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The Importance of Treatment Integrity: Examining the Effect of Dosage on Intervention Outcomes

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Abstract

Treatment integrity is a critical component to evaluating the impact of interventions (Collier-Meek et al., 2018). However, one frequently underreported and unacknowledged dimension of treatment integrity is intervention dosage. Determining the amount of treatment (i.e., dosage) necessary to produce desired changes is important to increasing our understanding of the impact of an intervention and the development of a more efficient and precise method of organizing and delivering treatments (Codding et al., 2016). Utilizing data (n = 391) from four individual randomized control trials and three clustered randomized control trials, the purpose of the present study was to descriptively examine the dosage of a performance feedback intervention implemented among seven cohorts of third-grade students, as well as examine the relationship between the amount of intervention dosage received and students' writing productivity. Results of this study found that for every intervention session received, students wrote approximately two more words, which was considered a statistically significant outcome ($p \leq 0.001$).

Keywords: treatment integrity, dosage, writing productivity, academic intervention

THE IMPORTANCE OF TREATMENT INTEGRITY: EXAMINING THE EFFECT OF DOSAGE ON INTERVENTION OUTCOMES

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Treatment integrity has historically been referred to as the degree to which an intervention is implemented as planned (Gresham, 1989). More recently, it has been conceptualized as the extent to which individuals trained to deliver an intervention are able to deliver different dimensions (i.e., quality, adherence, and dosage) of the intervention consistently and comprehensively (Sanetti & Kratochwill, 2009). Examining different dimensions of treatment integrity is a critical component to evaluating the impact of interventions; however, systematic reviews of the literature (Collier-Meek et al., 2018) suggest that many of the central dimensions of treatment integrity (i.e., quality, dosage) are not reported or evaluated. Furthermore, there are no clear guidelines or reporting standards regarding which dimensions of treatment integrity should be included or how they should be assessed (Gresham, 1989; Sanetti & Kratochwill, 2009). One central dimension of treatment integrity, treatment dosage, has largely been ignored. Dosage refers to the number of intervention components that are implemented, or the extent to which participants receive or are exposed to intervention components (i.e., number of intervention sessions received or minutes or hours of exposure) (Domitrovich et al., 2008; Durlak & DuPre, 2008). As a result, assessing the impact of intervention dosage is critical to informing our understanding of intervention efficacy.

Treatment Fidelity and Integrity

Treatment fidelity concerns two related but distinct issues: treatment integrity and treatment differentiation (Mocher & Prinz, 1991). Treatment integrity is measured by assessing the extent to which an intervention is implemented as planned. As argued by Gresham and colleagues (1993), without collecting data on the implementation of the independent variable, the internal validity of the experiment may be compromised. Therefore, it is important to administer

interventions exactly as directed to ensure internal validity. Treatment differentiation is measured by assessing whether treatment conditions differ from one another as planned (Mocher & Prinz, 1991). This assessment is important to ensure that treatment conditions differ from one another as intended, and to permit accurate comparison in clinical trials (Mocher & Prinz, 1991). Despite the importance of both issues, current literature in the field allots more attention to treatment integrity, which is the focus of the present study.

Collecting and reporting treatment integrity outcomes are crucial in making conclusions regarding intervention effectiveness, or ineffectiveness (Collier-Meek et al., 2018). If an intervention fails to yield significant change, yet lacks treatment integrity data, it is impossible to assess whether the observed effects were due to ineffective treatment, or an effective treatment implemented with poor integrity (Gresham, 1989; Gresham et al., 1993). As stated by Durlak (1998), positive findings cannot be attributed to an intervention without knowing if the intervention was conducted as intended. Furthermore, if an intervention yields negative results but implementation has not been monitored, there is a danger that potentially useful interventions will be prematurely rejected for the wrong reasons (Durlak, 1998).

Another reason why treatment integrity data are important is because a lack of treatment integrity limits the exploration of factors that may mediate intervention efficacy. Without treatment integrity data, the opportunity for researchers to evaluate the influence of critical factors such as dose, treatment adaptations, or intervention complexity is removed (DiGennaro Reed & Codding, 2014). Consequently, a common methodological issue to measuring treatment integrity surrounds the inclusion of different dimensions of treatment integrity, some of which include adherence (i.e., intervention steps delivered as-planned), quality (i.e., how the intervention steps are delivered) (Collier-Meek et al., 2018), and exposure (i.e., the duration that

the intervention is received by a student) (Sanetti & Kratochwill, 2009). When considering the different dimensions of treatment integrity, the amount of weight given to each dimension should also be considered, as some dimensions have greater effects than others (e.g., it is likely more important to contingently deliver a positive reinforcer than to provide a rationale to students for an intervention program) (Gresham, 1989). Making this distinction is crucial both in research, and practice, further emphasizing the importance of evaluating treatment integrity.

Treatment Integrity: Dosage

Despite emphasis throughout the school psychology literature concerning the importance of collecting treatment integrity data (Collier-Meek et al., 2018; DiGennaro Reed & Codding, 2014; Gresham, 1989; Gresham et al., 1993; Sanetti & Kratochwill, 2009), one dimension remains frequently underreported or unacknowledged, that being dosage. One explanation as to why dosage is accounted for so minimally in the literature is because little to no consensus exists concerning definitions and labels of different aspects of treatment integrity (Dane & Schneider, 1998). This is evidenced in the case of dosage, which is also frequently termed as exposure or intensity (Collier-Meek et al., 2018; Dane & Schneider, 1998; Duhon et al., 2009). For the purposes of this study, the terms intervention and treatment dose and dosage will be used.

When assessing for dosage, the following domains are often considered: (a) the number of sessions delivered competently during each session, (b) the amount of time that treatment is delivered per session, typically reported in minutes, (c) the number of sessions delivered per day, week, or month, and (d) the total treatment duration, typically counted by the number of weeks (Codding & Lane, 2015). Further, Warren and colleagues (2007) argue that treatment dose is a function of three separate, but related subcomponents: (1) the length of the treatment session, (2) the average rate of treatment episodes per unit of time, and (3) the distribution of episodes (i.e.,

interventionist actions that are hypothesized to lead a student toward an intervention goal, or a teaching/learning moment that occurs during the intervention) over the session (e.g., an intervention with a designated dose of 60 teaching episodes per 1-hour intervention session would mean that on average, one teaching episode occurs per minute). From a reporting guidelines perspective, Warren and colleagues (2007) indicated that the first two subcomponents (i.e., the number of treatment episodes and the length, in time, of the treatment) should always be specified in the methodology of studies. In addition, Bellg and colleagues (2004) provide numerous strategies in which treatment dose can be assessed across participants. For example, one method can be applied that includes promoting the recording of deviations from the treatment protocol regarding length, number, and frequency of student contact with the intervention (Bellg et al., 2004). By determining the amount of treatment (i.e., dose) needed to produce desired changes in an intervention, a more efficient and precise method of organizing and delivering treatments could become more commonplace in both research and practice (Codding et al., 2016).

When thinking about the impact of treatment dose, it is important to consider manipulations to dose, such as the role of frequency (Codding et al., 2016). Dose frequency is the number of times a dose of the intervention is provided per day and per week (Warren et al., 2007). In a study conducted by Codding and colleagues (2016), the effect of intervention frequency on intervention outcomes, while keeping dose constant was examined. Small groups of students received one of three frequencies (i.e., once, twice, four sessions) of a mathematics intervention weekly, with total exposure time (i.e., dosage) held constant (i.e., 48 minutes) for all groups. Results for the Curriculum-Based Measurement-Mathematics (M-CBM) outcome measure indicated that students in the four-times-weekly treatment condition (M = 24.44; SD =

15.10) demonstrated significantly better math productivity than those in the control (*M* = 16.76; *SD* = 13.87), twice-weekly (*M* = 17.08*; SD* =14.04), and once-weekly (*M* = 16.57; *SD* = 13.96) conditions. Thus, the outcomes reported in this study support briefer, more frequent intervention sessions, especially considering time constraints that schools and teachers face (Codding et al., 2016). In addition, student engagement was measured using the Behavioral Observation of Students in Schools (BOSS; Shapiro, 2004). Although the average observed student engagement (i.e., students actively participating) was high (range, 72%-94% of intervals observed), its impact was not assessed relative to intervention outcomes. Rather, for the purpose of this study, it was used as a measure of procedural fidelity. Therefore, while Codding and colleagues' (2016) results support the utilization of briefer, more frequent treatment sessions in school-based settings given time constraints present, this research did not consider how factors beyond the experimenters' control (e.g., students not receiving intervention sessions) impact dose and treatment effect.

