

Improving the Sentence Writing Fluency of a Student With Attention Deficit Hyperactivity Disorder and Speech/Language Impairment: A Pilot Study

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The skill of sentence writing – the composition of connected text into sentence types understandable to readers – is foundational to written expression. Unfortunately, many students with learning disabilities – particularly those with attention deficit hyperactivity disorder (ADHD) and speech and/or language impairment (S/LI) – struggle to develop sentence writing and its multiple, related skills. Using a single-baseline design, we studied effects of a supplemental writing intervention on one elementary-aged student with comorbid ADHD and S/LI. The intervention entailed delivery of a writing fluency intervention with several antecedent- and consequence-based components: explicit instruction, fluency practice, a reinforcer survey, and contingent reinforcement. The participating student improved his accuracy and speed of sentence writing during intervention. Results are discussed within the context of text writing fluency and frameworks of academic interventions for students with ADHD and S/LI.

Keywords: Sentence Construction, Writing Fluency, Written Expression

INTRODUCTION

Sentence writing – the composition of connected text within sentence types understandable to readers – is one of the foundational skills involved in clear and understandable written expression. There are a variety of different sentence types (e.g., simple or compound), but all sentences are comprised of multiple, correctly spelled words that follow rules of capitalization, punctuation, semantics, and syntax (Ritchey et al., 2016). For many elementary students, simple sentences serve as an important bridge from handwriting letters and spelling words to expressing meaning through the writing of connected text (Berninger et al., 2011).

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Compared to their typically-developing peers, students with learning disabilities – particularly those with attention deficit hyperactivity disorder (ADHD) or speech/language impairment (S/LI) – tend to perform more poorly on measures of handwriting, spelling, fluency, and overall sentence structure (Fey et al., 2004; Graham et al., 2016; Koutsoftas, 2016). For students with ADHD, difficulties with sentence writing are not surprising because the symptoms of ADHD (i.e., inattentive and impulsive behaviors) can interfere with the development of receptive, expressive, and pragmatic language in oral and written language (Prelock & Hutchins, 2018). Consequently, ADHD is frequently comorbid with S/LI (Mueller & Tomblin, 2012).

For students with ADHD and S/LI, difficulties with sentence writing and its related skills are problematic to overall writing development. According to the Simple View of Writing (Berninger & Amtmann, 2003), the act of writing is a cognitively-demanding process that involves three composite areas (i.e., transcription, text generation, and executive functions) competing for a finite amount of memory resources. Transcription is handwriting or typing letters and spelling words. Text generation is the translation of oral language into sentences (i.e., sentence writing) and discourse. Executive functions include the cognitive and behavioral skills involved in self-regulation of the writing process, including intentions, planning, monitoring, and reacting to writing and ideas (Graham, 2018). When a composite area and its related skills are developed to proficiency or fluency, more memory resources are available for other aspects of writing. For instance, fluency with sentence writing and discourse is related to writing quality (e.g., Troia et al., 2019).

Intervention Framework

Two complementary intervention frameworks hold promise to develop the sentence writing fluency of students with ADHD and S/LI: (a) behavioral fluency and (b) antecedent- and consequence-based procedures. According to behavioral fluency (Kubina & Yurich, 2012), fluency – in a general sense – occurs when a specific behavior or skill (e.g., sentence writing) has a strong history of reinforcement. Fluency is also conceived as a learning outcome that is sequentially developed (Datchuk, 2017): A specific behavior or skill (e.g., sentence writing) is first developed to a high degree of accuracy through instruction, then it is developed to a brisk speed through practice. As the result of instruction and practice (i.e., reinforcement), students should show an immediate improvement in performance (i.e., accuracy and speed), as measured by the frequency of correct and incorrect responses (e.g., number of correct and incorrect writing sequences per 1 minute). In other words, sentence writing fluency – and more broadly, writing fluency – is conceived as improving from interventions that provide multiple and frequent opportunities to receive reinforcement through instruction and practice.

