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The effects of "Handwriting without tears®" with consequences on the handwriting skills of appropriate size, form, and tool for a five year-old student with a developmental delay

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Abstract
The ability to write one's own name legibly is a critical lifelong skill for academic success. The purpose of the present study was to evaluate the effects of the *Handwriting Without Tears*® program on teaching a five year-old how to write his first name using proper size, form, and tool. The participant was a five year-old boy enrolled in a self-contained special education preschool setting. A multiple baseline design across letters was employed. The overall success of the procedure led to the continuation of the intervention. The participant enjoyed the procedure and improved his academic skills.

Keywords: Handwriting Without Tears®, Developmental Delays, Multiple Baseline Design, Preschool Child, Handwriting, Fine Motor Skills, Classroom Research, Multiple Baseline Design

Introduction

Handwriting is an important skill that is typically taught in early primary years when children have the developmentally appropriate fine motor skills (Graham, 1999; Graham, S, Harris, & Fink, 2000). Handwriting is further a necessary skill to support elementary school the success of children since much of the work required of students in elementary school must be handwritten; therefore, teaching pre-academic handwriting to preschoolers is crucial (Delegato, McLaughlin, Derby, & Schuster, 2013). Handwriting is a difficult and complex set of skills that requires an intricate exchange of cognitive and visual motor skills, hand strength and fine motor ability (Donica, Larson, & Zinn, 2012). According to several authors (Berninger, Vaughn, Abbott, Abbott, Rogan, Brooks, Reed, & Graham, 1997; Graham, 1999, 2010; Graham, Harris, & Fink-Chorzempa, 2002), handwriting remains a highly functional skill used across multiple educational settings. One foundational skill required before functional writing can occur is It has been suggested for the learner to be able to appropriately size and form his letters with the proper tool. About 31% to 60% of a student's school day is spent engaging in fine motor related activities, involving mostly written tasks (McHale & Cermak, 1992; Griffith, McLaughlin, Neyman, Donica, & Toone). Finally, it has been suggested that environmental factors that may be inhibiting their students abilities to learn to write legibly (Donica, 2010a, 2010b).

Various classroom-based procedures have been employed to improve the handwriting of students and these have varied from extra time for instruction in handwriting (Graham, Harris, & Fink, 2000), tracing (Gutting-McKee, McLaughlin, Neyman, & Toone, 2013), prompting and consequences (Caletti, McLaughlin, Derby, & Rinaldi, 2012), tracing, modeling and worksheets (Maricich, McLaughlin, Derby, & Conley, 2012; Thompson, McLaughlin, Derby, & Conley, 2012) to packaged curriculum developed to develop specific skills in handwriting from preschool through sixth grade (Donica, 2010a, 20110b). These have included such curricula in part or whole, as *Handwriting Without Tears*® (HWT®) (Olsen, & Knapton, 2006, 2013). HWT® is a structured program that has been developed to teach handwriting using the procedures and pedagogy from occupation therapy. It is a self-contained program that has been widely employed for both general as well as special education by teachers and occupational therapists (Donica et al., 2012).

Finally, HWT® can be appropriate for all learning styles and is able to do so in a fun and exciting way to teach handwriting to children.

There have been several recent evaluations of HWT in the peer-reviewed literature. For example, Cosby, McLaughlin, Derby, and Huewe (2009), employed a tracing and modeling technique derived from the HWT® program. They found that their technique was effective in improving a preschool-aged student's handwriting resulting in a final outcome of the participant's ability to correctly write all the letters in her name. Coussens, McLaughlin, Derby, and McKenzie (2012) reported the use of the HWT® program increased in their participant's letter writing legibility. Although not directly assessed, the authors subjectively felt that instruction in handwriting led to the improvement for their participant in spelling, writing, and reading. Also in their view, the HWT® materials helped challenge the participant by expanding on his prior knowledge and strengths. Because the participant was unable to properly size and form his letters with the appropriate tool, the HWT® curriculum reinforced and adequately supported the target goal of writing his first name with proper size, form, and tool. Morris, McLaughlin, Derby, and McKenzie (2012) were able to implement HWT® activities and materials including Mat Man, drawing a person with 16 parts for body awareness, to improve the prewriting skills of preschoolers. Finally, Lebrun, McLaughlin, Derby, and McKenzie (2012) were able to implement HWT with 31 preschool students enrolled in an integrated preschool. Using an interrupted times series design, these students improved the performance in handwriting.

