

## A Writing Intervention to Teach Simple Sentences and Descriptive Paragraphs to Adolescents with Writing Difficulties

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### Abstract

The present study used a multiple-baseline, single-case experimental design to investigate the effects of a multicomponent intervention on construction of simple sentences and word sequences. The intervention entailed sequential delivery of sentence instruction and frequency building to a performance criterion and paragraph instruction. Participants included four adolescents (i.e., three females and one male enrolled in grades 8 to 10) with difficulty constructing simple sentences. All participants exhibited improved performance in constructing complete, simple sentences per 1 min. Three of four participants showed improvements in their correct word sequences per 1 min. Following intervention, the majority of participants demonstrated performance comparable to or slightly higher than levels at the end of intervention. The practiced application of simple sentences and word sequences to descriptive paragraphs fluctuated across participants.

*Keywords:* precision teaching, writing, sentence construction, systematic and explicit instruction, adolescents

Students use written expression across academic settings and content areas to document and synthesize knowledge (Graham, 2013). Unfortunately, many students, including those with and without disabilities, display writing difficulties. Prevalence rates of writing difficulties have met or exceeded rates of reading difficulties in several studies, and students with disabilities have shown an increased likelihood for difficulty (Katusic, Colligan, Weaver, & Barbaresci, 2009; Mayes & Calhoun, 2007; Stoeckel et al., 2013; Yoshimasu et al., 2011). Students who are typically developing along with those with disabilities have

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also shown underwhelming performance on standardized assessment. In twelfth grade, only 25% of typically developing students and 5% of students with disabilities scored proficient or above on the writing subtest of the National Assessment of Educational Progress (U.S. Department of Education Institute of Education Sciences, National Center for Educational Statistics, 2011).

Written expression ranges from sentence level skills (Datchuk & Kubina, 2013; Graham, 2006), such as spelling, handwriting, grammar/usage, and sentence construction, to more complex skills and strategies needed for multiple-paragraph composition (Berninger & Amtmann, 2003; McCutchen, 2011). Many students struggle with sentence level skills. Students with disabilities and writing difficulties construct a low proportion of complete sentences and commit frequent errors in syntax and grammar/usage (Alstad et al., 2015; Bui, Schumaker, & Deshler, 2006; Krok & Leonard, 2015).

Proficiency in constructing simple sentences is an important and foundational skill for continued writing growth. Constructing simple sentences allows writers to combine sentences into more complex types, such as compound sentences (Berninger, Nagy, & Beers, 2011), and compose multiple related sentences into paragraphs and extended compositions. For students struggling to compose sentences, providing intervention on simple sentences may effectively and efficiently promote writing growth, leading to increases in numerous related skills such as complete sentences, capitalization, punctuation, and words with correct syntax (Datchuk & Kubina, 2013; Kame'enui & Simmons, 1990). Moreover, researchers have proposed that fluency in simple sentence construction assists continued writing growth (Datchuk & Kubina, 2013; Graham et al., 2012).

The fluent construction of simple sentences allows writers to quickly and accurately engage in written expression and to focus on additional demands of writing such as idea generation (Graham et al., 2012). The theory of behavioral fluency explains the possible benefits of achieving fluency with specific academic skills, such as simple sentence construction, and provides a useful framework to develop intervention procedures. The theory stems from a precision teaching approach to academic intervention (Kubina & Yurich, 2012) and defines fluency as a learning outcome achieved through highly accurate and well-paced behavior (Binder, 1996; Johnson & Street, 2013; Kubina & Morrison, 2000; Kubina & Yurich, 2012). Specifically, fluency is achieved when a skill reaches a specific performance criterion stated as a rate of correct and/or incorrect responses within an allotted time.

In the behavioral fluency literature, responses and skills are viewed along a spectrum of components and composites. An individual

skill is a component skill, and a combination of one or more component skills is a composite skill. Several benefits occur when component or composite skills achieve fluency (Bucklin, Dickinson, & Brethower, 2000; Hughes, Beverley, & Whitehead, 2007; Kubina, Young, & Kilwein, 2004). To begin with, the practiced skill improves in speed and accuracy. Next, skills achieving fluency maintain or retain across time with minimal to no decrement in performance. Finally, fluent component skills apply to closely related composite skills (i.e., fluency promotes the learning outcome of application). A composite skill may occur automatically from the combination of several fluent component skills or stem from the practiced application of one or more component skills to the composite (McTiernan, Holloway, Healy, & Hogan, 2016).

With few exceptions, prior writing studies have focused on intervention procedures to acquire accurate but not fluent sentence construction. Several reviews of the research literature (Datchuk & Kubina, 2013; Graham & Perin, 2007; Rogers & Graham, 2008) found studies either started with simple sentences prior to more complicated sentence types (e.g., compound or complex sentences) or started with more complicated sentence types. Five studies (i.e., Anderson & Keel, 2002; Datchuk, Kubina, & Mason, 2015; Viel-Ruma, Houchins, Jolivet, Fredrick, & Gamma, 2010; Walker, Shippen, Alberto, Houchins, & Cihak, 2005; White, Houchins, Viel-Ruma, & Dever, 2014) began with simple sentence construction and used systematic and explicit instructional procedures (Archer & Hughes, 2011) with picture-word prompts. Instructors modeled simple sentence construction with various pictures, such as a picture of a child playing soccer. Words accompanied each picture, such as *boy* and *soccer*. Using the picture-word prompts, instructors demonstrated the writing of simple sentences such as "The boy kicked the soccer ball." Instructors prompted participants through guided practice of constructing simple sentences to picture-word prompts, provided positive and corrective feedback and then tested for independent student performance.