To further our understanding of the impact of dosage on treatment outcomes, Duhon and colleagues (2020) stressed the importance of adopting a data-informed approach to evaluating dosage effects by obtaining precise measurements of the amount of time an individual spends being exposed to an intervention. Duhon and colleagues suggested adopting three subcomponents to define and assess dosage: (1) dose, which is considered the quantity of treatment during a fixed period of time, (2) dose schedule, which is the schedule of doses delivered over time (e.g., a 10-minute intervention delivered every school day over 2 weeks), and (3) cumulative dose, which is considered the total time a student spends engaged in the intervention. In addition to providing recommendations regarding dose reporting standards, Duhon and colleagues (2020) also experimentally examined the effect of several different doses

on mathematic fluency gains amongst fourth-grade students. Students were divided into eight groups, all receiving a different dose schedule of the treatment ranging from 2-minutes, 8 times a day to just 2-minutes, once every other week. Results of this study indicated that the minimum threshold for an effective dose was once per day (d = 0.92). However, the magnitude of effects varied as a function of dosage. Specifically, the highest dosage schedule (i.e., 8 times per day) resulted in large improvements in students' performance (d = 1.29). Based on these findings, Duhon and colleagues argued that the once per day dose schedule served as the minimum dose necessary to find improvements in students' performance relative to a control condition. Further, Duhon and colleagues also reasoned that by promoting precise measurement and the evaluation of all factors impacting dosage, including intervention session attendance, academic intervention research can shift from being largely speculative to a data-informed approach.

Dosage in Relation to Academic Interventions

Current literature in the field of school psychology has examined procedural factors associated with intervention effectiveness; however, it is rare that the amount of treatment necessary (i.e., dose) to produce the desired outcome is assessed and reported (Duhon et al., 2020). In a systematic review of the literature, Dane and Schneider (1998) examined the prevalence of treatment integrity variables in evaluations of preventative interventions amongst elementary-age students, including dosage. Results of this study indicated that relatively few studies documented data on dosage and its impact on intervention efficacy. Specifically, only 13% of the total studies reviewed assessed for dosage. Furthermore, dosage was documented more frequently in clinic-based interventions (55%), or community-based interventions (33%), than in school settings (12%). Taken together, these findings suggest that dosage is frequently ignored in school-based studies.

In a more recent systematic review of 58 research articles examining one type of school-based academic intervention (i.e., performance feedback) that is commonly used to improve teachers' fidelity of intervention implementation, Collier-Meek and colleagues (2018) reported that none of the studies assessed dosage. In addition, results indicated that intervention adherence (i.e., intervention steps delivered as planned) was the only dimension assessed and reported in the majority of studies. Taken together, these findings suggest that oftentimes school-based professionals are solely receiving feedback on the extent of steps implemented (i.e., adherence), rather than the quality or dosage of intervention delivery (Collier-Meek et al., 2018). Nonetheless, intervention dosage, may be a dimension that has a more significant impact on treatment outcomes than other dimensions of treatment integrity (e.g., adherence, quality, or exposure). That is, intervention efficacy is threatened when participants do not receive the intended dosage of an intervention (Dane & Schneider, 1998). Unfortunately, when implementing interventions in school-based settings, time is a significant barrier to intervention implementation and cannot be easily controlled.

Performance Feedback Intervention and Dosage

One of the most critical influences on student learning is performance feedback, which has been commonly defined as the information provided by an intervention agent (e.g., teacher, peer, self) regarding an individual's performance specific to the task or process they have been asked to complete and has been identified as one of the most critical influences on student learning (Hattie & Timperley, 2007). In addition, Bandura's (1991) social cognitive theory posited that performance feedback provides an individual knowledge regarding their progress, which in turn can cause them to set goals to go beyond that of their previous performance. In their conceptual model of performance feedback, Hattie and Timperley (2007) defined three

important considerations to be made when providing feedback to an individual: (1) “where am I going?” (i.e., what are the goals?), (2) “how am I going?” (i.e., what progress is being made towards the goal?), and (3) “where to next?” (i.e., what needs to be done to make better progress) (p. 86).

Hattie and Timperley conducted a comprehensive meta-analysis of the performance feedback literature (i.e., 196 studies, totaling 6, 972 effect sizes) and reported a positive average effect size of 0.79, displaying the adequacy of performance feedback as an academic intervention. More recently, Wisniewski and colleagues (2020) conducted a meta-analysis to replicate and expand upon the meta-synthesis conducted by Hattie and Timperley. Results suggested that feedback has a medium effect (d = 0.48) on student learning, although considerable variability of the effects was a notable finding. Wisniewski and colleagues emphasized the importance of integrating participant characteristics, feedback type, and skills targeted in future research.

Performance feedback interventions are frequently used to improve students’ writing development (Brindle et al., 2016). Biber and colleagues (2011) conducted a review of the performance feedback literature, and more specifically, research studies that examined the effectiveness of feedback on student writing. Of the 306 studies identified during the literature review, a meta-analysis focused on a smaller number of studies (n = 26) was conducted (i.e., totaling 88 effect sizes). Biber and colleagues reported several findings of note. Overall, performance feedback was found to result in moderate to large gains in writing performance among students learning in English as a first language (range, d = 0.63 to 0.83) as well as those learning English as a second language (d = 0.55 to 1.29). Regarding both the source and mode of feedback provided, Biber and colleagues noted several interesting trends. When feedback was

provided by the teacher, students learning English as a first language demonstrated moderate to large gains in writing (range, d = 0.53 to 1.52) whereas large gains among students learning English as a second language were demonstrated when feedback was provided by peers (range, d = 1.41 to 1.96). However, oral feedback produced larger gains (range, d = 0.84 to 1.868) than written feedback (range, d = 0.40 to 0.68) regardless of English language status. The findings reported by Biber and colleagues highlighted the importance of examining factors that may influence the effect of performance feedback on the writing development of elementary-age students.

More recently, in the content area of writing, Graham and colleagues (2015) conducted a meta-analysis of both experimental and quasi-experimental intervention studies conducted among students first- through eighth-grade students diagnosed with specific learning disabilities utilizing feedback to improve writing quality. Large effects were found when feedback was provided to the students by either adults (d = 0.87), peers (d = 0.58), or students themselves (d = 0.62), with a smaller effect observed when writing feedback was generated by a computer (d = 0.38). Although Graham and colleagues demonstrated large effects regarding performance feedback, most of the studies included examined performance feedback interventions that were individually administered in special education classrooms and required extensive time; thus, demonstrating the need for a simple and efficient performance feedback intervention that could be implemented class-wide in general education classrooms.

