graham & Harris, 2003), which allows for comparison of effects across studies. We computed PND by calculating the percentage of data points in treatment (or maintenance) that exceeded the highest point in baseline. PND was calculated for each dependent measure for which graphs were provided.

Based on the recommendation by Rogers and Graham (2008), we also computed a mean weighted (by number of participants) PND when conceptually similar dependent measures (e.g., quality, completeness, length) were included in at least four studies. We also computed a PND range that served as a proxy for a confidence interval, and provided the modal score. PND was interpreted using criteria suggested by Scruggs et al. (1987): (1) PND above 90% is a large effect, (2) PND between 70% and 90% is a moderate effect, (3) PND between 50% and 70% is a low or small effect and (4) PND 50% or below is classified ineffective.

Means and standard deviations for outcome measures (when provided) are also reported. To assess the magnitude of changes, we computed Percent Change (PC) score by dividing the mean post-instruction score by the mean baseline score and multiplying by 100. A positive PC greater than 100 indicates a change in the desired direction. Similar to PND, when four or more studies reported means for a conceptually similar measure we report mean weighted PC for the studies.

Results

A total of 11 articles comprising 12 separate studies were located. All of the studies used single-subject design methodology and all studies were multiple baseline designs. Table 1 shows information on participants characteristics. Table 2 shows instructor, setting, genre, strategy used, outcome measures and PND for graphic data for post-instruction and maintenance. All studies required participants to demonstrate that they could successfully use the strategy independently before instruction ceased. Table 3 shows means for baseline, post-instruction, and the PC for each study.

Participants and Setting

A total of 27 students with ADHD (19 males and 8 females) participated in the 12 studies. Students' grades ranged from 2nd to 12th. A total of 9 students were in grades 2-5, 6 students were in grades 6-8, and 12 students were in grades 9-12. Nine studies reported data on student ethnicity, of these students 16 were Caucasian, 2 were African-American, 1 was Hispanic, and 1 was African-American/Hispanic. Ten studies reported information on special education status. Of these students, 12 were served under OHI, 4 under EBD, 2 under SLD, 2 under EBD/SLD, 1 under EBD/OHI, and 1 under SLI. Seven studies reported information on medication status. Of these studies, 10 students received medication for ADHD, and 11 did not. Of the students receiving medication, 8 of the 10 were in elementary school. The following co-morbid conditions were reported: anxiety disorder (2 students; Kiuhara, O'Neil, Hawken, & Graham, 2012, Reid & Lienemann, 2006), bi-polar disorder (2 students; Lienemann, Graham, Leader-Janssen, & Reid, 2006, Mason, Kubina, & Taft, 2011), depression (1 student; Mason et al., 2011), and mood disorder (1 student; Reid & Lienemann, 2006).

All but two studies were conducted in the typical public school environment. The exceptions were Mason, Kubina, Valasa, and Cramer (2010), which took place in alternative school for students with emotional and behavioral disorders (EBD), and Mason and Shriner (2008), which took place in an elementary school with students served in an Inclusive Therapeutic Program. Only 4 studies provided information on student placement in the school. In De La Paz (2001), both students were in a full day inclusive classroom. In Jacobson and Reid (2010, 2012) students were in inclusive classes with resource support. In Mason et al. (2011), two students were in inclusive classrooms with special education support, and one student was in an inclusive classroom with no support. All but three studies used one-to-one instruction. De La Paz (2001) was conducted in a whole class setting, and Mason, Kubina, and Taft (2011) studies 1 and 2 were conducted in small-groups. Two studies (De La Paz, 2001; Mason Kubina, & Taft, 2011, study 1) used the classroom teacher as the instructor; the remainder used research personnel as instructors.