Complementary to behavioral fluency, several studies have successfully structured academic interventions for students with ADHD and other comorbid disabilities (e.g., learning disabilities and S/LI) around antecedents and consequences (Trout et al. 2007). Antecedent-based procedures for written expression include presentation of instructional stimuli (i.e., instructor behavior and curriculum materials), such as those used in explicit or strategy instruction (Archer & Hughes, 2011; Harris et al., 2008). Conversely, consequence-based procedures entail manipulation of stimuli that follow student writing, such as providing performance feedback, reinforcing correct responses, or teaching students to self-monitor their performance (Reid et al. 2005; Trout et al., 2007).

Prior Writing Intervention Studies

Two instructional approaches have included a combination of writing fluency and antecedent/consequence procedures (Datchuk et al., 2020): self-regulated strategy development (SRSD) and sentence instruction and frequency building to a performance criterion (SI and FBPC) – with the most well-researched being SRSD (Reid et al., 2014). Both approaches feature scaffolded instruction (i.e., instructor modeling, followed by guided and independent practice) as an antecedent, and performance feedback, self-monitoring, and reinforcement as a consequence. Both approaches, however, differ in their targeted writing behavior or skill: SRSD has typically been used to improve story/essay writing (Harris et al., 2008), and SI and FBPC has primarily been used to teach sentence writing (e.g., Datchuk, 2017).

To improve story and essay writing, SRSD involves instructor-led lessons across six stages of strategy development: (a) developing preskills and background knowledge, (b) discussing the strategy, (c) modeling, (d), memorizing, (e) completing guided practice, and (f) independently performing the strategy (Harris et al., 2008). Across the six stages, students are provided with performance feedback on their number of story or essay elements produced as a consequence-based procedure. Also, students are taught how to self-monitor their performance towards a goal or criterion and how to self-reinforce with vocal or written praise (e.g., self-talk or written notes of encouragement) while pursuing their goal.

Several studies have found overall positive effects from SRSD interventions for students with ADHD (Reid et al., 2014) and those with comorbid S/LI (Carroll, 2018; Shen & Troia, 2018). In some SRSD studies, students engaged in fluency practice following strategy instruction; students quickly wrote persuasive essays within a specified time frame until a goal or criterion was achieved (e.g., Mason et al., 2011, 2013). In addition, one study found positive effects by delivering tangible or activity rewards contingent on participation in the strategy steps (Kuhara et al., 2012).

To improve sentence writing, SI and FBPC is an intervention with sim-

ilar antecedent- and consequence-based procedures to SRSD (Datchuk et al., 2020). As an antecedent, students participate in instructor-led, explicit instruction lessons on constructing sentences followed by fluency practice. In the explicit instruction lessons, the skill of constructing simple sentences is segmented into small instructional units. Instructors model how to complete each unit, lead students through guided practice, then test for independence. Following several explicit instruction lessons, students engage in fluency practice writing simple sentences to a series of picture-word prompts (see Figure 1 for an example).

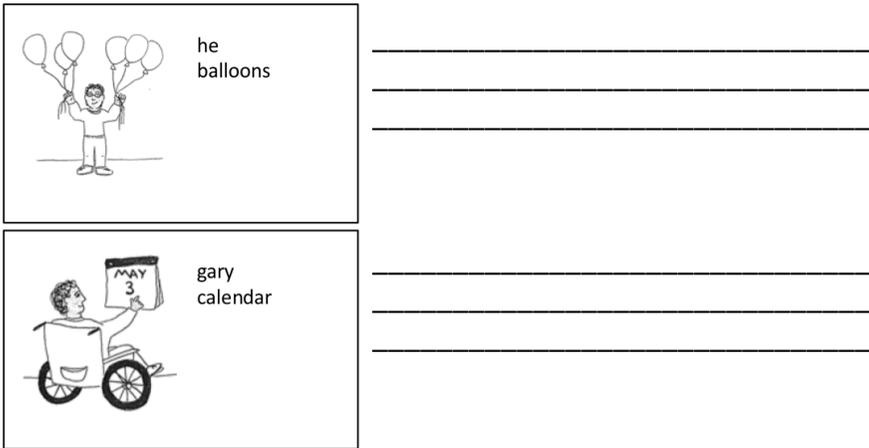


Figure 1. Example Picture-Word Prompts for Sentence Writing

As a consequence, students receive performance feedback on a modified form of the number of correct and incorrect writing sequences in their sentences – a measure of the number of words within a sentence that feature correct capitalization, punctuation, semantics, and syntax (Ritchey et al., 2016). Students are taught to self-monitor their sentence writing by tabulating or graphing their highest score each session and comparing it to a criterion. Students also receive praise/encouragement to raise their score and reach their goal/criterion.