One study (i.e., Datchuk et al., 2015) addressed fluency of simple sentence construction. The experiment featured a multi-component intervention of systematic and explicit instruction paired with a deliberate practice routine, referred to as sentence instruction and frequency building to a performance criterion (SI and FBPC). During SI and FBPC, students first received instruction to increase accuracy of simple sentences then completed multiple timed practice trials to increase frequency. Feedback and error correction were delivered between each timed trial. Instruction and practice continued until students reached a time criterion of 18 lessons or a performance criterion of 30 correct word sequences (CWS) with zero to three incorrect

word sequences (IWS). The number of words showing correct capitalization, punctuation, and syntax (Parker, McMaster, & Burns, 2011) were scored as CWS, and IWS measured the inverse. Unlike prior studies, phonologically similar words or words missing one or two letters were counted as correct (McCutchen & Stull, 2015).

The data from Datchuk et al. (2015) suggested intervention led to steady improvements in the accuracy and frequency of CWS and complete sentences. Participants showed minimal to no decreases in maintenance following completion of intervention. The study procedures focused on improving the component skill of simple sentence construction and did not provide opportunities to apply simple sentences to the composite skill of composing paragraphs. Composing short paragraphs describing a scene or process (i.e., an expository writing task, specifically a descriptive paragraph) can serve as a logical progression to continued writing growth after acquiring simple sentences (Datchuk & Kubina, 2013; Kame'enui & Simmons, 1990).

Given the struggles of many adolescents with writing tasks, specifically with simple sentence construction, a critical need exists for interventions to effectively and efficiently improve writing. Extending prior research on improving sentence construction (e.g., Anderson & Keel, 2002; Datchuk et al., 2015; Viel-Ruma et al., 2010; Walker et al., 2005; White et al., 2014) and using a framework of behavioral fluency (e.g., Johnson & Street, 2013; Kubina & Yurich, 2012), the present study investigated effects of a multi-component intervention, SI and FBPC with paragraph instruction, on the fluency of simple sentences, word sequences, and the practiced application of these skills to descriptive paragraphs.

The investigation had four experimental questions. First, what effect does the intervention, SI and FBPC with paragraph instruction, have on the accuracy and frequency of word sequences? Second, what effect does the intervention have on the accuracy and frequency of simple sentences? Third, what effect does the intervention have on maintenance of both word sequences and simple sentences approximately 30 days following intervention? Finally, what effect does the intervention have on the practiced application of word sequences and simple sentences to descriptive paragraphs?

## Method

### *Participants and Screening*

Table 1 shows participant characteristics. Participants included three females (Rachel, Kim, and Bettie) and one male (Orin). Ages

**Table 1**  
**Participant Characteristics**

Variable	Level	Students			
		Rachel	Kim	Bettie	Orin
Demographics	Gender	F	F	F	M
	Age	17-7	15-5	13-4	14-6
	Grade	10	10	8	8
	Ethnicity	AA	AA	AA	AA
	Exceptionality	Mild ID	SLD	SLD	N/A
Terra Nova	Reading SS (% tile)	656 (30)	628 (13)	616 (13)	498 (1)
	Language SS (% tile)	633 (17)	614 (9)	623 (19)	N/A
WJ-R III	Writing Fluency Subtest SS (%tile)	70 (2)	68 (2)	55 (1)	70 (2)
Sentence Writing	CWS (IWS)	19 (4)	20 (0)	11 (0)	7 (3)
	Complete (Incomplete)	0 (4)	3 (0)	0 (2)	0 (2)
Handwriting	CLPM	85	100	108	122

*Note.* F=female, M=male. AA=African-American. SLD=specific learning disability, Mild ID=mild intellectual disability. SS=standard score, %tile=percentile score. WJ-R III=Woodcock-Johnson III. CWS=correct word sequences, IWS=incorrect word sequences. CLPM=correct letters per min.

ranged from 13 to 17 years. All participants were administered the *Woodcock Johnson-III Writing Fluency* subtest (Woodcock, McGrew, & Mather, 2007), and their performance placed them in either the first or second percentile. Kim and Bettie received special education services for specific learning disabilities and Rachel for mild intellectual disability. Orin, referred by teachers for special education evaluation, was retained in the eighth grade due to inadequate academic progress. Informed consent and assent was obtained from parent/guardians and participants, and all procedures were approved by the university Institutional Review Board.

Participants were selected from a five-step screening process. First, teachers at the cooperating school nominated students with difficulty writing simple sentences. Second, students were administered a sentence construction probe and had to score below the performance criterion of 30 CWS and zero to three IWS. Third, students were asked to complete a sentence copy task and had to write approximately 100 correct letters per min. Fourth, students completed a spelling probe of 25 frequently used words and had to correctly spell

at least 23 of the words. The list of 25 words came from a prior study (i.e., Datchuk et al., 2015) that used the same intervention materials. Fifth, the cooperating school administered DIBELS oral reading fluency benchmarks several times during the school year (Good & Kaminski, 2002). Performance on the benchmarks must have been at or above the third-grade reading level given the reading level of intervention materials.

### *Setting*

Participants attended an urban charter school in Louisiana. The intervention occurred during summer vacation, between typical school semesters. Participants received no additional writing instruction during this time. Each participant worked individually with the lead author in an unoccupied classroom at the school or a quiet area in their homes such as the dining room area. The first author served as primary instructor and data collector. An independent observer, a first-year high school general education teacher, scored all measures. A second independent observer, a second-year high school special education teacher, scored measures for interobserver agreement (IOA). A third observer, a Ph.D. student in special education, coded audio recordings and permanent products for procedural fidelity.

### *Dependent Measures*

There were four dependent measures in this study including number of (a) word sequences per 1 min, (b) simple sentences per 1 min, (c) word sequences per 3 min, and (d) simple sentences per 3 min. The 1-min dependent measures were observed on sentence construction probes. The 3-min dependent measures were observed on descriptive paragraph probes. Sentence construction probes were administered at the end of each session. Descriptive paragraph probes were administered periodically during the study: two probes during the baseline condition, two during the SI and FBPC condition, one during the paragraph instruction condition, and one during maintenance. Sentence construction probes were administered for 1 min and descriptive paragraphs for 3 min. A countdown timer started when participants began writing. The participants did not receive positive or corrective feedback during or following each probe.