Griffiths, McLaughlin, Donica, Neyman, and Robison (2013) evaluated and measured the effectiveness of HWT® modified gray block paper with letter writing on two preschool students diagnosed with developmental delays in pre-academics. Both students were selected from a self-contained special education preschool classroom. The gray block paper intervention was used to teach both students how to write the letters in their first names. By the end of data collection, both participants were able to write the letters in their names with increased legibility. Delegato et al., (2013) were able to teach five preschool students handwriting employing HWT strategies with a handwriting racetrack. The addition of the handwriting racetrack was an additional procedure to provide the participants additional practice. All found students improved their handwriting performance.

The overall purpose of this study was to evaluate the effects of the HWT® program on the correct size, form, and tool for the handwriting of letters with a five year-old boy with a developmental delay. An additional purpose was to attempt to provide an additional evaluation and replication of employing HWT® in another elementary school and different classroom.

Method

Participant and Setting

The participant was a five year-old preschool student identified with developmental delays in cognitive, physical (fine motor and gross motor), communication, social/emotional, and adaptive skills. The participant's delay in fine motor development made it difficult for him to access and utilize academic tools, toys, and manipulatives impacting his independence and success in an educational setting. The participant lived with both his biological parents and had much support from his mother and grandmother. The participant had the ability to recognize, identify, and print the letters in his first name. However, he had issues in handwriting in terms of consistency and appropriate size, form, and tool (pencil). The participant also had delays in the area of his social/behavioral development. He was not yet able to respond to instructions given in a large group and initiate an appropriate task without being reminded.

We made use of the participant's cooperation and desire to learn in a one-on-one setting, emphasizing the need for accommodations and modification in this domain. The participant showed an increase in positive vocalizations since he was introduced to an augmentative communication device (ACD), the iPod touch for a trial period. Prior to the learner's trial period, his vocalizations were limited to highly preferred snacks and frustrations with peers. Since receiving the ACD, the learner was initializing verbal output. The participant used the iPod touch to participate in the present study.

The study took place in a half-day self-contained special education preschool from 12:30 to 3:00 p.m. Monday thru Thursday in a low-income urban elementary school in the Pacific Northwest. There were a total of additional 12 students in the class during the entire afternoon session. The study was conducted initially from 12:00 to 12:30 p.m. three days a week before the afternoon session started. The first author asked the participant's mother to bring him in early due to his inability to stay focused in a louder environment. After two weeks of having the participant come in early, the first author continued with the study during the participant's entry task from 12:30 to 1:00 pm every day of the week. At this time, the first author and participant remained a part of the classroom environment but worked at a table that was further removed from the rest of the class. Additionally, the first author seated the participant so that his back was to the free play activities. This classroom has been the setting for additional research employing DI flashcards with preschoolers (Delong, McLaughlin, Neyman, & Wolfe, 2013).

Materials

The materials used in this study included a Picture Exchange Communication System (PECS) visual schedule made by the fourth author. This schedule was presented to the participant after each learning task was completed. A pre-test and post-test were administered at the beginning of each learning segment by providing the participant with the visual prompt "Name: _____" paired with the instructional cue "Write name." As mentioned previously, the participant had an Augmentative Communication Device (iTouch) that was used to communicate throughout the intervention. The participant's reward was access to the classroom iPad (Appendix F). A pencil grip was also provided.