Several studies have reported overall positive effects for SI and FBPC – and more broadly, for explicit instruction approaches – on the sentence writing of students with disabilities (Datchuk et al., 2020). In addition, positive effects have been found for students from diverse language backgrounds, including English as a second language learners (Viel-Ruma et al., 2010). No study to date, however, has investigated effects of explicit instruction and fluency practice (i.e., SI and FBPC) on the sentence writing of students with ADHD and S/LI. Furthermore, no SI and FBPC studies have solicited input from students on the potential value of praise or encouragement as reinforcing consequences.

The value of potential reinforcers (i.e., reinforcer quality) can vary by individual, so stimuli that has been presented during typical delivery of writing interventions – including SRSD and SI and FBPC (e.g., praise statements, self-talk, and graphing; Datchuk, 2017; Reid et al., 2014) – may not be effective and do little to increase motivation and reduce the symptoms of ADHD for some students (Neef et al., 2005). Prior research on improving the oral reading fluency of students with ADHD and other disabilities suggests that providing reinforcer surveys and delivering reinforcement contingent upon performance may be an effective consequence-based approach to reinforce fluent performance and increase motivation to achieve a set goal or criterion (e.g., Hilsmier et al., 2016).

Purpose of this Pilot Study

The purpose of this pilot study was to determine effects of SI and FBPC on the sentence writing of one student with ADHD and S/LI (i.e., English sentence writing of a student who spoke English as a first language). The present pilot study differed from prior studies in two important ways. First, the writing intervention literature has typically focused on improving the story and essay writing of students with ADHD and S/LI but not sentence writing. To extend this literature, we used intervention procedures (i.e., SI and FBPC) found to improve the sentence writing of students with other disability types (Datchuk et al., 2020). Second, we modified procedures to include administration of a reinforcer survey to determine potential reinforcers (e.g., activities or tangible items), and we delivered these reinforcers contingent upon the student achieving a specific criterion during fluency practice. One research question guided the present investigation: What effect does SI and FBPC, with reinforcer survey and contingent reinforcement, have on the sentence writing of a student with ADHD and S/LI?

METHOD

Student and Setting

One student, Oliver, participated in the study. Table 1 shows his demographic information. Oliver was 10 years old and enrolled in fourth grade. He had comorbid diagnoses of ADHD (i.e., the hyperactive and impulsive type) and S/LI (i.e., speech sound disorder with issues in phonology and retrieval of words, and a language impairment in syntax and semantics). His special education records had questionnaire and eligibility testing results. In questionnaires, both his parents and teacher rated Oliver as displaying high levels of hyperactive and impulsive behaviors, noting Oliver consistently engaged in movement at inappropriate times and had difficulty completing school and homework because of fidgeting and off-task behavior. As part of his eligibility testing results, Oliver had below average performance on the Sentence Assembly subtest (i.e., 5th percentile rank) of the *Clinical Evaluation of Language Fundamentals* (Wiig

et al., 2013) and the Written Expression subtest (i.e., 10th percentile rank) of the *Kaufman Test of Educational Achievement (KTEA-II*; Kaufman & Kaufman, 2006).

Oliver attended an afterschool center for homework help, and the director of the center referred him to the lead author as struggling to construct complete sentences in his homework.

The study took place at the afterschool center in a small city in the Northeastern United States. The lead author was the instructor. The intervention was delivered one-on-one in a quiet place in the afterschool center, such as an empty hallway or office, and the instructor sat at an adjacent desk to the student. In a face-to-face meeting prior to the start of the study, Oliver’s parents provided informed consent, and Oliver provided informed assent. The study was conducted under approval of the lead author’s university institutional review board.