**Sentence construction probes.** Sentence construction probes featured 10 small pictures across two pages. Pictures measured approximately 4 cm × 4 cm. Word prompts, between two to three words, were adjacent to each picture. For example, a small picture showed a farmer picking apples with accompanying words of *sally* and *apple*. Three horizontal lines for writing were to the right of each picture.

Picture-word prompts did not overlap across probes or instruction and practice materials.

Sentence construction probes were scored for CWS and IWS per 1 min. A CWS occurred for each instance a response began with a capital letter, finished with an end mark, and between syntactically correct words (McMaster et al., 2011). An IWS occurred for the inverse: sentences beginning with a lowercase letter, no punctuation mark at the end of a sentence, and between syntactically incorrect words. Differing from prior studies that used word sequences (Amato & Watkins, 2011), misspellings that were phonologically similar to the intended word (e.g., *careweed* for *carried*) or words missing one or more letters (e.g., *crak* for *crack*) were counted as correct because intervention procedures did not address spelling.

Sentence construction probes were also scored for simple sentences: complete and incomplete sentences per 1 min. Complete sentences were each occurrence that a sentence began with a capital letter, ended with a punctuation mark, had at least one subject and one verb, and made syntactic sense (Bui et al., 2006). Incomplete sentences occurred when sentences began with a lowercase letter, did not end with a punctuation mark, failed to have at least one subject and one verb, or did not make syntactic sense. Skipped or omitted picture-word prompts were not counted as incorrect.

**Descriptive paragraph probes.** Each descriptive paragraph probe featured one large picture, approximately 7.5 cm × 12.5 cm, depicting multiple subjects engaged in a related activity. Next to the picture were the names of each subject and five additional words describing the picture. For instance, one picture displayed three cooks preparing a meal in a kitchen with the names of each cook, *Betty*, *David*, and *The chef*, and five additional word prompts, *beef*, *bread*, *mixed*, *spoon*, *cooked*. Two pages of horizontal lines appeared below the picture for writing space. Pictures were unique and did not repeat across probes or instruction and practice materials. Descriptive paragraph probes were scored for both word sequences (CWS and IWS) and simple sentences (complete and incomplete) per 3 min. Scoring procedures were identical to sentence construction probes except for one difference: complete sentences on descriptive paragraph probes had to correspond to the picture to be scored as correct. This scoring difference was added to capture the importance of overall coherence within a paragraph (i.e., sentences not corresponding to descriptive paragraph picture were off topic and did not make semantic sense).

### *Experimental Design and Data Analysis*

The present study used a multiple baseline across participants design (Kazdin, 2011). Staggering introduction of intervention across participants provided multiple opportunities to replicate and verify effects of intervention (Cooper, Heron, & Heward, 2007). The experimenters used visual analysis and celeration lines and values on semi-logarithmic charts to evaluate experimental effects. Celeration describes the trend of data as proportional difference across time (i.e., a downward trend as division and an upward trend as multiplication) and offers a standard, universal measure for visualizing and quantifying change (Johnston & Pennypacker, 2009; Lindsley, 1991). A participant began intervention when flat, stable trends in his/her performance in CWS and IWS occurred or if the trend of IWS accelerated at a greater rate than CWS as shown by celeration values. When the selected participant completed the first three instructional lessons of SI and FBPC, another participant exited the baseline condition and began intervention.

### *Procedures*

Two experimental conditions were delivered sequentially: (a) SI and FBPC and (b) paragraph instruction. Several decision rules guided the start and stop of the experimental conditions. First, participants had to achieve at least 90% accuracy on the first three lessons of SI and FBPC or repeat each lesson until achieving it. Second, starting with the fourth lesson of SI and FBPC, participants had to achieve at least 30 CWS with 0 to 3 IWS per 1 min on the majority of practice timings for two consecutive lessons, or following lesson 18, whichever occurred first. Finally, participants had to score at least 90% accuracy on the three lessons of paragraph instruction or repeat each lesson until achieving it.

**Baseline and concurrent intervention.** During the baseline and experimental conditions, participants attended a summer remedial math program at their school. A mathematics instructor employed by the cooperating school delivered approximately 60 min of mathematics instruction each day. At the end of the lessons, the lead author administered a sentence construction probe. Math instruction ran concurrently to the experimental conditions: each experimental session began with SI and FBPC or paragraph instruction followed by mathematics instruction.

**SI and FBPC.** The first experimental condition replicated procedures from a previous study (i.e., Datchuk et al., 2015). The first three lessons lasted approximately 25 min each and were designed to improve the accuracy of simple sentence construction. These lessons fol-



lowed a systematic and explicit instructional format (Archer & Hughes, 2011). The instructor modeled appropriate responses, prompted participants through guided practice by evoking active responses and providing positive and corrective feedback based on their responses, and tested for independence. During the first lesson, the instructor introduced simple sentences as an important skill needed for clear written expression. The instructor defined complete simple sentences as containing two main parts: one part that names someone or something and a second part that tells more. Incomplete sentences were missing one of the two main parts. Participants read aloud complete and incomplete sentences that corresponded to a picture. Using the definition of simple sentences as those including two main parts, participants orally identified complete and incomplete sentences and fixed incomplete sentences by transcribing the missing main part.

During the second lesson, participants continued to review both parts of a simple sentence by orally identifying parts of multiple sentences. In contrast to the first lesson, sentences no longer corresponded to a picture. Participants read aloud a series of phrases and orally identified each phrase as a complete or incomplete sentence and if incomplete, then identified the part presented. Participants then filled in missing capitalization and/or punctuation. In the third lesson, participants viewed a collection of small pictures depicting a single subject engaged in an activity. Two to three words served as additional prompts: the name of the subject and either a verb or object. Using both words, participants constructed simple sentences for each picture.