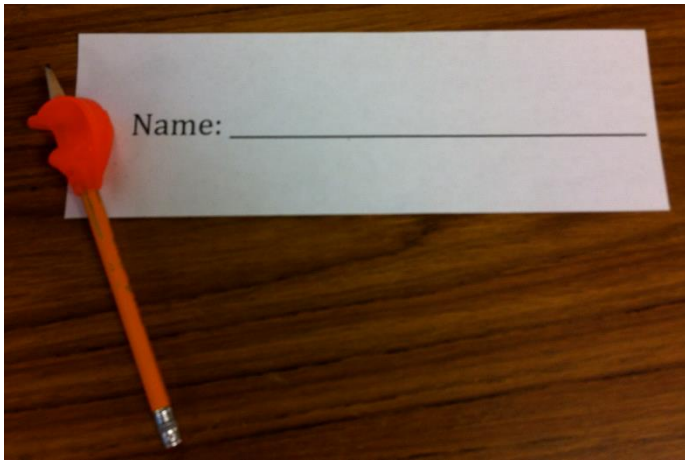
The *Handwriting without Teas*® "Letters and Numbers for Me" book designed for the kindergarten student was used. The non-laminated pages from this book used in the study included the capital letter pages for the participant's name with worksheets included a non-laminated *Handwriting Without Tears*® worksheet for each letter in the participant's name with additional visual prompts (dotted

lines and highlighter) and a laminated *HWT*® worksheet for each letter in the participant's name with additional visual prompts (Appendix C). The first author created upper and lowercase box-controlled worksheets to match the *HWT*® kindergarten standards - 1 inch for uppercase letters and ½ inch for lowercase letters (Appendix D). A portfolio sleeve was also used for additional practice by putting the box-controlled worksheets in the sleeve to be used with a dry-erase marker as an additional practice strategy. The laminated blank sheet of paper and the transparency was also presented to teach the concept of match and does not match.

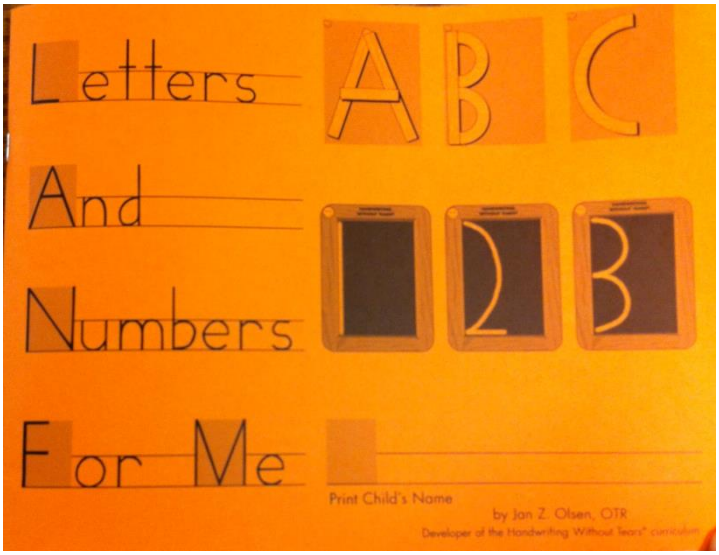
Data Collection: Primary Learning Target

Session	Lesson	Letter	Criterion: 1 point each		
1			Size:	Form:	Tool:
2			Size:	Form:	Tool:
3			Size:	Form:	Tool:
4			Size:	Form:	Tool:
5			Size:	Form:	Tool:
6			Size:	Form:	Tool:
7			Size:	Form:	Tool:
8			Size:	Form:	Tool:
9			Size:	Form:	Tool:
10			Size:	Form:	Tool:
11			Size:	Form:	Tool:
12			Size:	Form:	Tool:
13			Size:	Form:	Tool:
14			Size:	Form:	Tool:
15			Size:	Form:	Tool:

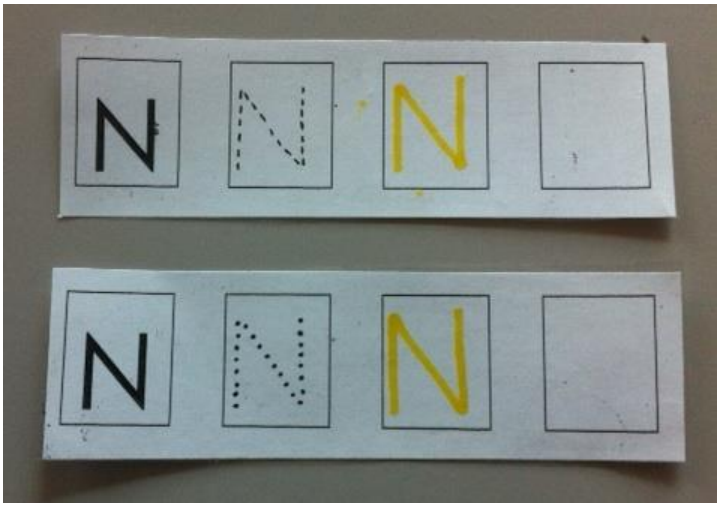
Appendix A: Our Data Collection Sheet.



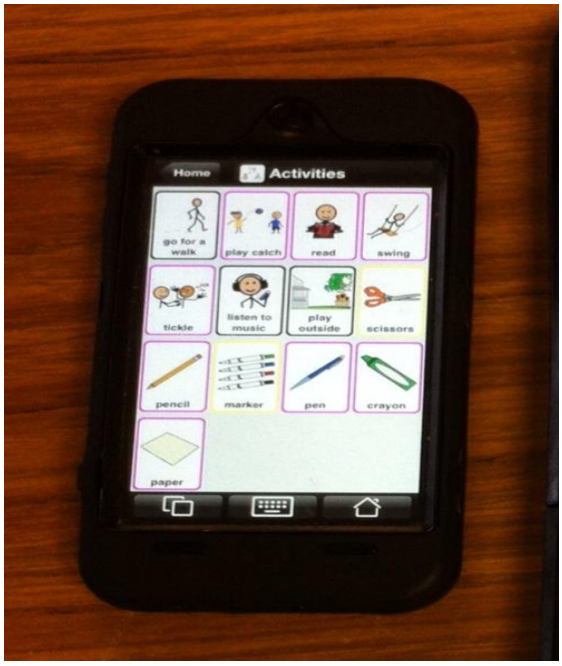
Appendix B: Pre and Post Test.



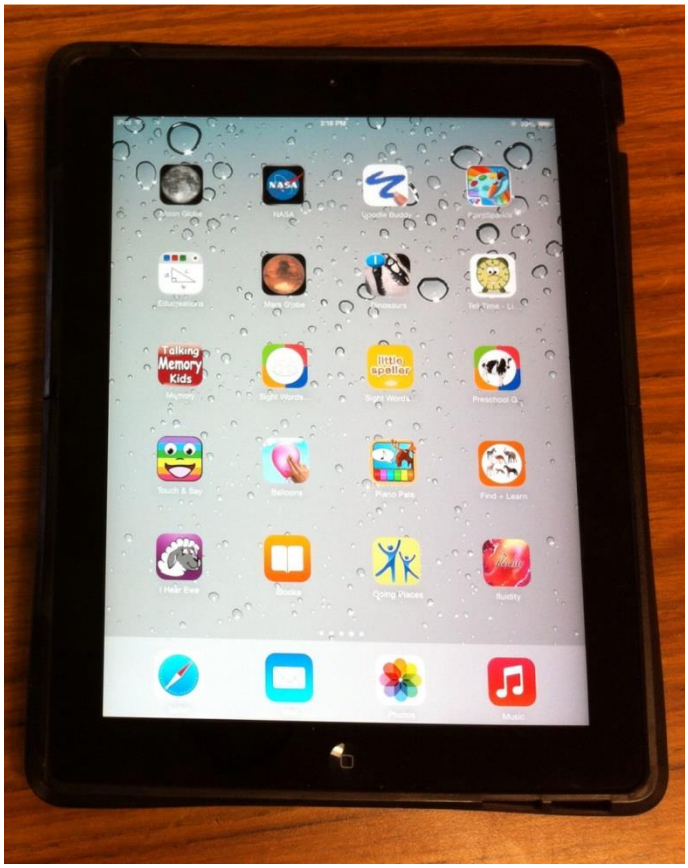
Appendix C: Handwriting Without Tears® Worksheet from "Letters And Numbers for Me" Workbook.