Table 1. ***Participant Characteristics***

Authors	*n*/Grade/Gender	Special Ed. Status	Co-Morbid Conditions	Placement	Number Receiving Medication	Ethnic Status
De La Paz (2001)	1 8th grade female; 1 7th grade female	1 SLI	N/A	Full day inclusive	0 of 2	2 C
Jacobson & Reid (2010)	2 11th grade males, 1 12th grade male	3 OHI	N/A	Inclusion with resource support	0 of 3	3 C
Jacobson & Reid (2012)	3 10th grade males, 1 11th grade female	4 OHI	N/A	Inclusion with resource support	0 of 4	2C, 1 AA, 1 HSP
Kiuhara et al. (2012)	1 10th grade male, 1 10th grade female	N/A	1 Anxiety disorder	N/A	N/A	1 C, 1 AA/HSP
Lienemann et al. (2006)	1 2nd grade female	N/A	1 Bi-Polar	N/A	N/A	1 AA
Lienemann & Reid (2008)	2 4th grade (1 male, and 1 female); 2 5th grade (1male and 1 female)	2 OHI, 1 EBD, 1 LD	N/A	N/A	4 of 4	4 C
Mason, Kubina, & Hoover (2011)	2 11th grade males, 1 9th grade male	EBD	1 Bi-Polar, 1 Depression	2 inclusive with special education support, 1 inclusive no support	2 of 3	N/A
Mason, Kubina, & Taft (2011) Study 1	2 7th grade males	SLD	N/A	N/A	1 of 1	N/A
Mason, Kubina, & Taft (2011) Study 2	1 7th grade male	1 OHI	N/A	N/A	N/A	N/A

Mason et al. (2010)	1 7th grade female	1 EBD/ SLD	N/A	N/A	N/A	1 C
Mason & Shriner (2008)	1 2nd grade male	EBD/OHI	N/A	N/A	N/A	1 C
Reid & Lienemann (2006)	1 3rd grade male, 1 4th grade male, 1 4th grade female	1 SLD/ OHI, 1 OHI	1 Mood disorder/ anxiety disorder	N/A	3 of 3	3 C

Note: EBD = Emotional/Behavioral Disorder; LD = Learning Disability; OHI = Other Health Impaired; SLI = Speech/Language Impaired; N/A = not available; AA = African-American, HSP = Hispanic, C = Caucasian.

Table 2. ***Overview of Studies***

						PND	
Authors	Instructor	Group size	Genre	Strategy	Measures	Post Instruction	Maintenance
De La Paz (2001)	CT	Class	Essay	PLAN-WRITE	Elements	100%	100%
Jacobson & Reid (2010)	R	One-to-one	Essay	STOP & DARE	Elements TW Quality	100% 100% 100%	100% 100% 66%
Jacobson & Reid (2012)	R	One-to-one	Essay	STOP & DARE	Elements TW Quality	100% 100% 100%	100% 100% 100%
Kiuhara et al. (2012)	R	One-to-one	Essay	STOP, AIMS, & Dare combined with token economy	Elements Elements Quality	100% 100% 84%	N/A
Lienemann et al. (2006)	R	One-to-one	Stories	POW + WWW, What=2, How=2	Elements	100%	100%
Lienemann & Reid (2008)	R	One-to-one	Essay	POW + TREE	Elements TW	100% 100%	100% 100%
Mason, Kubina, & Hoover (2011)	R	One-to-one	Essay	POW + TREE	Quality Elements TW	77% 68% 68%	83% 50% 66%
Mason, Kubina, & Taft (2011) Study 1	R	small group	Essay	POW + TREE	Quality Elements	50% 100%	100% 100%

Mason, Kubina, & Taft (2011) Study 2	CT	small group	Essay	POW + TREE	Quality Elements	100% 80%	100% 50%
Mason et al. (2010)	R	one-to-one	Essay	POW + TREE	Quality Elements TW	80% 0% 0%	100% 0% 0%
Mason & Shriner (2008)	R	one-to-one	Essay	POW + TREE	Elements	33%	100%
Reid & Lienemann (2006)	R	one-to-one	Stories	POW + WWW, What=2, How=2	Elements TW	100% 100%	100% 100%