The remaining lessons of the SI and FBPC condition, starting with the fourth lesson, lasted approximately 6 min each and were designed to increase the frequency of responding. Each lesson included three, 1-min timed practice trials. Three copies of the same sentence practice sheet were used each lesson (e.g., three copies of Sheet A), but new sentence practice sheets were used across lessons (e.g., three copies of Sheet A on Monday, three copies of Sheet B on Tuesday, etc.). Each sentence practice sheet contained 10 unique small pictures, approximately 4 cm × 4 cm, with corresponding word prompts, similar in formatting to sentence construction probes. For example, one picture showed a cat drinking from a bowl with the words, *cat* and *bowl*.

For timed practice trials, the instructor stated the performance criterion and reviewed the participant's previous high score. The instructor presented one copy of a sentence practice sheet and told participants to write as many simple sentences as possible in 1 min. The participants began writing and the instructor started a countdown timer. At the completion of 1 min, the instructor scored responses and

provided participants with the number of CWS and IWS. The instructor orally corrected IWS, and participants transcribed a new, correct response. The instructor praised participants for constructing sentences that contained both parts of a simple sentence and encouraged participants to reach the performance criterion. The sentence practice sheet was collected and placed out of view. A new blank practice sheet was presented for subsequent timed practice trials.

**Paragraph instruction.** After completing the SI and FBPC condition, participants completed three lessons of paragraph instruction designed to practice application of complete sentences to paragraphs. Each lesson lasted approximately 25 min and had a systematic and explicit instructional format (Archer & Hughes, 2011). At the beginning of the paragraph instruction condition, the instructor introduced descriptive paragraphs as a collection of simple sentences describing the same topic, differing from fictional narratives that contain elements such as characters and setting or essays that contain topics and reasons.

In the first two lessons of paragraph instruction, participants read aloud sentences and paragraphs that described different topics. Paragraphs had errors in capitalization, punctuation, and run-on sentences. Participants stated the part of each sentence that named someone or something and then inserted correct capitalization and punctuation. The participants also stated and changed run-on sentences to complete, simple sentences. During the third lesson, participants constructed a series of related sentences describing a single large picture. Each large picture showed multiple subjects engaged in a related activity along with the names of each subject and five words to use during composition. Before finishing each composition, participants checked sentences for correct capitalization and punctuation, inclusion of a part that named something and a part that told more within each sentence, and presence of run-on sentences.

**Maintenance.** The maintenance condition occurred between 30 and 41 days following completion of the paragraph instruction condition: Rachel (39, 40, and 41 days), Kim (37, 38, and 39 days), Bettie (30, 32, and 39 days), and Orin (30, 31, and 32 days). Participants did not receive any instruction or timed practice trials during maintenance. Participants were administered three sentence construction probes across three maintenance sessions and a single descriptive paragraph probe.

#### *Interobserver Agreement*

The first author taught two independent observers how to calculate all measures. On a series of practice measures, the first author modeled scoring procedures then led the observers through guided practice until each observer achieved 100% agreement with the first

author. One observer served as primary scorer and scored all measures following each lesson. The second observer scored a third of the probes (a total of 41 probes) from each participant, each dependent measure, and across all conditions for interobserver agreement (Johnston & Pennypacker, 2009). Using exact agreement procedures (Kazdin, 2011), total agreements divided by the total number of agreements plus disagreements multiplied by 100, observers agreed 93% on dependent measures (range = 71% to 100%).

### *Procedural Integrity*

An iPad was used to audio record all experimental sessions. The first author taught an independent observer the instructional protocol to a 100% criterion. Using a checklist, the independent observer randomly selected and scored a third of all audio recordings across participants and experimental conditions. The selected lessons achieved 100% procedural integrity.

## **Results**

### *Instructional Materials*

Instructional materials separate and distinct from sentence and paragraph probes were used during the SI and FBPC and paragraph instruction conditions. Participants were in the experimental conditions for differing durations based on their performance to the instructional materials. All participants achieved at least 90% accuracy on the first three lessons of the SI and FBPC condition without the need to repeat lessons, and all participants achieved the performance criterion on timed practice trials. Kim finished the SI and FBPC condition after 8 lessons or 105 min, and Bettie ended the condition after 13 lessons or 159 min. Both Orin and Rachel completed the SI and FBPC condition after 12 lessons or 129 min. Three of the four participants (Rachel, Bettie, and Orin) achieved 90% accuracy across three paragraph instruction lessons lasting a total duration of approximately 75 min. Kim required four paragraph instruction lessons, approximately 100 min, to achieve a minimum of 90% accuracy.

### *Sentence Construction Probes*

Figure 1 shows the number of word sequences, CWS and IWS per 1 min, on sentence construction probes. Table 2 lists the days and celeration values within the baseline and SI and FBPC conditions. During the baseline condition, all participants showed flat performance

**Table 2**  
**Celeration Values across Baseline and SI and FBPC Conditions**

Participant	Condition	Days	CWS	IWS	Comp.	Incomp.
Rachel	Baseline	8	+1.1	×1.2	×1.0	×1.0
	SI and FBPC	16	×1.0	+1.4	×1.9	+1.5
Kim	Baseline	11	×1.1	×1.3	+1.5	×1.5
	SI and FBPC	10	×1.1	+1.9	×1.2	+1.5
Bettie	Baseline	16	×1.0	×1.0	×1.0	×1.0
	SI and FBPC	19	×1.1	×1.0	×1.2	×1.0
Orin	Baseline	12	×1.3	×2.3	×1.0	×1.3
	SI and FBPC	23	×1.1	+1.3	×2.5	+1.3

*Note.* SI and FBPC = sentence instruction and frequency building to a performance criterion. CWS = correct word sequences, IWS = incorrect word sequences, Comp. = complete sentences, Incomp. = incomplete sentences.

in CWS and IWS or higher celeration values for IWS than CWS. For example, Orin's celeration values indicated a rising frequency of responding but an increase in errors and decreasing accuracy: CWS celeration = ×1.3 (12 days) and IWS celeration = ×2.3 (12 days).