Table 1. Student Characteristics

<i>Variable</i>	<i>Level</i>	<i>Oliver</i>
Demographics	Gender	Male
	Age	10-6
	Grade	4
	Ethnicity	White
	Disability status	ADHD, S/LI
Handwriting	Correct letters per minute	80
Reading	Correct (incorrect) words read per minute	195 (2)
Spelling	Correct (incorrect) words	22 (3)
Sentence Construction	CWS (IWS) per minute	9 (12)

Note. ADHD = attention deficit hyperactivity disorder, S/LI = speech and/or language impairment; CWS = correct writing sequences, IWS = incorrect writing sequences.

Dependent Variable: Writing Sequences on 1-Minute Transfer Probes

The dependent variable was the number of correct writing sequences (CWS) and incorrect writing sequences (IWS). A CWS occurred when a student response began with a capital letter, between each word that made semantic and syntactic sense within the context of an English sentence, and for presence of an appropriate end punctuation mark. Unlike definitions of CWS for use as a curriculum-based measure (Ritchey et al. 2016), words that were misspelled

but phonologically similar and had clear intent were scored as correct (e.g., *barc* instead of *bark*) because the intervention did not explicitly address spelling. An IWS occurred when a student response began with a lowercase letter, between each word that did not make semantic or syntactic sense within the context of an English sentence, and when end punctuation was lacking.

To measure the number of CWS and IWS, the instructor administered a 1-minute transfer probe (i.e., probe not used during instruction) at the end of each session. Each 1-minute transfer probe featured 10 picture-word prompts and horizontal lines for students to handwrite responses. Figure 1 shows an example of a picture-word prompt. The picture-word prompts used on 1-minute transfer probes did not overlap with those used in instructional materials (i.e., SI lessons and 1-minute practice timings). All picture-word prompts used on transfer probes and instructional materials featured lower-case letters (e.g., proper nouns such as first names of people) in order to assess if the student was relying on capitalization rules committed to memory instead of simply copying word prompts.

At the end of each session, the instructor handed Oliver a 1-minute transfer probe and stated, "Write your name and date, then put your pen/pencil down. You'll have one minute to write a complete sentence for each of these pictures. Try to work quickly and accurately. Do you have any questions?" Oliver looked through the picture-word prompts, and the instructor read aloud any requested words. A 1-minute countdown timer was started when Oliver began writing. At the end of 1 minute, Oliver was instructed to stop writing, and no feedback on performance was given.

Interobserver Agreement

The lead author taught an independent observer, an undergraduate special education student, CWS and IWS scoring procedures during a 1-hour training session. The independent observer scored 33% of 1-minute transfer probes randomly selected across baseline and intervention phases. Using a total agreement formula (number of agreements divided by the number of agreements plus disagreements multiplied by 100), interobserver agreement was 94% for CWS and IWS.

Independent Variable

The independent variable was SI and FBPC. The procedures were similar to those used in prior studies (Datchuk et al., 2020) with the exception of two additional features: a reinforcer survey and contingent reinforcement. There was a total of 12 SI and FBPC lessons. The first two lessons of intervention were the SI component and each lasted approximately 35 minutes. The SI lessons followed an explicit instruction approach to materials design and instructional delivery (Archer & Hughes, 2011). For materials design, the multiple skills involved in simple sentence writing were segmented into small instructional units,

and the units gradually increased in difficulty across time. For instructional delivery, the instructor followed model-lead-test steps: The instructor modeled how to successfully complete new instructional units, led the student through guided practice by praising correct responses and immediately correcting errors, and tested for independent performance. Throughout the model and lead steps, the student orally stated his response prior to writing it in order to ensure accuracy and provide additional practice.

The remaining SI and FBPC lessons (i.e., Lessons 3 to 12) were the FBPC component and lasted approximately 10 minutes each. The FBPC lessons involved completion of three, 1-minute practice timings of constructing simple sentences to a series of picture-word prompts. The lessons also included delivery of performance feedback, error correction, praise, goal setting, and delivery of reinforcement contingent upon achieving the goal/criterion. Oliver gained access to one of his preferred reinforcers – as stated on a reinforcer survey administered prior to the FBPC lessons – if the performance criterion was met or exceeded on at least one of the three, 1-minute practice timings completed each lesson.