Note. PND = Percentage of Non-overlapping Data; CT = Classroom Teacher; TW = Total Words; R = Researcher; N/A = not available

Table 3. ***Means and Standard Deviations for Studies***

		Baseline		Post instruction		% change
Study	Measure	Mean	SD	Mean	SD	
De La Paz (2001)	Plans	0.1	n/a	4.0	n/a	4000%
	Total Words	88.5	n/a	173.1	n/a	195%
	Elements	10.2	n/a	23.5	n/a	230%
	Quality	2.1	n/a	4.6	n/a	219%
	Vocabulary	5.8		13.5		232%
Jacobson & Reid (2010)	Planning TimeTransition	0.0	n/a	31.7	n/a	n/a
	Words	108.6	n/a	225.1	n/a	207%
	Total Words	0.7	n/a	4.7	n/a	671%
Jacobson & Reid (2012)	Planning Time	0.0	n/a	19.2	n/a	n/a
	Writing Time	4.8	n/a	27.9	n/a	581%
	Total Words	55.7	n/a	226.9	n/a	407%
	Essay Elements	1.0	n/a	6.2	n/a	620%
	Transition Words	0.1	n/a	6.1	n/a	6100%
	Quality	1.0	n/a	3.6	n/a	360%
Kiuhara et al. (2012)	Planning Time	0.3	n/a	13.9	n/a	4633%
	Writing Time	6.3	n/a	42.5	n/a	674%
	Total Words	82.2	n/a	243.3	n/a	295%
	Essential Elements	2.7	n/a	6.8	n/a	251%
	Functional Elements	6.6	n/a	22.5	n/a	340%
	Quality	2.3	n/a	4.9	n/a	213%

Lienemann et al. (2006)	Quality Story Elements Total Words	2.7 2.0 48.3	0.5 n/a 30.3	3.7 5.3 82.0	0.8 n/a 1.0	137% 265% 169%
Lienemann & Reid (2008)	Quality	1.5	0.4	4.9	0.8	326%
Mason, Kubina, & Hoover (2011)	Quality Essay Parts Total Words	3.1 4.4 69.7	0.8 1.4 22.0	5.1 6.7 108.1	1.3 0.9 22.8	164% 152% 154%
Mason, Kubina, & Taft (2011) Study 1	Quality Total Words	2.2 81.3	1.1 10.22	4.0 84	1.0 11.36	181% 103%
Mason, Kubina, & Taft (2011) Study 2	Quality Total Words	4.6 98.2	0.6 10.2	5.5 154	.5 31.8	119% 156%
Mason et al. (2010)	Quality Essay Parts Total Words	4.0 8.7 119.0	1.2 2.1 27.5	6.6 9.0 126.0	0.9 0.7 11.9	165% 103% 105%
Mason & Shriner (2008)	Quality Total Words Transition Words	0.0 10.0 0.0	0 5.2 0	2.0 22.3 2.0	2.2 18.1 1.4	n/a 223% n/a
Reid & Lienemann (2006)	Quality Story Parts Total Words	1.53 3.3 34.7	0.9 n/a n/a	4.3 7.0 151.3	1.0 n/a n/a	281% 212% 435%

Note: n/a = not available

Strategies and Genres

All studies addressed either essay writing or story writing. Two studies comprising a total of 4 students tested strategy instruction in story writing. The POW + WWW, What =2, How = 2 story writing strategy developed by Harris and Graham (1996) was used in both studies (Lienemann et al., 2006; Reid & Lienemann, 2006). POW is the general planning strategy: **P**lan the essay, **O**rganize your notes, and **W**rite your essay, whereas WWW, What = 2, How = 2 is a strategy for generating and organizing ideas for the story. More specifically, WWW, What = 2, How = 2 cues students to generate and include ideas for the parts of a good story, as students make notes for: **W**ho are the main characters? **W**here does the story take place? **W**hen does the story take place, **W**hat do the main characters want to do? **W**hat happens next? **H**ow does the story end? **H**ow do the main characters feel?