During the SI and FBPC condition, everyone except Bettie showed higher levels of CWS and lower levels of IWS compared to the baseline condition. Bettie showed higher levels of both CWS and IWS. Across participants celeration changed slightly for CWS and more pronouncedly for IWS, suggesting a minimal change in rate but dramatic increase in accuracy. For example, Orin's celeration of IWS accelerated in baseline, ×2.3 (12 days), then rapidly decelerated during SI and FBPC, +1.3 (23 days). Participants showed comparable levels of performance during the paragraph instruction condition: data points for CWS stayed at or slightly above the same level, and data points for IWS stayed at low levels. Maintenance occurred between 30 and 41 days following completion of the paragraph instruction condition. All participants displayed high levels of CWS and low to moderate levels of IWS, comparable to the end of the intervention condition.

Sentence construction probes were concurrently scored for the number of simple sentences, complete and incomplete per 1 min, as shown on Figure 2. Table 2 also lists the celeration values of the baseline and SI and FBPC conditions. During baseline, Bettie consistently showed more complete sentences than incomplete sentences. All other participants showed more incomplete than complete sentences. For example, Kim had a rising frequency of incomplete sentences, celera-

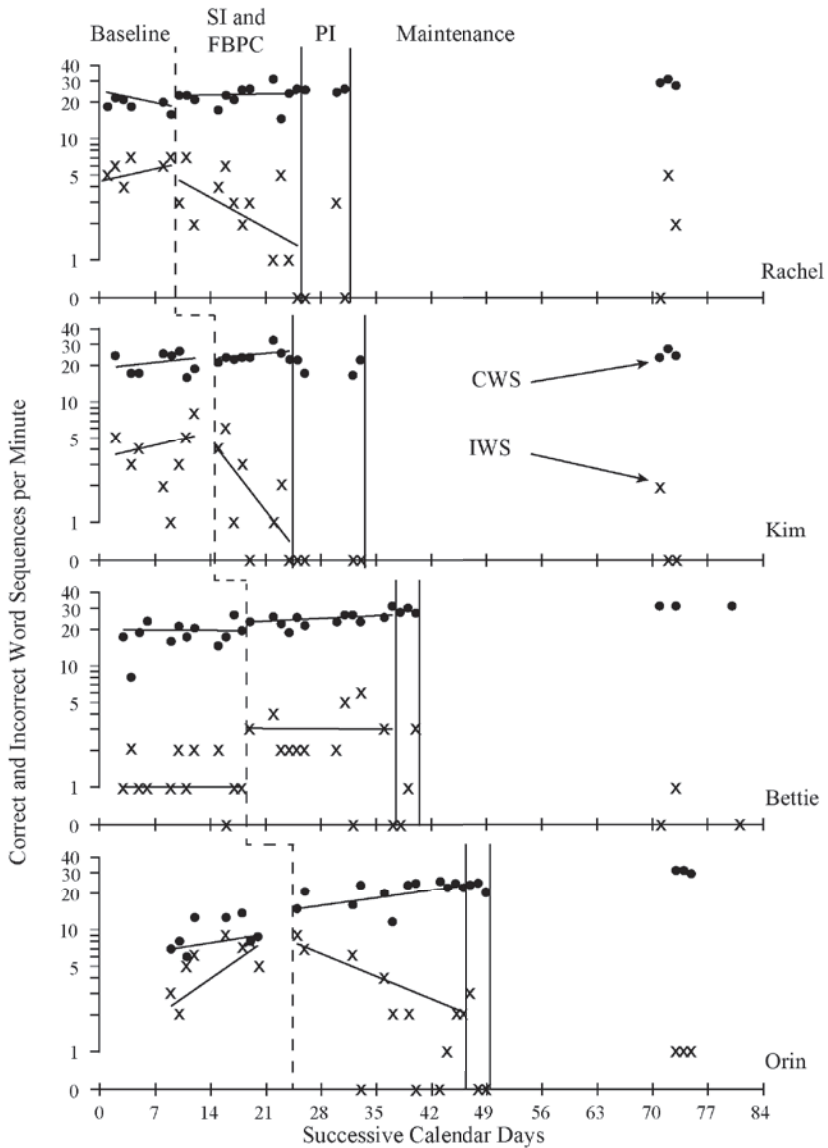


Figure 1. The number of correct and incorrect word sequences per 1 min on sentence construction probes. SI and FBPC=sentence instruction and frequency building to a performance criterion. PI=paragraph instruction.