Experimental Design

We used a single-baseline, AB design (Kennedy, 2005) for 1-minute transfer probes. This type of design allows detection of changes in performance from baseline and is suitable for pilot studies or preliminary investigations; however, because it lacks opportunities for internal replication, it does not permit detection of experimental effects or a functional relation.

Procedures

Screening

Table 1 shows Oliver's performance on screening probes. Prior to the start of the study, the instructor administered several screening probes to Oliver. Similar to prior studies (e.g., Datchuk et al., 2020), screening probes were administered to ensure that Oliver had sufficient transcription (i.e., handwriting and spelling) and reading (i.e., oral reading fluency) skills needed to respond to instructional stimuli. Two different probes were administered for transcription: a 1-minute copy task and an untimed spelling probe of 25 dictated words. A single, 1-minute oral reading fluency probe was administered for reading. All transcription and reading probes had words and sentences taken directly from intervention materials. In addition, a 1-minute transfer probe was administered to see if Oliver struggled to construct sentences.

Baseline and Concurrent Intervention

During baseline and concurrent to the intervention phase, Oliver received assistance on homework assignments at the afterschool center from college-student volunteers. No SI and FBPC components were delivered. His homework assignments were typically related to mathematics and English lan-

guage arts. The mathematics assignments primarily focused on computation and word problems, and the English language arts assignments typically involved answering questions connected to a short reading passage.

Lessons 1 and 2

During the first lesson, the instructor introduced the lessons as a way to improve sentence writing. The instructor defined sentences as containing at least two parts – a part that names someone or something and a part that tells more – in addition to starting with a capital letter and ending with an appropriate punctuation mark. When combined together, the parts made a complete sentence that was syntactically correct (i.e., followed rules of grammar) and semantically made sense. During the first lesson, Oliver completed multiple activities related to editing complete sentences: writing in the missing part of a sentence within fill-in-the-blank items, identifying the parts of a sentence in a list of complete sentences, identifying complete or incomplete sentences in a list, and correcting errors in beginning capitalization and end punctuation. For each activity, Oliver orally stated and wrote his responses (i.e., oral and written language). During the second lesson, he constructed complete sentences to a series of picture-word prompts (see Figure 1 for an example). To proceed to subsequent lessons, Oliver needed to show at least 90% accuracy on independent sections of both Lessons 1 and 2. No lessons had to be repeated.

Reinforcer Survey and Criterion

Following Lesson 2, the instructor administered a reinforcer survey to Oliver to determine potential reinforcers to use with subsequent lessons. The survey was an oral interview where Oliver was asked to name some preferred activities, tangible items, and/or food snacks. Oliver stated a preference for a food item – a pack of small fruit gummies – as well as several preferred activities: playing a *Minecraft* videogame on a computer tablet, reading a book on how to best play the *Minecraft* video game, playing soccer, and playing catch with a football. One of the identified reinforcers was then delivered contingent upon Oliver achieving a set performance criterion on 1-minute practice timings for Lessons 3 through 12 (i.e., not his performance on 1-minute transfer probes but his performance during intervention). For Lessons 3 to 7, the performance criterion was 20–25 CWS. To set this initial performance criterion, we used Oliver's performance on 1-minute transfer probes; specifically, we selected a high score Oliver achieved during Lessons 1 and 2. Oliver achieved the criterion multiple times during Lessons 3 to 7, so the criterion was raised to 25–30 CWS for Lessons 8 to 12.