Ten studies comprising a total of 23 students tested writing strategies for essay writing. Four different strategies were tested. De La Paz (2001) used the PLAN-WRITE strategy. PLAN is the organizing strategy – **P**ay attention to the prompt, **L**ist main ideas, **A**dd supporting idea, **N**umber your idea. WRITE is the composing strategy – **W**ork from your plan to develop your thesis, **R**emember your goals, **I**nclude transition words, **T**ry different kinds of sentences, and use **E**xciting interesting words. Jacobson and Reid (2010, 2012) used the STOP & DARE strategy developed by De La Paz and Graham (1997). STOP is the planning strategy **S**uspend judgment, **T**ake a side, **O**rganize your ideas, and **P**lan more as you write. The composing mnemonic DARE consists of **D**evelop a topic sentence, **A**dd supporting ideas, **R**eject possible arguments for the other side, and **E**nd with a conclusion.

Kiuhara et al. (2012) added an additional component to STOP & DARE making the STOP, AIMS, & DARE strategy. AIMS is a composing strategy designed to help students write a better introduction. AIMS stands for **A**ttract the reader's attention, **I**dentify the problem of the topic, **M**ap the context of the problem or provide background information, and **S**tate the thesis. Six studies used the POW + TREE strategy (Mason, Kubina, & Hoover, 2011; Mason, Kubina, & Taft, 2011, Studies 1 and 2; Mason, Kubina, Valasa, & Cramer, 2010; Mason & Shriner, 2008; Reid & Lienemann, 2008) developed by Harris and Graham (1996). As noted earlier, POW is a general planning strategy: **P**lan the essay, **O**rganize your notes, and **W**rite your essay using TREE. TREE is the composing strategy that prompts students to include the critical elements of an essay Topic, Reasons (at least three), Explanations for each reason, and Ending. Four of the studies using the POW + TREE strategy used a Quick Write format which required the students to plan and write their essays in a 10 minute time period (Mason, Kubina, & Hoover, 2011, Mason, Kubina, & Taft, 2011 Studies 1 and 2; Mason et al., 2010).

Effects on Outcome Measures

Three specific types of writing measures (i.e., genre elements, writing quality, and number of words) were common in the studies included in this review; each type of measure was applied in 4 four studies or more (see Tables 2 & 3). Consequently, we reported mean weighted PND, range of PNDs, and mean performance data for these three measures below. It is important to note that measures for each

of these constructs (e.g., writing quality) were not exactly identical in each study, but they were conceptually similar.

Genre elements. All studies provided graphic data for number of genre elements for post-instruction. The writing construct of genre elements was operationalized as the number of structural elements included in students' compositions. For studies testing a story writing strategy, genre elements included points for the following structural elements in the narrative: main character(s), place, time, goals of the main character, actions undertaken by the main character, reactions of characters, and ending. For studies testing an essay writing strategy, structural elements included premise (i.e., topic), reason for premise, reason against premise, ending, as well as explanation for premise, reason, and ending.

Scoring of these structural elements differed slightly across studies. For example, in studies teaching the POW + TREE strategy, structural elements were scored on a scale that ranged from 0 to 8 possible elements, with one point assigned for Topic, three points for Reasons to Support (one point for each of the first three Reasons), three points for Explanations (one point awarded when an Explanation was attached to a separate Reason), and one point for Ending. If students provided extra Reasons to Support and/or Explanations, additional points were awarded. With one exception all studies scored extra points if students included extra essay elements. The exception (Jabobson & Reid, 2012) capped the number of elements at 7. The two studies which assessed story writing (Lienemann, et al., 2006; Reid & Lienemann, 2006) both capped the number of story elements at 7.