To address the need for a performance feedback intervention that could be administered to an entire classroom of students, Eckert and colleagues (2006) developed an intervention based on prior analytic findings (Hattie & Timperley, 2007; Kluger & DeNisi, 1996) that was utilized for this study. During intervention implementation, students received the following: (a) task-

specific, individualized feedback regarding their writing productivity (i.e., total words written, TWW) during the previous session, (b) velocity feedback (i.e., an arrow pointing up or down) regarding whether their writing productivity had increased or decreased since the previous session, and (c) practice writing for three minutes in response to either a narrative or descriptive writing prompt. Randomized control trials evaluating this intervention (e.g., Hier & Eckert, 2014) have resulted in medium to large effect sizes (range, g = 0.66 to 0.89) in improving third-grade students' writing productivity. Hier and Eckert also reported that when students' narrative prompts were scored on the total number of correct writing sequences (CWS), which accounts for correct grammar, punctuation, and spelling, small to moderate effects (range, g = 0.34 to 0.59) were observed. With that said, students' spelling accuracy was not explicitly examined as an outcome variable, nor was spelling incorporated as a part of the performance feedback intervention. These results suggest that not only has performance feedback been provided considerable attention in the literature, but that it has a clear impact on writing ability amongst elementary-age students. Unfortunately, the same amount of detail has not been prescribed when considering how to implement performance feedback interventions with proper consideration of the dimension of treatment integrity known as dosage.

Purpose of the Present Study

Despite the extensive and robust literature base dedicated to the formulation and evaluation of performance-feedback interventions (Hattie & Timperley, 2007; Wisniewski et al., 2020), the same attention has not been provided to the integrity in which these interventions are being implemented. Although there is an emphasis throughout the school psychology literature concerning the importance of collecting treatment integrity data (Collier-Meek et al., 2018; DiGennaro Reed & Codding, 2014; Gresham, 1989; Gresham et al., 1993; Sanetti &

Kratochwill, 2009), one aspect remains frequently underreported or unacknowledged, that being dosage. Current literature in the field of school psychology has examined procedural factors associated with intervention effectiveness, but it is rare that the amount of treatment necessary (i.e., dose) to produce the desired outcome is assessed and reported (Duhon et al., 2020). In addition, dosage is often a difficult dimension of treatment integrity to examine in school settings given the various time constraints present (Domitrovich et al., 2008). Unfortunately, when implementing interventions in school-based settings, students who do not receive all intervention sessions is a common issue and cannot be easily controlled. Further, the impact of dosage is an important consideration when implementing interventions in urban school settings with a higher proportion of students eligible for free or reduced-price lunch because these students are more likely to miss intervention sessions (Gottfried, 2009). To date, no research has been conducted examining the effect of dosage on the effectiveness of a performance feedback intervention. With that said, one could argue that treatment integrity, and the dimension of dosage specifically, is a key consideration when implementing an intervention being that in its absence, findings cannot be attributed to the intervention. Therefore, there is a significant need for academic intervention research to comprehensively evaluate the impact of dosage on performance feedback intervention outcomes.

The purpose of the present study is to add to the existing literature on treatment integrity in the area of academic writing interventions. This study aimed to: (a) descriptively examine dosage, and (b) examine the impact that dosage has on intervention efficacy. Because no prior study has examined the impact of intervention dosage on writing intervention outcomes, no a priori hypothesis was proposed. However, by (a) descriptively examining data concerning

treatment dosage, and (b) evaluating the impact it has on intervention outcomes, it will contribute to the literature surrounding this important aspect of treatment integrity.

Method

Sample

The data for this study was obtained from four individual randomized control trials (IRCT) and three clustered randomized control trials (CRT) collected among seven cohorts between the years of 2003-2014. All data were collected within the Treatment Research in Academic Competency lab from public schools in the Northeast United States, with the data from four cohorts published elsewhere (i.e., Cohort 3, Truckenmiller et al., 2014; Cohort 4, Hier & Eckert, 2014; Cohort 5, Koenig et al., 2016; Cohort 6, Hier & Eckert, 2016). Each school was selected due to comparability in sample demographics, procedures, and outcome variables, and all third-grade students within each school were invited to participate. The sample (n = 391) was exclusively third-grade students because it is a crucial time in writing development due to increased writing demands (Berninger et al., 2002).

All human research protection guidelines were followed, including obtaining parental consent. Study inclusion criteria were identical across cohorts with participants (a) providing assent, (b) participating in general education classrooms, and (c) meeting criteria for proficiency in handwriting and writing on pre-intervention writing screening measures. Students were excluded from the study if they (a) met state assessment criteria for limited English proficiency, (b) received special education services due to an intellectual disability, specific learning disability in reading or writing, or serious emotional disturbance, or (c) experienced severe motor deficits that precluded them from writing.

After combining the data from all cohorts, there were a total of 391 participants in this study (see Table 1) and the average age was 8 years and 6 months. The majority of the sample was female (53.5%) and most students self-identified their race or ethnicity as Black or African American (49.1%) or White (40.2%). In addition, 7.2% of students identified their ethnicity Hispanic or Latino/Latina, and most were not eligible to receive special education services (91.3%). The recruited participants attended public elementary schools across the United States and due to their proximity to the respective universities, they were convenience samples. All sessions took place in classrooms within each school.

Research Assistants

Advanced graduate students in school psychology and advanced undergraduate psychology majors contributed to the data collection process as research assistants. Before data collection, all research assistants were required to complete formal training in ethics. In addition, research assistants received training on conducting procedural integrity observations, completing data entry, and administering and scoring measures. Research assistants were provided a manual detailing all procedures necessary for data collection and were required to demonstrate 100% proficiency in scoring measures and conducting procedural integrity observations before collecting data. For the purpose of the present study, the data collected from the prior studies were used to address the study's aims.

Materials and Measures

Student Weekly Writing Packet

During each intervention session, students received a packet that contained the following information: (a) students' identifying information on the first page, (b) a stop sign on the second page, (c) individualized performance feedback from the previous week on the third page

(Appendix A), and (d) a curriculum-based measurement in written expression probe (CBM-WE) (Appendix B), which was comprised of a narrative story starter and two additional pages for story composition.

Curriculum-Based Measurement in Written Expression probes

A total of 32 CBM-WE probes were administered across the seven studies (see Table 2), with a small percentage overlapping across studies (M = 21%). Each probe presented a sentence fragment, posed as the beginning of a story to provide students with an idea for writing either a narrative or descriptive story (e.g., "I was talking to my friends when all of the sudden…"), and the sentence fragment differed between sessions.

Each CBM-WE probe was previously evaluated for use with elementary-age students in urban school settings. Using interpretive guidelines set forth by Cohen (1988), McMaster and colleagues (2010) assessed the adequacy of the CBM-WE probes and reported high alternate-form reliability (r = .82 to .95), high criterion-related validity (r = .40 to .66), and moderate alternate-slope reliability (r = .39). In addition, the adequacy of the AIMSweb (2004) CBM-WE prompts was assessed and moderate to high test-retest reliability coefficients (range, r = .42 to .91) across varying time periods (i.e., one day to six months), moderate to high parallel forms reliability coefficients (range, r = .55 to .95), and moderate to high criterion validity coefficients (r = .41 to .84) were reported.

Procedures

All seven individual studies included in the sample used similar research procedures. Prior to data collection, Institutional Review Board approval from the university and participating school districts were obtained.

A CBM-WE probe was administered two weeks prior to the onset of random assignment and intervention implementation. Across all cohorts, weekly 20-minute sessions were conducted for approximately 6 consecutive weeks, baring school closures due to weather-related events or holidays. Research assistants were responsible for conducting sessions in a group format with the classroom teacher present.

Performance Feedback Intervention

The performance feedback intervention was conducted in a group format in students' general education classrooms. During each weekly 20-minute session, the weekly writing packet was distributed to each student in the classroom. As a part of the script, the research assistants explained the performance feedback sheet (Appendix A) in a group format. Students were instructed to review their individualized performance feedback sheet, which indicated their writing productivity (i.e., total words written [TWW]) on the CBM-WE probe from the prior session. In addition to providing quantitative information regarding students' writing productivity, the individualized performance feedback sheet included an arrow pointing upward or downward to indicate whether the students' writing productivity reflected an increase or decrease of the total number of words the students wrote relative to the prior session. Following receipt of the individualized performance feedback, students were instructed to complete a CBM-WE probe (Appendix B) following standardized procedures.