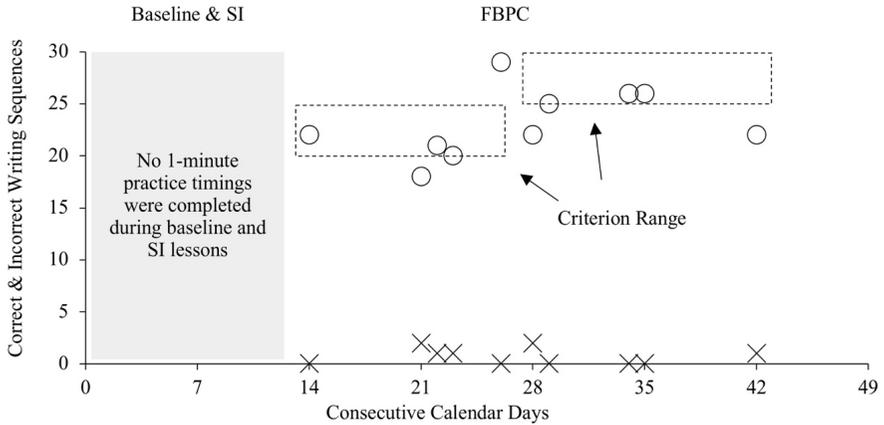
Lessons 3 to 12

Starting with the third lesson, Oliver completed three, 1-minute practice timings (i.e., a total of 30, 1-minute practice timings across 10 lessons). At the beginning of each lesson, Oliver was told the performance criterion. Then,

he was given a 1-minute practice timing sheet that contained 10 picture-word prompts. The instructor said, “Here are 10 picture-word prompts. When I tell you to start, you’ll have 1 minute to write as many complete sentences to these pictures as possible. If you come to a picture you don’t know, you can skip it. Any questions?” Oliver was allowed to look at the picture-word prompts and ask for any words to be read aloud or for any objects to be identified in the pictures. The instructor initiated a countdown timer once Oliver began writing.

At the end of 1 minute, the instructor scored the 1-minute practice timing sheet in front of Oliver and told him his number of CWS and IWS. The instructor corrected any IWS by modeling the correct response, then had Oliver copy it. The first 1-minute practice timing was then placed out of sight, and Oliver completed two additional 1-minute practice timings – receiving feedback, error correction, and encouragement at the end of each. The same set of 10 picture-word prompts were used for all three timings during the lesson (e.g., three copies of Set A for Lesson 3), but a new set of picture-word prompts were used for each lesson (e.g., three copies of Set B for Lesson 4 and three copies of Set C for Lesson 5). At the end of each lesson, Oliver graphed his best performance on a 1-minute practice timing (i.e., highest CWS and lowest IWS shown on the same timing). If his best performance met or exceeded the performance criterion (i.e., 20–25 CWS for Lessons 3 to 7 and 25–30 CWS for Lessons 8 to 12), then he selected one of his preferred activities or a food snack item. If his best performance did not meet or exceed the performance criterion, then no preferred activity or item was selected and the instructor encouraged Oliver to try again the following session.

Figure 2 shows Oliver’s performance on 1-minute practice timings during FBPC lessons, specifically his best performance on a timing (i.e., timing with the highest CWS). Open circles are CWS and X’s are IWS. Oliver met or exceeded his first performance criterion (i.e., 20–25 CWS) for four of five lessons and met or exceeded his second performance criterion (i.e., 25–30 CWS) for three of five lessons (i.e., a total of 7 out of 10 lessons). For reinforcement, Oliver typically chose fruit snacks (four times), followed by playing the *Minecraft* videogame (twice) and reading a book on strategies to play *Minecraft* (once).



Note. Circles are his highest number of correct writing sequences, and X's are his lowest number of incorrect writing sequences. SI = sentence instruction, FBPC = frequency building to a performance criterion.

Figure 2. Oliver's Performance on 1-Minute Practice Timings During FBPC Lessons.