Mean weighted PND for structural elements immediately following instruction for the 12 studies was 89.5 (range 00.0 – 100) suggesting a moderate to strong effect. The PND of 00.0 occurred in the Mason et al. (2010) study and was based on a single student. The modal PND score across studies was 100. Mean weighted PND for structural elements at maintenance (11 studies) was 86.9 (range 00.0 to 100) suggesting a moderate effect. The modal maintenance PND score across studies was 100. Seven studies reported mean performance for structural genre elements. Mean weighted PC across these studies was 308%, which indicated that the number of genre elements participants included in their compositions tripled after instruction.

Quality ratings. Seven studies provided the graphic data needed to compute PND for quality immediately following instruction. Quality was operationalized similarly across these studies. Typically, it was assessed using a Likert-type rating on a scale of 1 (lowest rating) to 7 (highest rating). Anchor papers were used to provide raters with an example of papers that would be representative of scores of 2, 4, and 6. Anchor papers were drawn from students in the general education classroom, so the ratings used were in comparison to student's peers. A score of 3 to 4 indicated that student's quality was rated as being in the normal range.

Mean weighted PND for writing quality for post-instruction for the seven studies was 86.2 (range 50 – 100) suggesting a moderate effect. The modal PND for post-instruction was 100. Six studies reported maintenance data for writing quality. Mean weighted PND was 88.2 (range 66 – 100), suggesting moderate effects. Modal maintenance PND for quality was 100. Ten studies reported mean performance for quality ratings. Mean weighted PC for these studies was 248%, indicating that quality ratings more than doubled after instruction.

Number of words. Six studies provided the graphic data needed to compute a PND for number of words. Number of words was operationalized as the total number of words in a composition. Mean weighted PND for number of words following instruction was 89.1 (range 00.0 – 100), suggesting a moderate effect. The modal PND for post-instruction was 100.

Six studies provided maintenance data for number of words. For these studies, mean weighted PND was 84.3 (range 00.0 – 100), suggesting a moderate effect. In both instance noted above, the PND of 00.0 occurred in the Mason et al. (2010) study and was based on a single student. Modal maintenance PND for number of words was 100. Eleven studies reported mean performance for number of words. Mean weighted PC for these studies was 254%, which indicates that the length of participants' compositions more than doubled after instruction.

Planning time. Four studies reported information on planning or time spent planning (De La Paz, 2001; Jacobson & Reid, 2010, 2012; Kiuhara et al., 2012). Two different measures of planning were used across these studies. De La Paz (2001) assessed the extent to which participants' written plans were complete, well organized, and responsive to the prompt used to cue students' writing. Plans were scored on a 6-point scale with 0 representing no planning and 6 representing an accurate outline for the essay. At baseline only one student engaged in any planning at all. After instruction, all students generated written plans, and planning ratings moved from 0.1 at baseline to 4.0 following instruction.

Jacobson and Reid (2010, 2012) and Kiuhara et al. (2012) measured time spent planning at baseline and post-instruction. None of the students in either study by Jacobson and Reid engaged in any planning during baseline. Kiuhara et al. (2012) reported that only 3 of 7 students engaged in any planning during baseline and the longest planning period averaged only 1 minute 45 seconds. After instruction, students mean planning time was 31 minutes, 19 minutes, and 13.9 minutes, respectively, Jacobson and Reid (2010), Jacobson and Reid (2012), and Kiuhara et al. (2012).

Writing time. Jacobson and Reid (2012) and Kiuhara et al. (2012) also reported data on time spent writing (i.e., number of minutes students spent writing after planning was completed). Both studies reported large increases in writing time over baseline. PC for the studies was 581% and 674%, for Jacobson and Reid and Kiuhara et al., respectively.