Appendix D: Size-controlling box worksheets (used for letters N, O, A).



Appendix E: The participant's ACD (iPod touch) used during intervention to communicate.



Appendix F: The classroom iPad used as the reward for the participant.

Dependent Variable and Measurement

The dependent variable for this study was the number of handwriting points per letter (4 different letters) using the letters in the participant's first name. One point was awarded for appropriate size, another point for appropriate form, and finally one for tool. Size and form were defined according to the kindergarten standards outlined in the *HWT*® program. Correct responses were determined by the *HWT*® standards as mentioned above for size and form.

Data Collection and Interobserver Agreement

Following each session with the participant, the first author presented the participant with a piece of paper with visual cues to write first name. The participant received one point each for appropriate size, form, and tool. The participant had four letters in his name and thus had the opportunity to earn a total of 12 points by the end of the intervention. Interobserver agreement was conducted once during baseline and 23 out of 23 times during the *HWT*® intervention. Interobserver agreement was calculated by having a colleague of the first author independently determine the number of correct and incorrect responses. The first author's data and the interobserver data were compared to determine the percent of interobserver agreement. The percent of interobserver agreement was determined by dividing the smaller number of correct response from one observer by the larger number of correct response from the second observer and then multiplying by 100. The percent of sessions that had interobserver agreement was 43%. The average interobserver agreement was 90% and the range was 65% to 100%.

Experimental Design

A multiple baseline design across four sets of individual letters (Kazdin, 2011; McLaughlin, 1983) one letter per set, was used to evaluate the effects of a *HWT*®-based intervention on correctly printing the letters in his name in title case. Two days of baseline were taken with all sets. The first author began intervention with the *HWT*® program but after 5 days of intervention for set 1, a phase change occurred in which a overhead transparency and the concept of "match" and "does not match" was introduced. After session 5, intervention for Sets 1, 2, 3, and 4 included all strategies listed above. Set 2 had 11 days of intervention using all the strategies listed above, set 3 had 5 days of intervention, and set 4 had not yet met criteria for intervention. The decision for intervention of set 1 was shown after there were zero correct responses for two consecutive sessions. For set 2 and 3, the previous intervened set had to show three correct responses for three consecutive sessions.

Baseline: During baseline, the first author gave the participant a blank sheet of paper and a pencil. The participant was prompted with the instructional cue, "Write name." The participant was given gestural and verbal prompts to redirect him to the task. No direct feedback regarding the participant's performance was given. Specific praise and high fives were given for overall effort and responding to the task.

Handwriting without Tears® on handwriting skills: The *Handwriting Without Tears*® program was utilized to teach the participant how to properly size and form the letters in his name. "Letters and Numbers for Me" was the kindergarten workbook that identifies kindergarten standards (Olsen & Knapton, 2002). This program is the only district-approved curriculum for handwriting in the participant's school district. For each session, one letter was introduced. The teacher presented several writing tasks. The first was the *HWT*® page for the letter being introduced for that day. The worksheet provided a step-by-step procedure for how to properly form the letter. *HWT*® had child-friendly language to help learners understand how to form letters. The verbal instructions was modified by the first author to fit the communication skills of the participant. For example, for the letter *N*, the teacher said, "big line down, frog jump, slide down, up." For the letter *o*, the teacher said "magic c, keep on going, stop." For the letter *a*, the teacher said "magic c, up like a bump, slide down." For the letter *h*, the teacher will say "down, up and over, down" (Olsen, 1998, "Letters and Numbers for Me", 2002). The first author modeled the correct verbiage as she demonstrated the formation of the letter. The participant quickly learned the verbiage and would say it as he was writing.