Treatment Fidelity

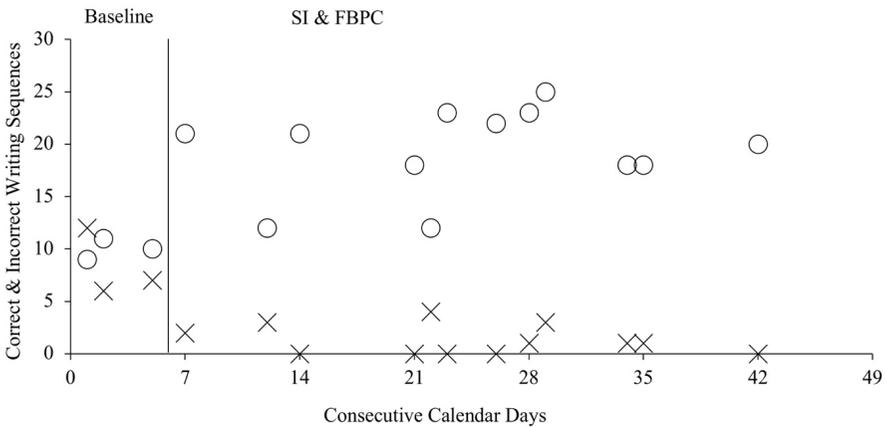
All baseline and intervention sessions were video recorded. A special education graduate student served as an independent observer and scored videos for fidelity of implementation. After a 2-hour training session regarding intervention and measurement procedures conducted by the lead author, the observer used a fidelity checklist to score 33% of all videos, randomly selected across experimental phases. The fidelity checklist for baseline sessions entailed correct administration of 1-minute transfer probes (i.e., statement of directions, 1-minute countdown timer, and no delivery of feedback). The fidelity checklist for intervention sessions entailed appropriate instructional design and delivery techniques for SI (i.e., model, lead, or test was appropriately used for the instructional unit) and FBPC lessons (i.e., three, 1-minute practice timings; performance feedback; error correction; praise; self-graphing; and contingent delivery of reinforcement when appropriate). Fidelity of implementation was 100% for observed baseline and intervention sessions.

RESULTS

Figure 3 shows the results on 1-minute transfer probes: Open circles are CWS and X's are IWS. As shown in Figure 3, Oliver completed three baseline sessions. Across the three sessions, he showed inaccurate performance on 1-minute transfer probes: His data paths for CWS and IWS clustered together, and his

sentences tended to feature one text writing error for every one to two instances of correct text writing. His responses featured multiple errors in grammar and usage and incomplete sentence structure (e.g., “betty watch tv”). His average performance on 1-minute transfer probes during the baseline phase was 10.0 CWS and 8.3 IWS.

Following the baseline phase, Oliver completed 12 SI and FBPC sessions: two SI lessons followed by 10 FBPC lessons. At the start of the SI and FBPC phase, Oliver showed an immediate increase in both accuracy and speed on 1-minute transfer probes. His performance on transfer probes showed some variability, but data paths for both CWS and IWS separated from one another with no overlap. Compared to baseline, more of his responses featured correct grammar, usage, and complete sentence structure (e.g., “My brother laid on the couch.”). His average performance on 1-minute transfer probes during the SI and FBPC phase was 19.4 CWS and 1.3 IWS.



Note. Circles are the number of correct writing sequences, and X’s are the number of incorrect writing sequences. SI & FBPC = sentence instruction and frequency building to a performance criterion.

Figure 3. Oliver’s Performance on 1-Minute Transfer Probes

DISCUSSION

Many students with ADHD and S/LI struggle with sentence writing and its related skills (e.g., Fey et al., 2004; Graham et al., 2016). In this pilot study, we investigated effects of a modified form of SI and FBPC – a supplemental intervention shown to have positive effects for students with disabilities (Datchuk et al., 2020) – on the sentence writing fluency of one student with comorbid ADHD and S/LI. Results should be viewed cautiously given limitations

of the type of experimental design used and associated threats to internal validity (i.e., single-baseline design with possibility of history and practice effects), but overall positive results provide tentative support for using SI and FBPC to improve the sentence writing fluency of students with ADHD and S/LI. On 1-minute transfer probes, the participating student, Oliver, had inaccurate sentence writing skills during the baseline phase, as shown by the close proximity and overlap of the CWS and IWS data paths. Upon starting the intervention phase, he showed an immediate increase in both accuracy and speed of sentence writing. Across the intervention phase, his data paths for both CWS and IWS on transfer probes did not overlap; however, CWS had some variability.