Vocabulary and transition words. De La Paz (2001) assessed vocabulary by counting the number of novel words 7 letters or longer. She reported a PC of 239% indicating that the number of novel words more than doubled. Jacobson and Reid (2010, 2012) assessed the number of transition words used. At baseline, the mean number of transition words was 0.7 and 0.1 respectively, in these two studies. After instruction the number of transition words increased to 4.7 and 6.1, respectively.

Discussion

The purpose of this review was to assess the use of SRSD for writing with students with ADHD. We first discuss the type of students with ADHD who have participated in the studies conducted to date and the settings in which SRSD has been tested with these students. We then examine the overall effectiveness of SRSD with students with ADHD.

Participants and Settings

There was a distinct disparity in term of participants' gender. There were roughly 2.5 times as many male as female participants. This was expected as ratios of around 3 to 1 are often found in community-based samples of students with ADHD (DuPaul & Stoner, 2003; Wolraich & DuPaul, 2010). Participants' grade level ranged from grade 2 to grade 12. Interestingly, the great majority of participants were at the middle-school or high-school level. This was unexpected as academic intervention research with students with ADHD more often focuses on students at the elementary level (Trout, Lienemann, Reid, & Epstein, 2007). Participants in the studies reviewed were served under several categories of disability including OHI, EBD, LD, and SLI. The most common category was OHI followed by EBD and LD. This was consistent with previous research in ADHD (Reid, Maag, Vasa, & Wright, 1994; Schnoes, Reid, Wagner, & Marder, 2006). Comorbid conditions (e.g., bi-polar disorder, depression) were present in 6 of the students, which was also consistent with the types of disorders present in the ADHD population (Barkley, 2006). Thus, while the number of students included in the review was relatively small, the composition generally was representative of the population of students with ADHD in terms of special education placements and the proportion of students in each diagnostic category.

Medication data were available for 21 of 27 participants. Of these students, 10 were medicated during the intervention and 11 were not. This was important for two reasons. First, medication tends to reduce the disruptive behaviors exhibited by many students with ADHD and to improve compliance and persistence (see Barkley, 2006 for a detailed discussion). This would tend to have a salutary effect on the instructional interactions between teacher and student. If SRSD were practical only for students who were medicated it would seriously limit its usefulness. This was a serious concern because around 25% of students with ADHD cannot tolerate or do not improve on medication, and medication is often discontinued after two years (Bussing et al., 2005), which means that fewer secondary students receive medication (Castle, Aubert, Verbrugge, Khalid, & Epstein, 2007).

Second, medication affects EFs. When medicated, students are able to better control impulsivity and to engage in higher order activities such as planning and monitoring (Francis, Fine, & Tannock, 2001). Unmedicated students might respond differently to SRSD instruction, which directly addresses EFs such as planning and monitoring in lessons. Fortunately, SRSD instruction was equally effective for both groups of students, which suggests that the effectiveness of SRSD instruction was not sensitive to the effects of medication.

With the exception of two studies (Mason et al., 2010; Mason & Shriner, 2008) all studies took place in typical public school environments. Less information was available on students' placement, only 4 studies provided this information. Students in these studies were placed in an inclusive general education classroom, three with resource support and one with no support. This was consistent with previous research which indicates that around 80% of students with ADHD are placed in the general education classroom for most of their school day (Schnoes et al., 2006). Strategy instruction was done in a one-to-one setting for 9 or the 12 studies. Two studies (Mason, Kubina, & Taft, 2011 studies 1 and 2) used small groups and one (De La Paz,

2001) was conducted in a whole class setting. Only one study (De La Paz, 2001) used a classroom teacher to deliver instruction.

We are not aware of any research that has documented typical instructional settings for students for writing instruction for students with ADHD, so we cannot say to what extent this is representative. However, given the clear evidence that students with ADHD spend the majority of time in the general education classroom (Schnoes et al., 2006), it seems likely that they would receive instruction primarily in small group or whole class settings and that the classroom teacher would be the individual who delivered instruction. Thus, the instructional environment is not representative of what students with ADHD would typically experience. This has implications for practice, as students with ADHD tend to do better in one-to-one environments (Barkley, 2006).