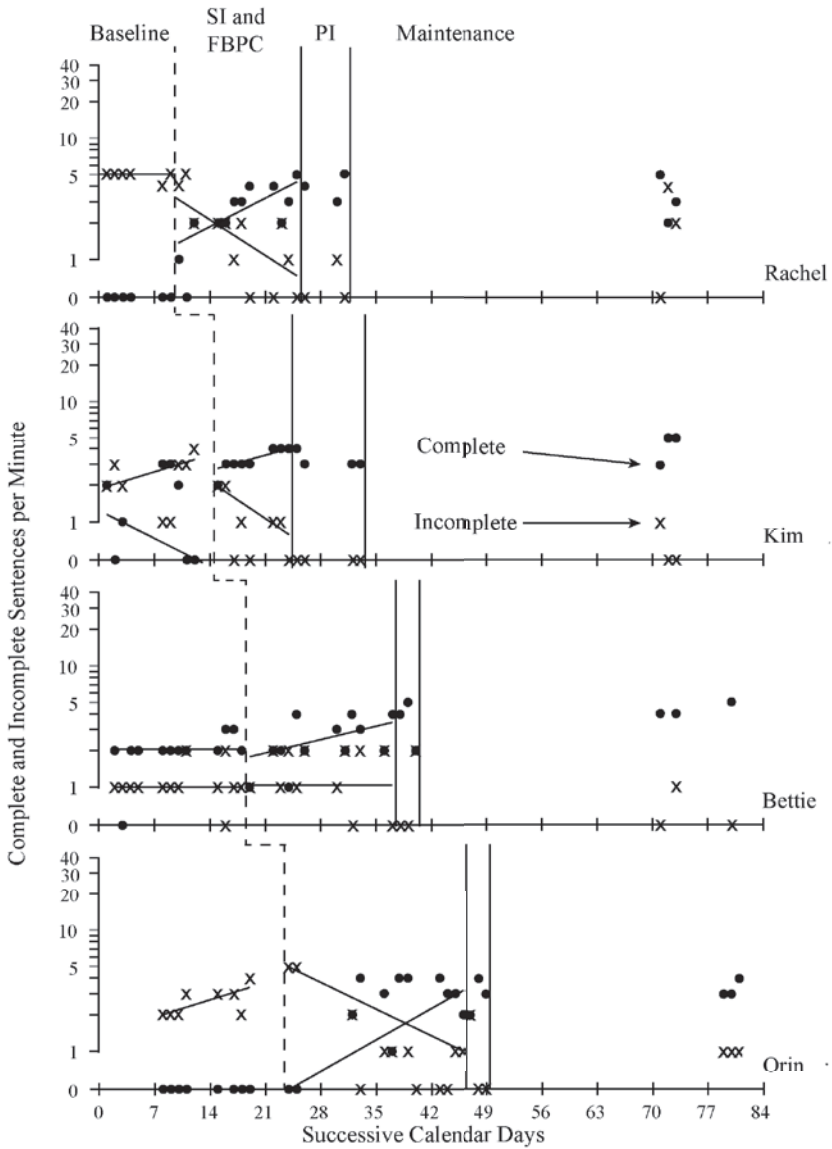


Figure 2. The number of complete and incomplete sentences per 1 min on sentence construction probes. SI and FBPC = sentence instruction and frequency building to a performance criterion. PI = paragraph instruction.

tion value =  $\times 1.5$  (11 days), and a declining frequency of complete sentences, celeration value =  $+1.5$  (11 days). During the SI and FBPC condition, all participants showed increases in accuracy and speed of responding. Illustrative of this pattern, Rachel's complete sentences rose from a baseline celeration of  $\times 1.0$  (8 days) to a celeration of  $\times 1.9$  (16 days), and incomplete sentences declined from a celeration of  $\times 1.0$  (8 days) to a celeration of  $+1.5$  (16 days).

Results during the paragraph instruction condition were mixed. Rachel and Kim showed performance comparable to the SI and FBPC condition: complete and incomplete sentences stayed at the same level and did not overlap. Bettie and Orin constructed a comparable number of complete sentences to SI and FBPC but incomplete sentences overlapped. Three of the four participants (Kim, Bettie, and Orin) demonstrated comparable or slightly higher levels of complete sentences and a low level of incomplete sentences during maintenance. Rachel displayed uneven and variable performance with overlap between complete and incomplete sentences.

#### *Descriptive Paragraph Probes*

Figures 3 and 4 show the frequency of word sequences (CWS and IWS) and simple sentences (complete and incomplete) per 3 min on descriptive paragraph probes. Participants completed a total of six descriptive paragraph probes across experimental conditions. The two descriptive paragraph probes administered in baseline (i.e., Baseline 1 and Baseline 2) showed higher levels of CWS than IWS. Incomplete sentences, however, were at or above complete sentences for all participants. The results taken together indicate participants composed a moderate to high number of words correctly but sentences remained indistinguishable and incomplete.

Four descriptive paragraph probes were completed during the intervention and maintenance conditions. Overall, performance showed a lower level or declining trend in IWS compared to baseline. Rachel's performance in CWS trended upwards, but CWS fluctuated for all other participants. The decline in IWS with fluctuating CWS indicates an improvement in accuracy but decrease in speed or frequency of words in paragraphs. In addition to increased accuracy of word sequences, Orin constructed more complete than incomplete sentences during and following intervention. However, the number of complete and incomplete sentences constructed showed high variability for Rachel, Kim, and Bettie. Across time, more of their word sequences made sense but accuracy or frequency of sentences did not improve. The first author conducted an error analysis of the descriptive paragraphs completed by Rachel, Kim, and Bettie. The majority