Variables of Interest

Writing Productivity

Writing productivity was calculated by computing TWW in the CBM-WE probe based on scoring procedures outlined by Shapiro (2011). TWW includes all words or groupings of letters separated by a space, regardless of spelling, grammar, or punctuation. For this study,

TWW was selected as an outcome variable because: (a) the component of performance feedback provided in the intervention was TWW, (b) it is highly correlated with other CBM-WE metrics, such as the number of correct writing sequences (range, r = .89 to .93; Koenig et al., 2016), and (c) previous studies suggest that TWW is an adequate measure to detect growth for elementary-age students (McMaster & Campbell, 2008; McMaster et al., 2011). In addition, performance feedback on TWW can be easily understood by not only students, but caregivers and teachers as well (Nelson et al., 2004), and previous research has reported that students find this type of feedback to be highly acceptable (Truckenmiller et al., 2014).

Dosage of Intervention Received

To descriptively examine dosage as well as consider this outcome measure in relation to students' writing productivity at the conclusion of the intervention, the number and percentage of the dosage of the intervention received across participants was calculated. In addition, the impact of dosage was assessed in relation to students' writing productivity. Although intervention dose is typically comprised of: (1) minutes of instruction per session, (2) number of learning trials per session, (3) frequency of instructional sessions, and (4) total duration over which the implementation occurred (Codding & Lane, 2015), for the purposes of this study, the amount of intervention sessions each student received was computed across participants and examined in relation to students' writing productivity. Therefore, whether a participant had received dosage was assessed by whether they had data for each intervention session of the CBM-WE probe in the form of TWW (e.g., if a student wrote 20 words during session 1, but no TWW value was available for session 2, they were counted as not having received intervention dose during session 2). In addition, for the purposes of this study, the last session for each participant was considered as the

last data collected from them (e.g., if a participant did not receive the intervention during session 6, session 5 was be considered the last session of the intervention they received).

Research Design

Using a random number generator, students or classrooms were randomly assigned to the performance feedback or alternative condition. For studies in which students were randomized to condition (i.e., Cohorts 4-7), the students were instructed to move to the classroom associated with their condition assignment before beginning the session. For studies in which classrooms were randomized to a condition (i.e., Cohorts 1-3), students remained in their classroom and the assigned condition was implemented. Data from those students assigned to the performance feedback condition were utilized for this study to conduct a secondary data analysis, resulting in a sample of 391 participants. For the purposes of the present study, a correlational design was used to examine the relationship between the amount of dosage and students' writing productivity.

Procedural Integrity and Interscorer Agreement

To assess whether the intervention procedures were implemented as prescribed, secondary research assistants observed 67% of the total sessions (n =298) using a procedural checklist to assess whether the procedures had been implemented as prescribed. The mean procedural integrity was 95% (range, 83% to 100%) and was calculated by dividing the number of procedural steps completed by the total number of procedural steps and multiplying by 100%.

To assess the scoring fidelity of the primary dependent measure, TWW, research assistants double scored 38% (n = 4, 807) of the CBM-WE probes on a word-by-word basis. The percentage of interscorer agreement was calculated by dividing the total number of agreements by the total number of agreements plus disagreements, multiplied by 100%. Results indicated a mean interscorer agreement of 98% (range, 64% to 100%) for TWW and a mean Kappa

coefficient of .962. In instances where scoring discrepancies were noted, the primary investigator of the study re-examined the probe and made a final scoring determination.

Results

Data Preparation

Data Input and Consistency Checks

The primary researcher was responsible for entering raw data into a Microsoft Excel file, which was used for initial data organization. All inputted data were double-checked to ensure the accuracy of data entry and reduce errors. Excel data were analyzed using IBM SPSS Statistics (Version 28) predictive analytics software to compute descriptive statistics, and R (R Core Team, 2014) was used to examine students' writing productivity in relation to the amount of intervention dose received.

Data Inspection

The data were checked by inspection of the residuals for outliers, homogeneity of variance, normality, multicollinearity, homoscedasticity, and linearity. With the exception of outliers and the homogeneity of variance regarding the number of sessions attended, all of the assumptions were met. Four outlier data points were identified (i.e., participants 312, 584, 594, and 602). Upon inspecting the data, it was determined that they were due to the pattern of missed dosage among these participants. Therefore, they were not removed. In addition, the homogeneity of variance was assessed using the Levene test, and the variance between the number of sessions received (continuous) and post-intervention TWW was statistically significant ($p = 0.01$). Therefore, the assumption of the homogeneity of variance was violated.

There was independence of residuals, as assessed by a Durbin-Watson statistic of 1.91. There were no studentized deleted residuals greater than ±3 standard deviations, no leverage

values greater than 0.2, or values for Cook's distance above 1. The assumption of normality was met, as assessed by a Q-Q Plot. There was no evidence of multicollinearity, as assessed by tolerance values greater than 0.1. There was homoscedasticity, as assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Finally, linearity was assessed by partial regression plots and a plot of studentized residuals against the predicted values between the baseline TWW and final session TWW. There was no linear relationship between TWW and intervention dose when visually inspecting the data by the number of sessions attended (see Figure 1); however, the number of sessions received data were not transformed because the lack of linearity was due to the assumption of homogeneity of variance having been violated ($p = 0.01$) and therefore, it was decided that transformation of the data would not help the relationship between these variables.

Descriptive Analyses

To descriptively examine the overall dosage of the intervention received across participants, the data set was examined, and the number and percentage of intervention dosages across sessions were calculated (see Table 3). Most participants (60.3%) received all six intervention sessions. However, there were a considerable percentage of participants (26.0%) who had received five intervention sessions, and another 9.2% who had received four sessions. Less than two percent of the participants received two sessions or less.

In addition to descriptively examining the overall intervention dosage across participants, I examined the dosage pattern for those participants that did not receive all six intervention sessions. Interestingly, the intervention dosage was lowest during the final intervention session. More specifically, of the 156 participants who did not receive six intervention sessions, only 107 (68.6%) received dosage during the final intervention session. The first intervention session had

the second lowest overall dosage received, as 113 participants (72.4%) received intervention dosage during that session. The remaining intervention sessions (i.e., third, fourth, fifth) had intervention dosage that exceeded 73% of the participants (range, 73.1% to 78.2%).

In an effort to explore whether there were gender differences in students' intervention dose, an independent-samples t-test was conducted to compare the number of intervention sessions received for females and males. There was no statistically significant difference in the number of sessions received for females (M = 5.41, SD = 0.85) and males (M = 5.43, SD = 0.91), t (389) = -0.245, p = 0.806). Therefore, these results suggest that there were no differences between the number of intervention sessions that female and male students received.

Further, chi-square analyses were computed to examine whether there were differences in the proportion of females and males who had received dosage across intervention sessions (see Table 4). Chi-square tests for independence with Yates' Continuity Correction indicated no significant associations between gender and whether intervention dose was received for session one, $\chi 2$ (1, N = 391) = .47, p = .49, session two, $\chi 2$ (1, N = 391) = .38, p = .54, session three, $\chi 2$ (1, N = 391) = 2.08, p = .15, session four, $\chi 2$ (1, N = 391) = .21, p = .64, session five, $\chi 2$ (1, N = 391) = .17, p = .68, or session six, $\chi 2$ (1, N = 391) = .08 , p = .78 .