Strategies and Genres

A total of four strategies were used in the studies; one strategy addressed planning and drafting a story, the remainder addressed planning and drafting essays. All of the strategies have been widely used by previous researchers and have demonstrated efficacy for students with LD (Graham, 2006; Graham & Harris, 2003; Graham et al., 2013). Encouragingly, none of the strategies were modified in any way for use with students with ADHD. The only accommodation for ADHD noted in any of the studies was the use of external reinforcement in Kiuhara et al. (2012). This suggests that no special accommodations or changes are needed to use SRSD effectively with students with ADHD. Thus existing, commercially available lessons plans for the strategies used should be effective (e.g., Harris, Graham, Mason, & Friedlander, 2008) with these students.

The predominant genre addressed was essay writing with the great majority of participants at the middle- or high-school level. Only two studies with a total of four students addressed story writing. The effectiveness of SRSD for essay writing with middle- and high-school students was encouraging given the wide spread use of proficiency tests at these levels. However, the lack of research using story writing or personal narratives was a concern. Personal narratives are often used in competency testing at the elementary level. Because Common Cores State Standards (2012) also place emphasis on informative writing and using writing as a tool to support reading comprehension and learning of content material, broader applications of SRSD writing strategy instruction with students with ADHD are needed in order to address the new realities of writing instruction in most school in the United States.

Effects of SRSD on Outcome Measures

During baseline, the compositions of students with ADHD in these studies were incomplete, short, and of poor quality. This changed following SRSD instruction. With the exception of two students (Mason et al., 2010, Mason & Shriner, 2008), SRSD was effective in improving the writing performance of all of the students with ADHD who participated in the studies reviewed here. In the case of Mason et al., 2010, the student was already functioning at grade level, which may explain the lack of effects. In the case of Mason and Shriner (2008) the student was place in a thera-

peutic setting immediately following the instruction phase. This may have contributed to the lack of effects.

In terms of structural elements, few students with ADHD had even 50% of the genre elements typically found in a specific type of compositions (e.g., story). After instruction, students more than tripled the number of genre elements, and the mean PND of 89.5 suggested a moderate to strong effect. These data suggest that SRSD instruction was highly effective at improving the completeness of students' compositions. Mean PND for maintenance was only slightly lower (86.9), suggesting that effects maintained. However, maintenance periods were typically one to two weeks; longer periods are necessary to determine whether the effects would remain over the course of a school year. Maintenance is generally a concern for students with ADHD, because failure to maintain skills or strategies is a common problem. (Johnson & Reid, 2011).

Effects on number of words written were moderate to strong (mean PND = 89.1) and the average PC was 254%, which indicated that students more than doubled the length of their compositions. Effects on number of words were not as pronounced as other measures in terms of average PC. This may be due in part to the fact that students' performance on this measure tends to be more variable (Harris, Graham, & Mason, 2006), and many studies did not place an emphasis on writing longer compositions during instruction.

Effects on quality were moderate to strong with mean weighted PND for post-instruction of 86.2 and maintenance of 88.2. On average, the quality of compositions more than doubled after treatment. In all but one instance, SRSD instruction had the effect of bringing below average quality ratings into the normal range or above. In the study that did not normalize quality ratings (Mason & Shriner, 2008), students increased from a mean of 0 to a mean 2.0, which, while not in the normal range, indicated considerable improvement. In two studies, (Mason et al., 2011, Study 2; Mason et al., 2010) students' baseline scores were above average (4.6 and 4.0 respectively) and mean quality ratings still improved. Overall, effects on completeness, number of words and quality are consistent with research of SRSD with students with learning disabilities and other disabilities (Graham & Harris, 2003; Graham, Harris, & McKeown, 2013; Rogers & Graham, 2008), and suggest writing instruction using SRSD can meaningfully improve the compositions of students with ADHD.