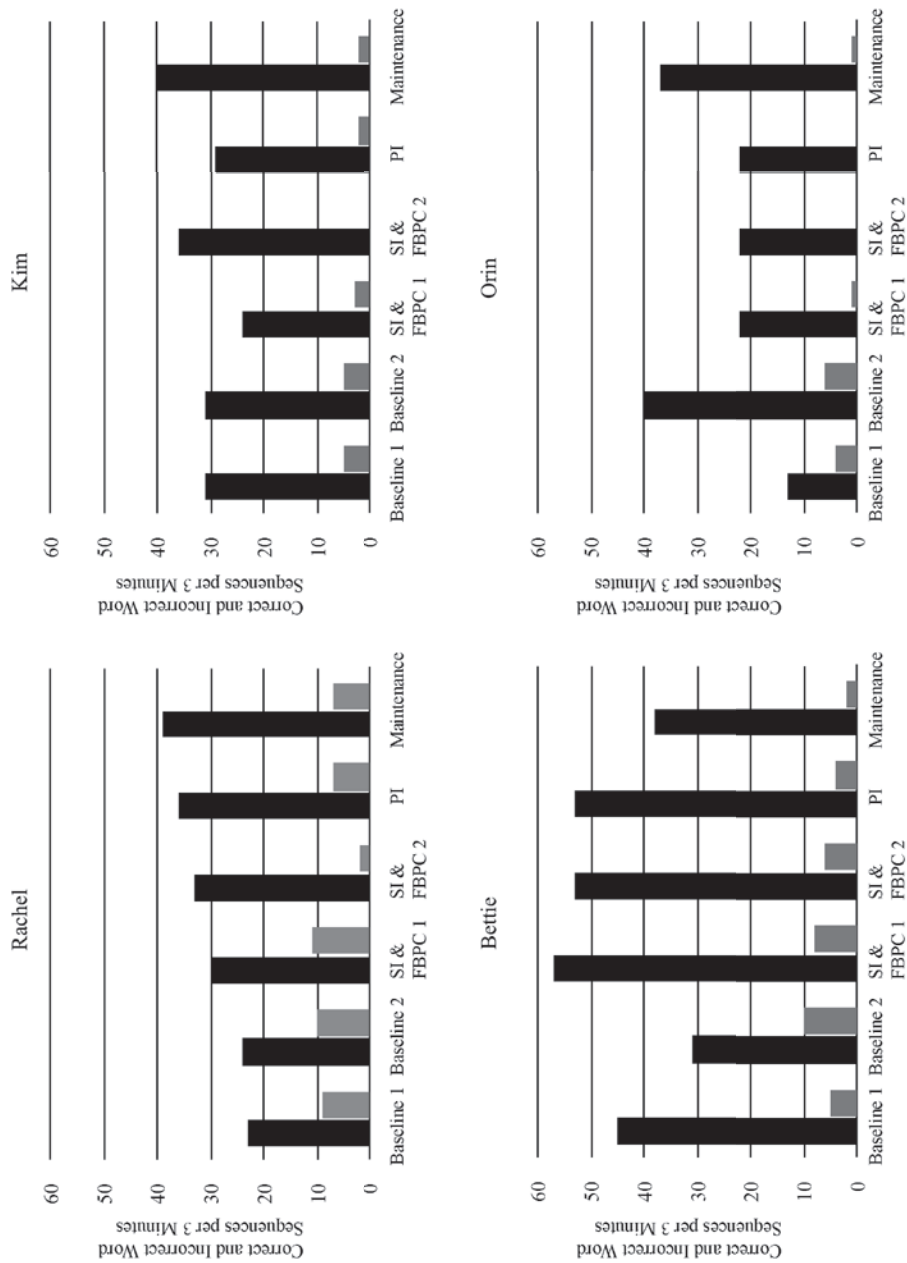


Figure 3. The number of correct and incorrect word sequences per 3 min on descriptive paragraph probes. SI and FBPC = sentence instruction and frequency building to a performance criterion. PI = paragraph instruction. Solid black bars indicate CWS, and grey bars show IWS.



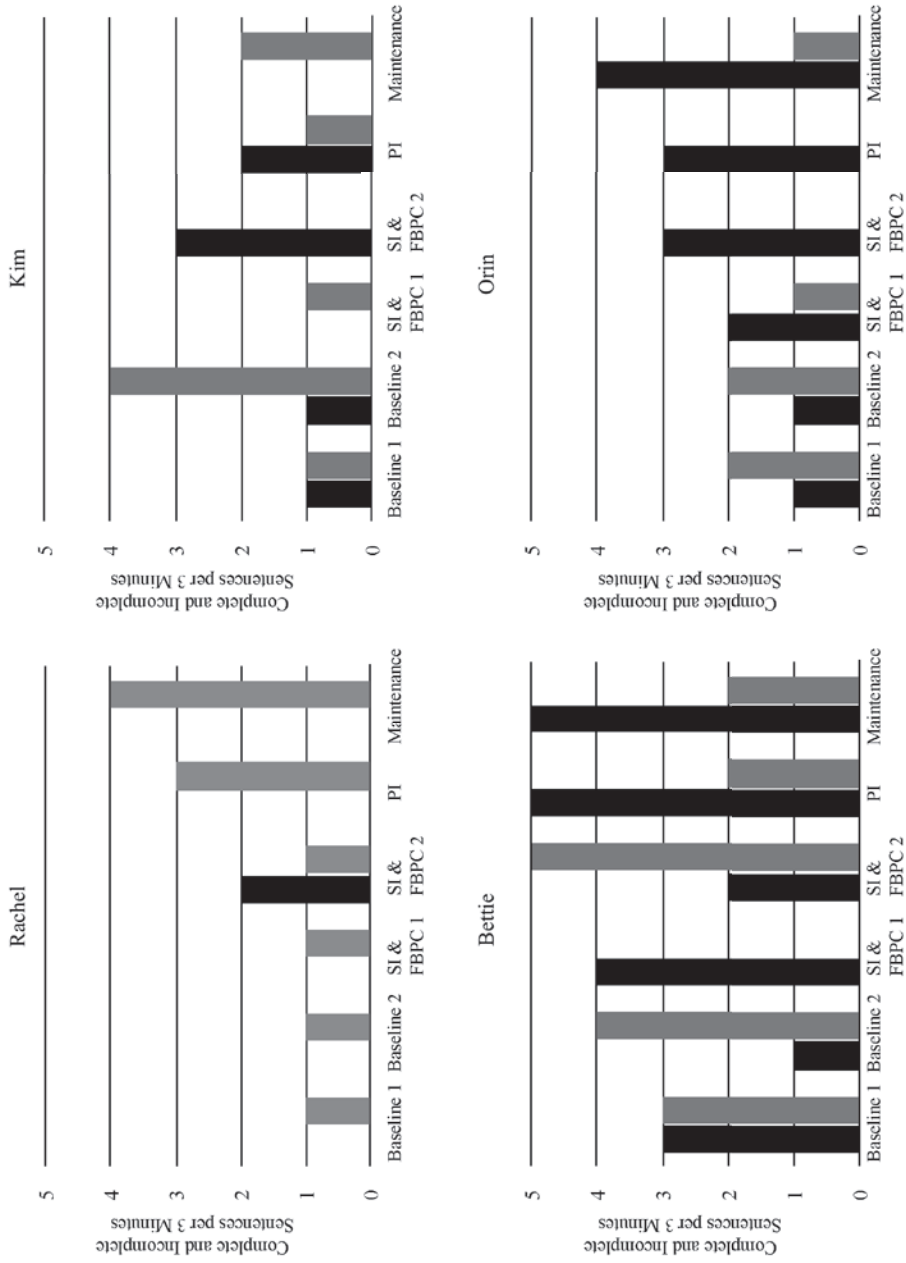


Figure 4. The number of complete and incomplete sentences per 3 min on descriptive paragraph probes. SI and FBPC = sentence instruction and frequency building to a performance criterion. PI = paragraph instruction. Solid black bars indicate complete sentences, and gray bars show incomplete.

of errors were skills not explicitly taught during intervention, including incorrect subject-verb agreement (e.g., "Timmy ride a bike"), improper word usage (e.g., *ain't*), and incorrect capitalization/punctuation (e.g., "Mr jenkins").