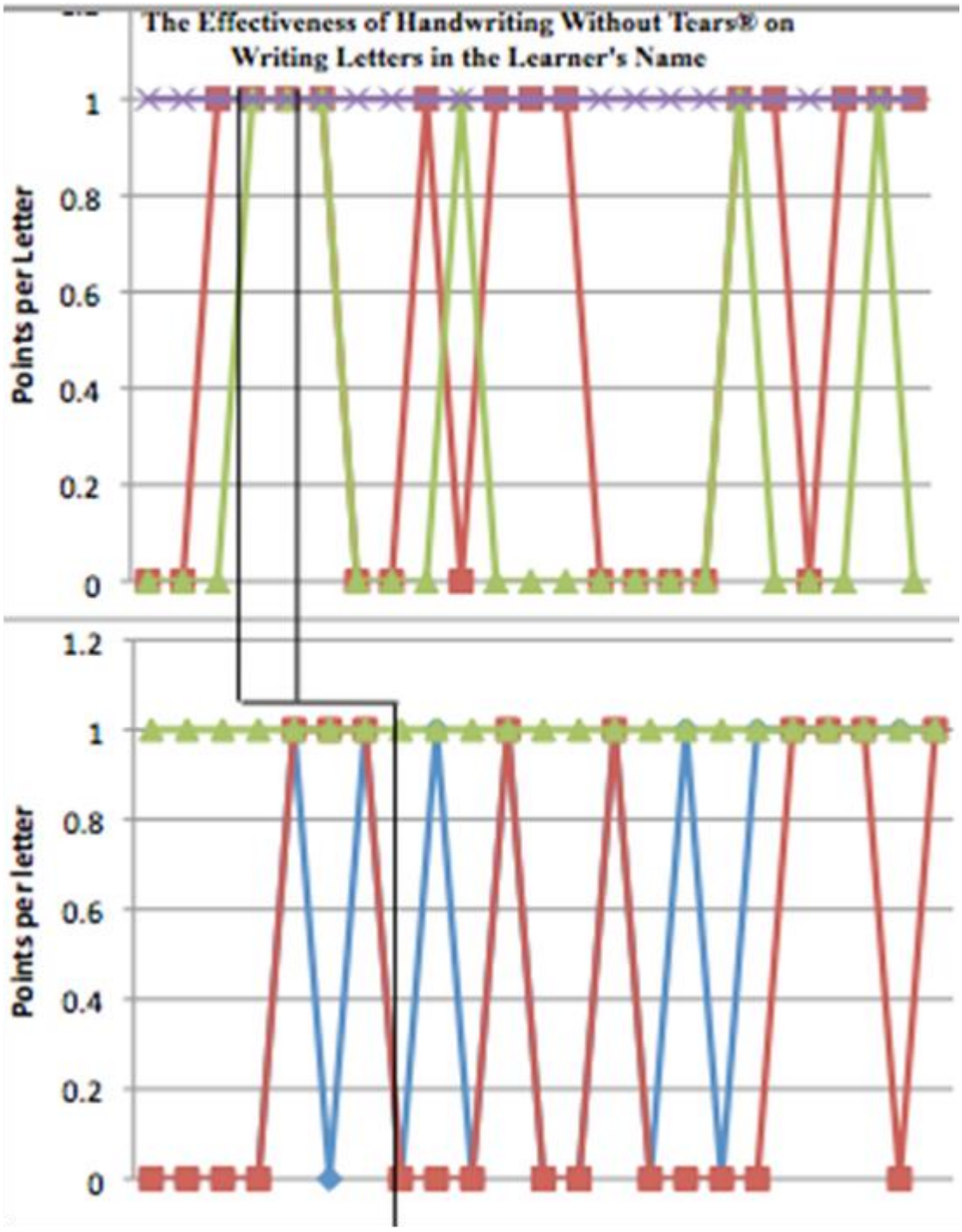
The other writing tasks given during a session included size-controlling boxed worksheets that followed the *HWT*® curriculum. The same size-controlling boxed worksheets were given in a portfolio sleeve to provide the participant with exposure to different writing utensils and surfaces.