Time spent planning was reported in only 4 studies (De La Paz, 2001; Jacobson & Reid, 2010, 2012; Kiuhara et al., 2012). All studies reported marked gains in planning time that maintained during the maintenance phase. This was encouraging because students with ADHD typically fail to adopt a planful strategic approach to complex tasks such as writing a composition (Johnson & Reid, 2011) and may fail to maintain use of a strategy over time (Kofman, Larson, & Mostofsky, 2008). It must be noted, however, that the longest maintenance period was only 1 month (Jacobson & Reid, 2012); it is not certain if students with ADHD would continue to use a strategy over a longer time frame (e.g., an academic year). Time spent writing also increased (Jacobson & Reid, 2012; Kiuhara et al., 2012). This was encouraging because students with ADHD have difficulties maintaining effort on tasks (Milich & Okazaki, 1991), especially tasks that require sustained cognitive effort (Hoza, Pelham, Waschbusch, Kipp, & Owens, 2001).

Vocabulary and transition words were further assessed in three studies; all of these studies found improvements on specific measures of vocabulary (De La Paz, 2001; Jacobson & Reid, 2010, 2012). Improving the vocabulary and use of transition words of students with ADHD has largely been overlooked. This is a concern because language difficulties are well documented among students with ADHD (Schnoes et al., 2006).

Limitations and Implications

Overall, the results of this review demonstrated that strategy instruction in writing using the SRSD model can be effective in improving the writing of students with ADHD. However, the results of the review also indicated that there are a number of limitations and areas for future research. First, the effects noted were almost entirely for essay writing with middle- or secondary-school students, with all of these studies concentrating on essay writing. Additional research is needed to further investigate the effects of SRSD with elementary aged students with ADHD. Given the nature and extent of the academic problems of students with ADHD early intervention should be of prime concern.

More research should also address using SRSD as a means to improve the narrative writing of students with ADHD, as we located only two studies that tested SRSD with this kind of writing. More importantly, the impact of SRSD on other important writing tasks that students with ADHD are expected to do, as part of Common Core, needs to be studied. This includes a variety of writing tasks, such as writing to learn, writing to read, informative writing, and writing summaries.

A second limitation of the current body of research examining the effect of SRSD on the writing of students with ADHD is that it has all focused on planning, composing, and drafting. While planning, composing, and drafting are critical to successful writing (Graham & Harris, 2003), students also need to develop effective strategies for evaluating and revising their text to make it better. There is currently a small body of SRSD revising studies that demonstrate that such instruction can enhance the revising behavior of struggling writers and result in qualitatively better written products (see Graham, Harris, & McKeown, 2013). Such instruction needs to be tested with students with ADHD.

A third limitation of the studies reviewed here is that they all were single-subject design studies. While such studies have a number of positive features, including experimental control, they do not provide as stringent a test of the effects of SRSD with students with ADHD as randomized group design studies. Such studies are needed to more firmly establish the overall effect of this treatment with students with ADHD.

A fourth limitation of the accumulated literature was that all but two of the studies involved instruction delivered by research staff in an individual or small group format. While this suggests SRSD can be effective for students with ADHD in a Response to Intervention type of format, it is less certain if it would be effective with these students when instruction is delivered to the whole class or to small groups by the students' actual teachers. Future research is needed to investigate its effectiveness in these settings.

While maintenance was assessed in many of the studies conducted to date, this was done fairly soon after instruction ended (typically about one week later). Additional research is needed to determine if such effects can be maintained longer with students with ADHD, and to identify effective instructional procedures for promoting such effects.

Lastly, none of the studies reviewed which aspects of SRSD instruction were responsible for improvements in the writing of students with ADHD. Thus, component analysis studies are needed in order to identify which aspects of the instructional model are responsible for changes in students' performance (see Sawyer, Graham, & Harris, 1992, for an example of such research with students with LD).

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