## Discussion

Many adolescents with disabilities struggle to fluently construct simple sentences. The more advanced skill of paragraph composition is also affected negatively when a writer cannot form complete simple sentences. Using a framework of behavioral fluency (Kubina & Yurich, 2012) with instructional procedures from the sentence construction literature (Anderson & Keel, 2002; Datchuk et al., 2015; Viel-Ruma et al., 2010; Walker et al., 2005; White et al., 2014), the present study examined effects of a multi-component intervention, SI and FBPC with paragraph instruction, on the acquisition and fluency of word sequences and simple sentences and application to descriptive paragraphs.

The intervention improved construction of simple sentences and word sequences per 1 min. Results across participants, specifically the display of an experimental effect across three participants (i.e., Rachel, Kim, and Orin), suggest a functional relation between the intervention and dependent measures observed on sentence construction probes (i.e., word sequences and simple sentences). Overall changes in both CWS and IWS suggest intervention increased the rate of responding slightly but increased accuracy substantially. Three of four participants, everyone except Bettie, showed decreases in the celeration and level of IWS. The level of CWS increased but small to no changes in trend occurred. More pronounced changes were found in the number of complete and incomplete sentences. All participants showed upward celerations in complete sentences, flat trends or steep declines in incomplete sentences, and overall higher levels of performance. Bettie exhibited increased accuracy and speed constructing complete, simple sentences; however, she displayed limited improvement on word sequences per 1 min.

Results suggest the intervention produced lasting, meaningful changes in the writing behavior for the majority of participants. During the maintenance condition, the majority of participants showed performance comparable to or slightly higher than the end of intervention. Rachel's frequency of CWS and IWS in maintenance was similar to intervention; however, her rate of incomplete sentences increased from intervention levels. Rachel's performance reveals a difference in the relationship between word sequences and sentences.

Her small number of IWS were spread across multiple sentences instead of clustering in a few (e.g., 1 IWS in incomplete sentence 1, 1 IWS in incomplete sentence 2, etc.), meaning a small number of errors raised the frequency of incomplete sentences.

As an additional finding, results provide limited support that procedures improved accuracy of word sequences in descriptive paragraphs. All participants, except Bettie, showed higher frequency and accuracy of word sequences in descriptive paragraphs following intervention. Despite gains in word sequences, the practiced application of complete sentences to descriptive paragraphs fluctuated across participants. The results may shed light on types of practice needed to ensure robust application of sentence construction to descriptive paragraphs. An error analysis revealed other skills within the composite skill, specifically inaccurate subject-verb agreement and grammatically incorrect words, inhibited a robust application. Anecdotally, several of the teachers employed at the cooperating school noted that the sentence writing of the participants appeared to improve but subject-verb agreement was still an area of concern.

Overall results extend several complementary areas of research including prior research on simple sentence construction (Anderson & Keel, 2002; Datchuk et al., 2015; Viel-Ruma et al., 2010; Walker et al., 2005; White et al., 2014) and behavioral fluency (Kubina & Yurich, 2012). The intervention improved writing performance in several specific ways: it increased the rate and accuracy of simple sentences and the number of words used with appropriate syntax, capitalization, and punctuation (i.e., word sequences). Results maintained across time, suggesting a lasting, beneficial change of writing for the majority of participants. The practiced application to descriptive paragraphs proved more modest in comparison. More research is needed to bolster application of simple sentences and word sequences to paragraphs.

The present study has several limitations and future directions. First, the duration of the study and scope of research questions limited the number of descriptive paragraph probes administered and types of data collected. Collecting a larger number of paragraph probes would allow detection of a functional relation between intervention and descriptive paragraphs and potentially allow for additional analysis, such as the effects of intervention on paragraph quality. Future research should extend the experimental design to include administration of at least three descriptive paragraph probes within each experimental condition (Kratochwill et al., 2010) and analyze descriptive paragraphs for aspects of writing quality (e.g., coherence and organization). Second, only three of the four participants showed improvements on all dependent measures. One participant, Bettie,

exhibited improvement in constructing complete sentences but not word sequences. A large number of her errors related to subject-verb agreement, a skill outside the scope of intervention. Several reviews of the writing literature have recommended addressing grammar skills within lessons of sentence construction (Datchuk & Kubina, 2013; Graham & Perin, 2007), and future research should incorporate lessons on subject-verb agreement to potentially increase effectiveness of the intervention. This alteration could be accomplished by extending the sentence instruction lessons to include grammar skills and also ensuring sufficient accuracy has been established prior to engaging in frequency building. Third, participants did not graph the scores of timed trials. Future research should investigate adding this component to aid in decision-making and participant motivation.

More research is needed to establish effects of intervention, but the present study has several specific implications for practice. First, practitioners should devote instructional time to focus on simple sentence construction. Instruction should follow a systematic and explicit framework (Archer & Hughes, 2011) followed by deliberate, timed practice. Teachers should model construction of complete simple sentences, lead participants through guided practice, and test for independence. Timed practice procedures should include performance feedback on correct and incorrect responses following each timing, error correction, and praise for correct responses. The use of picture-word prompts, small pictures with a few adjacent words, can promote active responding throughout the lesson and timed practice. Overall, the multi-component intervention, SI and FBPC with paragraph instruction, may prove as a suitable, supplemental support for adolescents qualifying for secondary or tertiary tiers of intervention within a multi-tiered system of supports.

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