After five sessions of teaching the participant set 1 (letter N), the first author saw no improvement. It was decided that the use of a transparency would benefit the participant so he could compare his writing to the teacher model. This session was further modified to teach an additional

component to help the participant better understand how to form the letter N. The concept taught was a comparison of same and different, using the vocabulary "match" and "no match" because it more appropriately fit the participant's developmental level. To teach this concept, the teacher showed her a modeled letter N on a transparency and placed it on top of the participant's printed letter. The participant was then asked if his N looked the same or different as the model. This procedure continued as all other sets were introduced. Specific praise and high fives were given for appropriate responses in addition to access to the classroom iPad.

Results

The results of this study are displayed in Figure 1. For Set 1, the mean number of correct responses during baseline was 0. The mean number of correct responses during the *HWT*® intervention was 0.75 (range was 1 to 3). Once the transparency and concept of match and no match was added after Session 5, the mean average of correct responses was 1 (range 1 to 3). The number of correct responses during Set 2 baseline was 0, with the mean average of correct responses was 0.2 (range 1-3). The number of correct responses during Set 3 baseline was 0, with the mean average of correct responses was 0.5 (range 1-3). The number of correct responses during Set 4 baseline was 0.0, and intervention did not occur on Set 3.



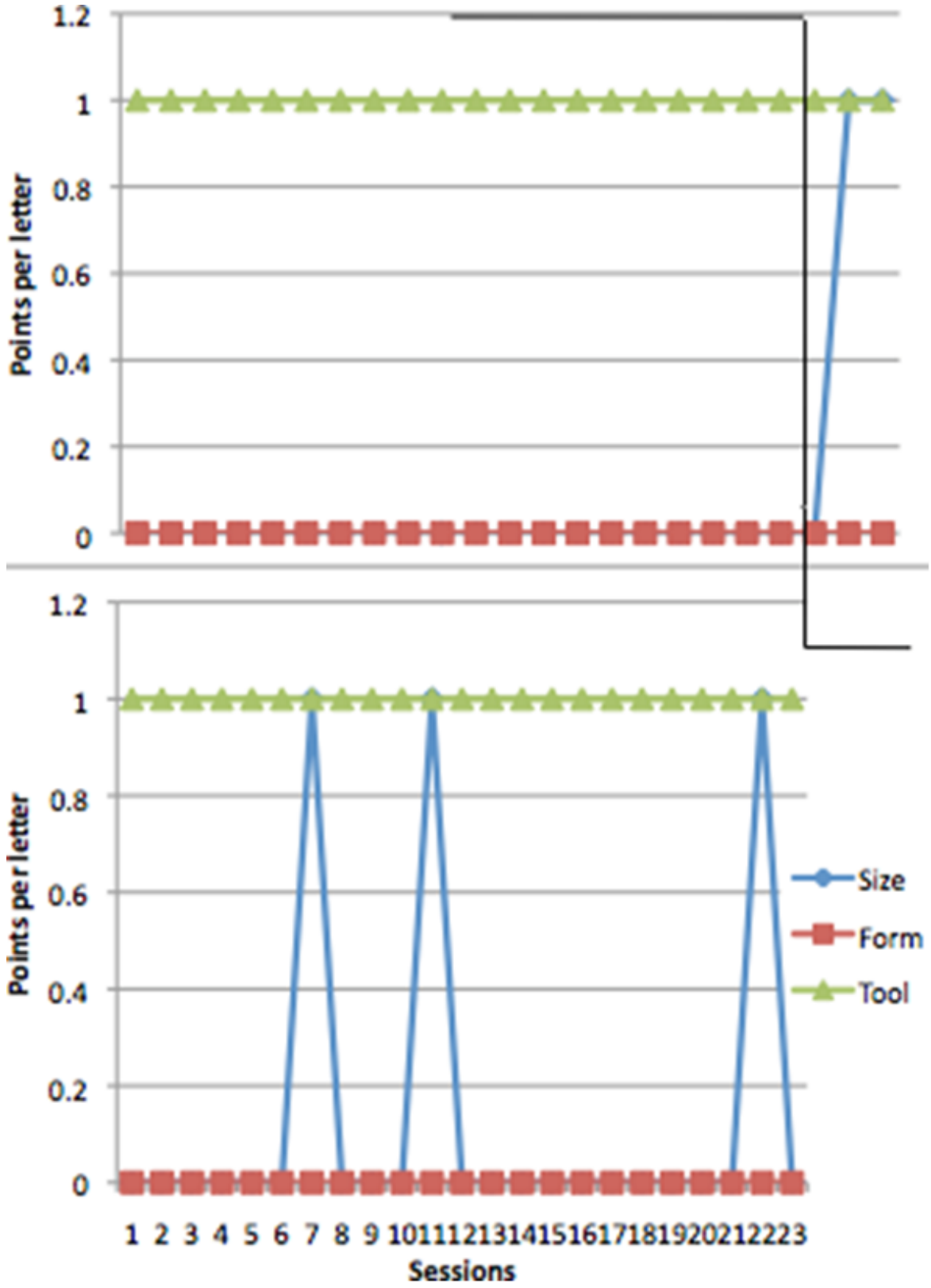


Fig 1: Results of the number of appropriate size, form, and tool for letters in the participant's first name during baseline and HWT for each set.

Discussion

Though the first authors were unable to intervene on Set 4, the participant made significant improvements in learning how to appropriate size and form the letters in his first name. More substantial improvements were seen after the transparency and concept of match and no match were introduced. Prior to the intervention, the participant had no consistent ability to write his name with appropriate size, form, and tool. After conversations with the participant's Special Education teacher and the occupational therapist and considering IEP goals, it was determined that teaching the participant how to appropriately size and form his letters would be an ideal target skill.