Results extend the research literature on writing interventions for students with ADHD and S/LI. Prior research for this population has primarily investigated use of SRSD to teach story and essay writing to students (e.g., Shen & Troia, 2018). Using an intervention framework that situated sentence writing fluency within behavioral fluency and several antecedent- and consequence-based procedures (Kubina & Yurich, 2012; Trout et al., 2007), we modified SI and FBPC to include a reinforcer survey and contingent delivery of preferred reinforcers based on performance. Similar to prior studies on oral reading fluency (Hilsmier et al., 2016), a reinforcer survey was administered to increase the likelihood that the student found the consequences reinforcing and motivating. Prior SI and FBPC (e.g., Datchuk, 2017) and SRSD (e.g., Reid et al., 2014) studies have primarily delivered praise statements as a consequence and assumed that students found such praise to be reinforcing or motivating. We did not specifically test differences in reinforcer quality (i.e., praise or activity), but it is important to note that the participating student, Oliver, did not list vocal or written praise as a preferred reinforcer. Instead, when he achieved or surpassed the performance criterion on 1-minute practice timings (i.e., a total of 7 out of 10 lessons), he selected access to a preferred activity or a food snack.

The overall positive effects for Oliver may stem from the intervention addressing two areas related to his ADHD and S/LI diagnoses: inattentive or off-task behavior and oral and written sentence construction. We did not specifically measure Oliver's on- and off-task behavior during writing activities, but the short, timed sessions (i.e., three, 1-minute practice timings) provided few opportunities for Oliver to engage in off-task or impulsive behavior and still achieve the performance criteria and subsequently receive his preferred reinforcement. Also, Oliver needed to provide both oral and written responses regarding complete sentence structure (i.e., a complete simple sentence that featured correct syntax, made semantic sense, and had correct capitalization and punctuation) during the instructional lessons. This feature provided Oliver with scaffolded support in both his speech sound disorder and language impairment; indeed, scaffolding of oral and written responses is a recommended practice for students

with S/LI (Nelson et al., 2009). Despite overall positive results, Oliver did show some variability in CWS on 1-minute transfer probes. As noted in his special education records, it is possible that other problem areas not addressed during intervention, such as phonology and word retrieval skills related to spelling and transcription, may have led to increased variability. Future research should investigate ways of supporting these deficits for students with S/LI and continue to investigate the extent to which these results generalize to elementary students with comorbid ADHD and S/LI.

Implications for Practice

Although the results are preliminary in nature, there are two tentative recommendations for practitioners seeking to improve the sentence writing of elementary-aged students with ADHD and S/LI. First, a combination of explicit instruction and fluency practice may be an effective and efficient way to improve sentence writing. For explicit instruction, segment the skills involved in sentence writing into small instructional units, then provide scaffolded instruction (i.e., modeling, guided practice, and independent practice). For fluency practice, have students construct sentences to a series of picture-word prompts within a specified time frame (e.g., 1-minute practice timings). Afterwards, provide performance feedback (i.e., number of CWS and IWS), correct any errors, and praise student performance.

Second, a process of determining potential reinforcers through a survey and delivering those reinforcers contingent upon performance may increase student motivation and performance during fluency practice. To determine potential reinforcers, ask students for several preferred activities, tangible items, and/or food snacks. To determine a performance criterion, it can be helpful to base the criterion on high scores achieved during instruction. As a result of these recommendations, elementary-aged students with ADHD and S/LI may increase their sentence writing accuracy and speed.

Limitations and Future Directions

There are three main limitations. First, conclusions on experimental effects or a functional relation are limited given the use of a single-baseline design. It is possible that some of the positive effects noted during intervention resulted from factors outside of the intervention, such as history or maturation effects, that are not addressed by this type of design. Future research should use more rigorous types of experimental designs, such as a multiple-baseline design (Kennedy, 2005), to better detect experimental effects and a functional relation. Second, we did not collect information regarding the social validity of goals, procedures, and outcomes of the intervention. This is an important part of evaluating effects of an intervention, as the perceptions of stakeholders (e.g., participating students, parents/guardians, and teachers) can influence its usability. Future research should collect social validity information to better

inform overall effects of intervention. Third, we did not collect maintenance data following the completion of the intervention. The participating student's sentence writing improved in both accuracy and speed from baseline, but we do not know the degree to which his performance was affected by withdrawal of intervention procedures. Future research should collect maintenance data to see if performance gains continued following completion of the intervention.

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