Major Analysis

Mixed Effects Model

The relationship between the amount of intervention dosage received by students and their writing productivity was assessed. To do so, a mixed-effects model was conducted in R (R Core Team, 2014) using the lme4 package (Bates et al., 2007). Participants' TWW was treated as the dependent variable, the intervention dosage received was the fixed effect, and each student was treated as a random intercept, because the amount of intervention dose differed across

students, and that variation existed at random. Significance was calculated using the lmerTest package (Kuznetsova et al., 2017), which applies Satterthwaite's method to generate p-values for mixed models. The model specification was as follows: TWW ~ SessionsReceived (1|ID). Results of the analysis indicated that there was a significant main effect of intervention dosage on students' TWW (beta = 1.99, t = 16.95, $p \leq 0.001$). More specifically, the results indicated that for every extra session of the intervention received, students wrote approximately two more words.

Discussion

Despite consensus in the literature that treatment integrity is a critical component to evaluating the impact of interventions, it is often the case that central dimensions, such as dose, are not reported or evaluated in the current school psychology literature (Collier-Meek et al., 2018). The amount of treatment (i.e., dosage) necessary to produce desired changes is more difficult to assess than other dimensions of treatment integrity (e.g., adherence, quality) because time is a common barrier that cannot be controlled for. However, the importance of considering dose when implementing school-based interventions cannot be understated. This is especially true in urban school settings with a higher proportion of students eligible for free or reduced-price lunch because these students are more likely to miss school, and as a result, intervention sessions (Gottfried, 2009). However, it is rare that dosage has been given proper consideration in the school psychology literature, and it is often ignored all together (Collier-Meek et al., 2018; Dane and Schneider, 1998).

Performance feedback, which is commonly defined as the information provided by an intervention agent (e.g., teacher, peer, self) regarding an individuals' performance specific to the task or process they have been asked to complete, has been afforded considerable attention in the

literature and has a clear impact on the learning and skill development among elementary-age students (Biber et al., 2011; Eckert et al., 2006; Graham et al., 2015; Hattie and Timperley, 2007). However, no studies have examined the impact of dosage on intervention outcomes in the context of a performance feedback intervention. Therefore, the present study addresses a current gap in the school psychology literature regarding this important dimension of treatment integrity, and the primary aims of the study were to descriptively examine data regarding treatment dosage and evaluate the impact it has on intervention outcomes. Results indicated that for each intervention session received by students, they had written approximately two more words. The following discussion will explore the findings of this study and conclude with limitations and future aims.

Descriptive Characteristics of the Sample and Dose

More than half of the students (60.3%) received the full intervention dose (i.e., six sessions). Although no a priori hypothesis was proposed regarding the descriptive findings pertaining to dosage, the percentage of participants who received the full intervention dose falls below intervention adherence recommendations of 80% within the context of intervention fidelity (Hagermoser-Sanetti & Luh, 2020). This finding is particularly relevant given the importance of adherence, which is often considered foundational to successful intervention implementation. With that said, one could argue that other dimensions of integrity, such as quality, are irrelevant if students are not receiving the intervention at prescribed levels. As a result, student intervention dosage may be a primary, if not the foundational component of intervention fidelity, and efforts to address the supporting components (e.g., quality, overall adherence) may be misaligned.

An additional descriptive result of the present study indicated that students most frequently missed the last intervention session. One reason for this may be due to the time at which data collection occurred. More specifically, analyses of nationwide attendance data have found the students are absent far more often in the spring as the school year progresses (Attendance Works, 2021), therefore, more students may have missed the final intervention session due to absenteeism. This is increasingly important given that student absenteeism in the spring have been found to be associated with lower standardized test performance (Gottfried & Kirksey, 2017).

Because prior research has demonstrated gender differences in students' writing ability (Berninger & Fuller, 1992; McMaster et al., 2017; Narciss et al., 2014), the present study explored whether there were gender differences observed between the number of intervention sessions received by female and male students. The present findings suggest that there were no statistically significant gender differences regarding the total number of intervention sessions received or the pattern of attending sessions. This finding is consistent with the empirical literature that has examined the prevalence and pattern of nationwide student school attendance data (Anderson & Romm, 2020; Balfanz & Byrnes, 2012), which could be considered as a proxy for intervention dosage. Among these studies, gender differences in school attendance were not observed. As a result, it is more likely that intervention dosage plays a minimal role in the observed gender differences in students' writing ability, which may be impacted by factors such as cognitive and language skills, as well as motivational and attitudinal differences between female and male students (Berninger & Fuller, 1992; Graham et al., 2012; Kim et al., 2015; Troia et al., 2013).

To date, no study has assessed academic intervention dosage among students enrolled in urban school settings comprised of majority ethnic or racial minority classrooms (i.e., > 50% of students). The sample of the current study results reflect an urban school setting that contained a majority of ethnic or racial minority classrooms (i.e., 56.3% of the students identified as either Black or African American, or Hispanic or Latino/Latina). Therefore, the current study furthers our understanding of intervention dosage among students attending an urban school containing a majority of ethnic or racial minority students who are eligible for free or reduced-price lunch. This finding is especially relevant given the increased diversification of schools across the United States (National Center for Education Statistics, 2019), and the limited research examining factors that negatively impact students attending these schools.

The Relationship between Writing Productivity and Dosage

To date, no study has examined the effect of intervention dosage received by a student on writing intervention outcomes, which is unfortunate given the known importance of treatment integrity on intervention outcomes (Collier-Meek et al., 2018; DiGennaro Reed & Codding, 2014; Gresham, 1989; Gresham et al., 1993; Sanetti & Kratochwill, 2009). Further, despite that performance feedback interventions have been shown to have a clear impact on writing ability amongst elementary-age students (Biber et al., 2011; Eckert et al., 2006; Hattie & Timperley, 2007; Hier & Eckert, 2014), the impact of dosage has not been considered in relation to the reported findings. Rather, prior research examining the efficacy of performance feedback interventions has used statistical methods that accounted for students with missing session data via multiple imputation (Peeters et al., 2015), which is the preferred approach for addressing missing data (Peugh & Enders, 2004).

Although prior studies examining the impact of dosage within the context of mathematics interventions (Codding et al., 2016; Duhon et al., 2020) have demonstrated an impact on students' performance, no a priori hypotheses were proposed in the present study because the impact of dosage on writing intervention outcomes has never been examined. Results of the present study suggested that for each intervention session received, it resulted in greater TWW. More specifically, students, on average, were likely to write approximately two more words for every intervention session received. Therefore, the results of the current study further emphasize the importance of collecting and reporting dosage outcomes. This is an important consideration in both research and practice as it relates to performance feedback interventions. More specifically, evaluating the amount of intervention dosage necessary to produce the desired outcomes can maximize intervention implementation efficiency. Increasing the efficiency through the conservation of a valuable resource, such as time, is paramount in today's schools, as time is extremely limited (Collier-Meek et al., 2018; Domitrovich et al., 2008), and often considered a significant barrier to intervention implementation (Codding et al., 2016).

Limitations

The present study contained several limitations. First, this study utilized a correlational design and as a result, I am unable to draw conclusions about a causal relationship between the intervention dosage received and students' writing productivity. Second, because the present study relied on secondary data analyses, additional measures to improve the construct validity of dosage could not be undertaken. Based on the data collected, it was impossible to know why students did not receive intervention dosage or whether an absence of dosage was associated with additional factors (e.g., health problems, chronic absenteeism, receiving in-school services) that may have negatively impacted intervention outcomes. This is especially true in the current

study, as none of the data were collected with the purpose of experimentally examining the impact of dosage on intervention outcomes.

In addition, the determination of whether students had received intervention dosage presents an additional limitation. More specifically, whether a student had received intervention dosage was based on experimenter report of students not being in attendance for the entirety of the intervention session. That said, it is possible that some students received part of the intervention but then had to leave the session and were then noted as not being in attendance. It is also possible that some students were in attendance for the full intervention session but did not produce any writing during the CBM-WE probe, and therefore may have been mistakenly identified as not being in attendance. Although this is likely not the case, and if it is, it is only representative of a small number of students because the study procedures required all students not in attendance being marked 'absent' on their weekly writing packet.

Finally, the present study also posed several threats to external validity. First, the present study was the first to assess the relationship between the intervention dosage received by elementary-age students who were receiving a class-wide writing intervention. With that said, the data used for the present study was never collected with the intention of measuring or assessing intervention dosage. As a result, the extent to which this study reflects the impact of intervention dosage on writing intervention outcomes is limited given that the sample was comprised of entirely third-grade students who were receiving a specific type of writing intervention, that being performance feedback. Second, the data for this study was comprised of participants who were third-grade students enrolled in public, urban elementary schools in the Northeast United States from a sample of convenience. As a result, the extent to which the present findings can be generalized to the elementary school population is limited to the study's

sample characteristics.

Directions for Future Research

Results of this study demonstrated that intervention dosage was related to improved writing productivity amongst elementary-age students. These results may inspire future research studies exploring the dimension of treatment integrity known as intervention dosage, which has received limited empirical attention among school-based intervention studies. These findings highlight the importance of examining dosage as it relates to intervention outcomes. However, it is possible that the reported findings may have differed if there was more variance in the intervention dosage data, or if intervention dosage was experimentally manipulated. Thus, future studies examining class-wide interventions, such as performance feedback, should consider experimentally manipulating the intervention dosage received by participants and examining how variations in intervention dosage impact outcomes. More specifically, future research should collect data as to the amount of intervention dosage received by students and further assess factors that contribute to students receiving low intervention dosage (e.g., absent from school, receiving educational or behavioral supports outside of the classroom). Further, if researchers are choosing to impute their data, the amount of dosage received by participants should be reported prior to imputation, because, as evidenced by the present study, the dosage of an intervention received by a participant may have a significant impact on intervention outcomes. By doing so, both researchers and practitioners would have a better understanding of factors that may be preventing students from receiving full intervention dosage and the impact on academic outcomes, which in turn, may allow for more precise and efficient intervention implementation as it relates to intervention dosage.

Conclusion

Previous literature has demonstrated that although there is an emphasis throughout the school psychology literature concerning the importance of collecting treatment integrity data (Collier-Meek et al., 2018; DiGennaro Reed & Codding, 2014; Gresham, 1989; Gresham et al., 1993; Sanetti & Kratochwill, 2009), the dimension of dosage is often overlooked, or unacknowledged (Duhon et al., 2020). This gap is even more prevalent when considering the literature base regarding performance feedback interventions, which has demonstrated the utility of these interventions in improving the writing ability of elementary-age students (Hattie & Timperley, 2007; Hier & Eckert, 2014; Wisniewski et al., 2020), yet to date, no studies have assessed the impact of the dosage of a performance-feedback writing intervention received on the intervention outcomes of elementary-age students. Given the importance of the development of writing skills in early grade levels (Berninger et al., 2002), ensuring adequate treatment integrity regarding the dimension of dosage when implementing writing interventions is an important consideration. Future studies should place greater emphasis and allot more consideration towards the dosage of the intervention students are receiving and whether receiving different amounts of dosage impacts intervention outcomes to increase the efficiency of intervention implementation.

Table 1

Participant Demographic Characteristics (*N* = 391)

	Total	
Characteristic	%	(*n*)
Gender		
Female	53.5	(209)
Male	46.5	(182)
Race or Ethnicity		
American Indian or Alaska Native	.5	(2)
Asian	.5	(2)
Black or African American	49.1	(192)
Native Hawaiian or Other Pacific Islander	0	(0)
Hispanic or Latino/Latina	7.2	(28)
White	40.2	(157)
Two or More Races	1.0	(4)
Decline to Identify	1.0	(4)
Missing	.5	(2)
Special Education Eligibility		
Not eligible	91.3	(357)
Specific Learning Disability	.8	(3)
Other Health Impairment	7.4	(29)
Speech-Language Impairment	.5	(2)
	M	(*SD*)
Age	8.05	(.05)

Note. Missing the age of 9 participants.

Table 2

Curriculum-Based Measurement in Written Expression (CBM-WE) probe story starters

Probe
Describe your favorite day of the week and tell why you like it
Describe your favorite time of the year and tell why you like it**.**
I found a note under my pillow that said
I once had a magic pencil and
I opened the front door carefully and
I stepped into a time machine and
I was chewing on a piece of bubble gum when
I was on my way home from school and
I was playing outside when a spaceship landed
I was talking to my friends when all of a sudden
I was walking down the street when I saw
I was walking home when I found a $100 bill on the sidewalk and
I was watching TV when I heard a knock at the door and
If I could trade places with my teacher, I would
It was so hot outside that we
It was the last day of school so I decided to
Once upon a time there was a haunted house and
One day I found the most interesting thing
One day I went for an airplane ride and
One day I went to school but nobody was there except me so I
One day I woke up and was invisible and
One day my friend told me the strangest story
One day my mom surprised me and brought home a
One day we went to school and the teacher had turned into a
One night I had a strange dream about
One night in the abandoned graveyard
One time I was so excited that
Perhaps animals aren't supposed to talk, but
The best thing that ever happened to me was
The monster was sighted and
When we went to the zoo, we saw
Yesterday, a monkey climbed through the window at school and

Table 3

Dosage Received across Participants

	%	(*n*)
1 Session	.3	(1)
2 Sessions	1.0	(4)
3 Sessions	2.8	(11)
4 Sessions	9.2	(36)
5 Sessions	26.0	(102)
6 Sessions	60.3	(237)

Table 4

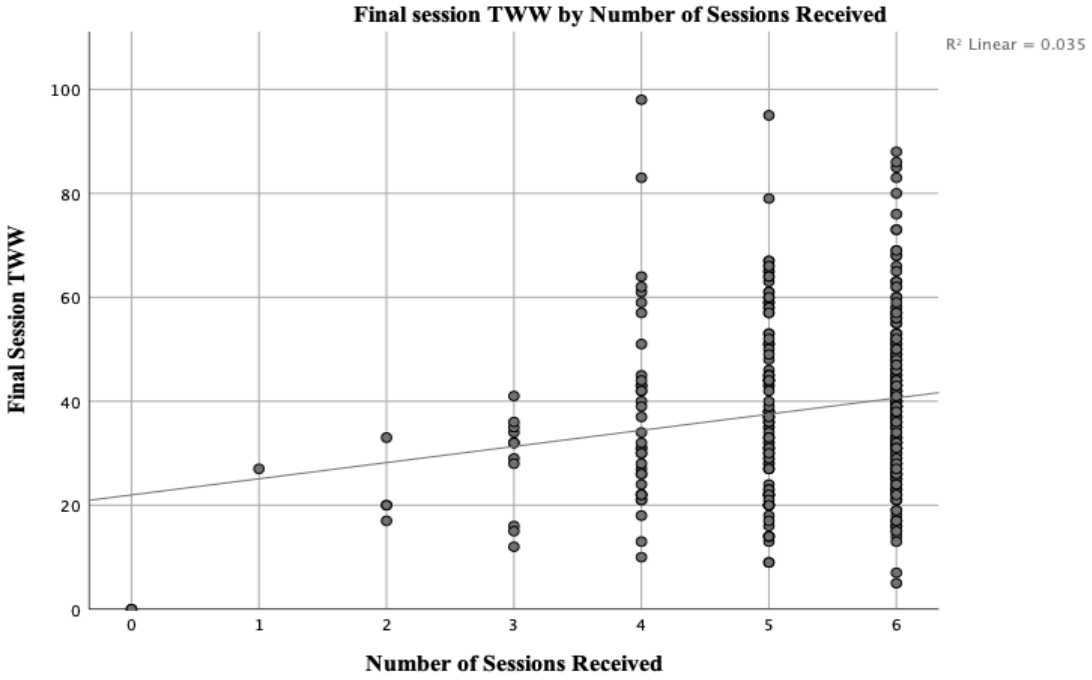
Proportion of Female and Male Students Who Received Dosage by Intervention Session

	Session 1 Received		Session 2 Received		Session 3 Received		Session 4 Received		Session 5 Received		Session 6 Received	
Gender	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
Female	88.5	(185)	91.4	(191)	89.9	(188)	90.4	(189)	92.3	(193)	87.6	(183)
Male	90.6	(165)	89.6	(163)	94.0	(171)	89.0	(162)	91.2	(166)	88.5	(161)
Total	89.5	(350)	90.5	(354)	91.8	(359)	89.8	(351)	91.8	(359)	88.0	(344)
Chi-square ($\chi 2$)	0.47		0.38		2.08		0.21		0.17		0.08	
p-value (2-sided)	0.49		0.54		0.15		0.64		0.68		0.78	
Phi	-0.04		0.03		-0.07		0.02		0.02		-0.01	

Note. Total = Number of participants who received that intervention session out of the entire sample ($N = 391$).

Figure 1

Linearity Between TWW and Dose by Number of Sessions

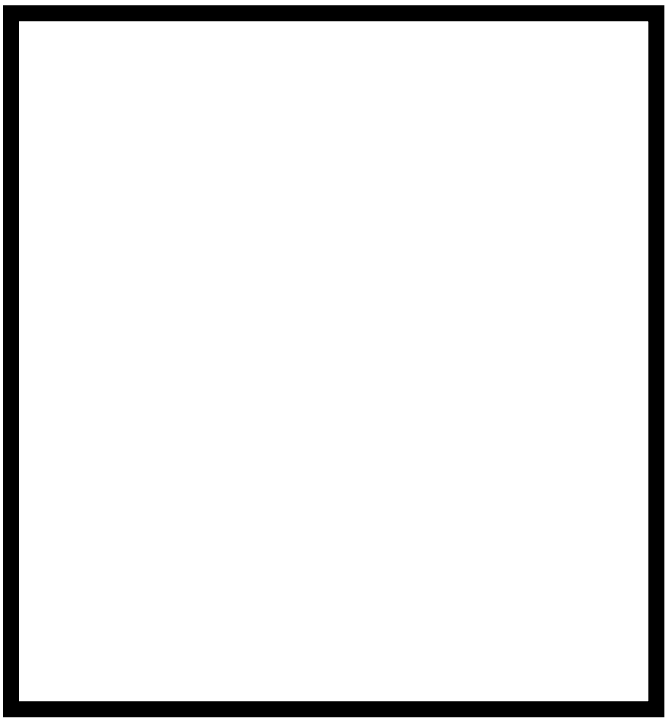


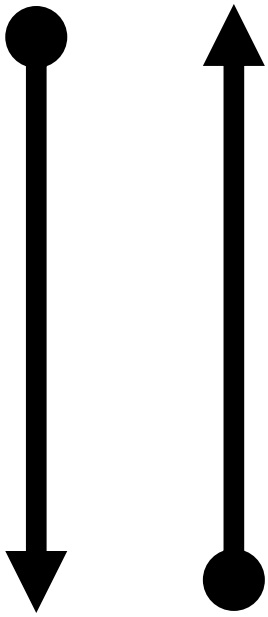
List of Appendices

Appendix A

Student Performance Feedback Sheet

Here is how you are doing in writing:





Appendix B

Curriculum-Based Measurement in Written-Expression Probe

I was talking to my friends when all of a sudden _____

Appendix C

Procedural Script for Performance Feedback

1. State to the students: "*Please turn to the next page of your packet that has a stop sign in the middle of the page. Today I want you to write a story. Before we do that, I want to tell you how you are doing with your writing skills. Last week we took all your stories back to SU and we counted all of the words that each of you wrote in your stories. Please turn to the next page of your packet. This page has a funnel with some numbers, letters, and pictures going into it at the top of the page.*"
2. Research assistant scans the room for questions and makes sure each student followed the directions.
3. State to the students: "*The box in the middle of the page [The research assistant should point to the box] tells you how many words you wrote last week. Next to the box you will see an arrow. If the arrow is pointing up towards the sky, then that means you wrote more words since the last time I worked with you. If the arrow is pointing down towards the floor, then that means you wrote fewer words since the last time I worked with you. If you have an equal sign instead of an arrow, then that means you wrote the same number of words as you did the last time I worked with you. Every week when we work with you, we are going to tell you how you are doing with your writing. Please turn to the next page of your packet. This page has a thought bubble at the top of the page."*

Procedural Script for the Remainder of the Writing Feedback Condition and for the Control Condition

1. State to the students: "*Please turn to the next page of your packet. This page has a thought bubble at the top of the page."*
2. Research assistant scans the room for questions and makes sure each student followed the directions.
3. State: *"I want you to write a short story. You will have some time to think about the story you will write and then you will have some time to write it."*
4. Research assistant scans the room for questions and makes sure each student followed the directions.
5. State: *"For the next minute think about writing a story that begins with this sentence*: **insert.** *Remember, take time to plan your story. A well-written story usually has a beginning, a middle, and an end. It also has characters that have names and perform certain actions. Use paragraphs to help organize your story. Correct punctuation and capitalization will make your story easier to read. Please do not write the story. Just think of a story that begins with this sentence:* **insert.**
6. Research assistant starts the stopwatch and times the students for **60 seconds (1 minute)**.
7. Research assistants monitor the students to ensure they are not writing the story yet.
8. After **30 seconds**, state: *"You should be thinking about:* **insert."**
9. At the end of **60 seconds (1 minute)**, state: "*Okay, stop thinking, turn to the next page of your packet that has a pencil at the top, and raise your own pencil high in the air."*
10. Research assistant scans the room to make sure all of the students are on the correct page. Assistance is provided when needed.
11. When everyone is done, state: "*Turn to the next page of your packet. It has a pencil at the top. When I tell you to start, please begin writing your story. Remember, if you don't know how to spell a word, you should try your best and sound it out. It is important that you do your best work. If you fill up the first page, please turn to the next page and keep writing. Do not stop writing until I tell you to. Do your best work. Okay, you can start writing.*"
12. Research assistant starts the stopwatch and times the students for **3 minutes.**
13. Research assistant monitors the students during the 3-minute period and makes sure students are following the directions.
14. After **1 minute, 30 seconds** have elapsed, state: "*You should be writing about:* **insert**."
15. After **3 minutes** have elapsed, state to the students: "*Please close your packets and I will come around and collect them. Thank you all for your hard work!"*
16. Research assistant ensure all students have stopped writing and collects all packets.

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CURRICULUM VITAE
SAMANTHA C. MAGUIRE

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EDUCATION

2025 (expected) Ph.D., Syracuse University, School Psychology
Graduate Student, School Psychology Program (APA and NASP approved)
Thesis: *The Importance of Treatment Integrity: Examining the Effect of Dosage on Intervention Outcomes*
GPA: 3.90

2020 B.A., (Summa Cum Laude) Siena College, Major: Psychology, Minor: Educational Studies
GPA: 3.98

PROFESSIONAL EXPERIENCE

8/21-present Department of Psychology, Syracuse University, NY
Graduate Student Clinician, Psychological Services Center
Supervisor: Dr. Afton Kapuscinski, Ph.D., Licensed Psychologist

- Provide evidence-based treatment in both individual and group settings to children, adolescents, and young adults with varying psychopathologies
- Conduct intake evaluations
- Receive supervision from licensed psychologists.

6/21-7/21 Department of Psychology, Syracuse University, NY
Instructor of Record

- Responsible for teaching four weekly classes as the sole instructor for "PSY205: Foundations of Human Behavior"
- Created a syllabus and all teaching materials, constructed assignments, activities, quizzes, and graded all student work

8/20-5/21 Department of Psychology, Syracuse University, NY
Graduate Teaching Assistant
Supervisor: Meredith J Martin, Ph.D.

- Responsible for teaching four 55-minute recitation sections on a weekly basis to cover course content and support student learning for "PSY205: Foundations of Human Behavior"
- This occurred in a hybrid model, teaching students in-person and via zoom simultaneously
- Duties also include holding office hours and grading assignments

10/18-5/20 Mentoring Program, Siena College, NY

- Assumed the role of a mentor to youths from inner-city Albany every Saturday afternoon
- Responsibilities included being present on a weekly basis and engaging in activities with children.

9/18-3/20 Educational Courses Requiring Field Experience, Siena College, NY

- Courses included: Issues in Contemporary Education, Educational Psychology, and Exceptional & At-risk Learners
- Each course required a 20-hour field experience at local schools, one of which at Shaker High School in the Special Education department
- Responsibilities included contacting teachers placed with and establishing a relationship as well as maintaining a consistent schedule of visitations.

5/18-3/20 Benton Hall Academy, Little Falls NY
Elementary School Substitute Teacher

- Substitute taught for grades K-5
- Responsibilities changed on a day-to-day basis, many included; following a lesson plan, and employing classroom management skills.

9/19-12/19 Boght Hills Elementary School, Cohoes, NY
Internship in School Psychology

- Interned eight hours a week under direct supervision of a doctorate trained school psychologist
- Duties included conducting systematic behavioral observations, helping with individual counseling sessions, and helping implement behavior plans
- Learned about standardized assessment procedures, educational plans, and other duties of the school psychologist

9/18-5/19 Childcare provider, Siena College, NY.

- By personal invitation of IRB Chair/Psychology Professor, provided paid childcare to a toddler once a month during IRB meetings for the IRB community member.
- Responsibilities included activities such as reviewing the alphabet, or drawing.

RESEARCH EXPERIENCE

8/20-present Treatment Research in Academic Competence Lab (TRAC), Syracuse University, NY
Graduate Assistant
Faculty Mentor: Dr. Tanya Eckert
Responsibilities include: attending weekly meetings, managing data input and analysis, reviewing literature on school-based research to improve children's academic skills, and co-authoring current research projects

8/20-present Research in Interventions Targeting Educational Success Lab (RITES), Syracuse University, NY
Graduate Assistant
Faculty Mentor: Dr. Bridget Hier
Attend weekly lab meetings to review coding assignments for a systematic review on writing quality

1/19-5/20 Research Assistant (Independent Study), Siena College, NY
Research Assistant
Faculty Mentor: Dr. Kristin Miller
Responsibilities included: consenting and surveying ~200 undergraduate students on test anxiety scales, excel data entry, light data analysis, and independent presentation of preliminary results via a poster at a state-wide school psychology conference.

PUBLICATIONS AND PRESENTATIONS AT PEER-REVIEWED CONFERENCES

Ash, T. L., & **Maguire, S. C.** (revise and resubmit). A scoping review of diversity training among teachers: The potential for school psychology. *School Psychology Review.*

Eckert, T. L., Hier, B. O., Circe, J. J., Goldstein, A. R., **Maguire, S. C**., & Nelson, K. A. (submitted). The Impact of Grit and Writing Apprehension on Third-Grade Students' Writing Productivity. *Psychology in the Schools.*

Hier, B. O., MacKenzie, C. K., Ash, T. L., **Maguire, S. C.**, Helminen, E. C., Masters, E. C., Finelli, C. C., Circe, J. J., Hitchings, T. J., & Sullivan, W. E. (in prep). Efffects of the Good Behavior Game on Students' Academic Engagement in Remote Classrooms During the COVID-19 Pandemic.

Eckert, T. L., **Maguire, S. C.,** Nelson, K. A., Amidon, S. Y. M., Goldstein, A. R., & Antoine, M. (in prep). Student intervention acceptability and dosage.

Eckert, T. L., Circe, J. J., Goldstein, A. R., Amidon, S. Y. M., Nelson, K. A., **Maguire, S. C**., & Antoine, M. (in prep). Comparison of paragraph and sentence writing prompts.

Eckert, T. L., Circe, J. J., Goldstein, A. R., **Maguire, S. C**., & Nelson, K. A. (2022, February 15-18). *Impact of reading comprehension on elementary-aged students' writing performance.* [Poster presentation]. National Association of School Psychologists, Boston, MA, United States.

Hier, B. O., Eckert, T. L., Hitchings, T. J., Circe, J. J., Watts, E. A., Finelli, C. C., **Maguire, S. C**., & Nelson, K. A. (2022, February 15-18). *Writing quality assessment: Preliminary results of a systematic review.* [Poster presentation]. National Association of School Psychologists, Boston, MA, Unites States.

Eckert, T. L., Hier, B. O., Circe, J. J., Goldstein, A. R., Eggleston, B. N., **Maguire, S. C**., & Nelson, K. A. (2021, February 23-26). *Association between writing productivity, writing apprehension, and grit*. [Poster presentation]. National Association of School Psychologists, Virtual Convention.

Hier, B. O., Datchuck, S. M., Eckert, T. L., Watts, E. A., Circe, J. J., Hitchings, T. J., Goldstein, A. R., Finelli, C. C., **Maguire, S. C**., & Nelson, K. A. (2021, February 23-26). *Validity and Classification Accuracy of Curriculum-Based Measurement of Sentence Construction.* [Poster Presentation]. National Association of School Psychologists, Virtual Convention.

Miller, K. & **Maguire, S.** (2020, February 18-21). *Test anxiety: Advances in understanding and implications for multi-tiered programming.* [Poster presentation]. Annual conference of the National Association of School Psychologists, Baltimore, MD, United States.

Miller, K. & **Maguire, S.** (2019, October 17-19). *"We SHOULD be nervous?!" The role of student expectations for arousal in understanding and preventing test anxiety.* [Poster presentation]. Annual conference of New York Association of School Psychologists, Syracuse, NY, United States.

PROFESSIONAL DEVELOPMENT

9/21-present Future Professoriate Program - Certificate in University Teaching, Syracuse University.
9/21-present Women in Science and Engineering – Future Professoriate Program, Syracuse University.

COMMITTEE INVOLVEMENT

10/21-present Psychology Action Committee, Events Comittee
9/20-present Communications Committee, School Psychology Program, Syracuse University.
9/20-present The Committee for Social Justice, Inclusion, Diversity, and Equity (SIDE), Syracuse University.
9/20-present Committee for Diversity and Inclusion by Psychology Doctoral Students, Syracuse University.

PROFESSIONAL AFFILIATIONS

6/21-present	Graduate student affiliate member, American Psychological Association (APAGS)
9/20-present	Student member of the National Association of School Psychologists (NASP)
9/19-present	Student member of the New York Association of School Psychologists (NYASP)

HONORS

3/19-5/20	Psi Chi, the International Psychology Honor Society, Siena College, NY
9/17-5/20	Presidential Scholarship, Siena College, NY.

RELEVANT COURSEWORK

Siena College: Psychology of Learning, Issues in Contemporary American Education, Adolescence and Schooling, Educational Psychology, Psychology in Schools, Exceptional and At-Risk Learners, Research Methods I, Sociology of Education, Tests and Measurements, Gender, Culture, and Schooling

Syracuse University: Introductory Seminar in School Psychology, Principles of Applied Behavior Analysis, Cognitive and Affective Bases of Behavior, Child and Family Interventions, Behavior Therapy Practicum, Lifespan Developmental Psychology, Statistics & Research Design I, Consultation Processes, Developmental Psychopathology, Direct Academic Assessment, Statistics & Research Design II, Consultation Practicum.