The first author began using the *HWT*® worksheets plus size-controlling boxed worksheets to teach the participant appropriate size and form according to the kindergarten standards, identified from the *HWT*® curriculum. After 5 sessions, the first author noticed no improvement in the

participant's letter writing for Set 1. The first author reevaluated the intervention and decided to add the additional component of the transparency and concept of match and no match. Within 3 sessions after session 5, the participant had mastered Set 1. Intervention was then able to begin on Set 2.

The participant was often more focused on Tuesday - Thursday because on Mondays, he came from outside speech therapy. In addition to the therapy, the participant's dad dropped him off and picked him up at school. The rest of the week the participant got dropped off and picked up by his mom. Due to the difference in routine on Mondays, the first author attributed the participant's lack of focus to those reasons.

Specific verbal praise, high fives, and access to the classroom iPad were used as reinforcers for the participant. Added enthusiasm and immediate specific praise as a result for appropriate responses were crucial for the participant and led to an overall improvement in performance. This helped the participant identify and understand correct responses.

The first strength of this study was the rapport and positive relationship the first author established with the participant. Prior to the start of the study, the first author made particular effort to interact with the participant in various learning environments within the school day. During the study, the participant came in 30 minutes before the school day began. This allowed for a quiet learning environment for instruction to take place and for rapport to continue growing. Another strength was the consistency and regularity of data collection. Data was taken at least once a day to evaluate the participant's progress. The use of the HWT® worksheets were effective because of the verbiage used to teach the participant how to form the letters in his name. The participant independently stated the HWT® prompts to help facilitate his own learning and progress. The size-controlling box worksheets that supplemented the *HWT*® worksheets helped reinforce proper size and form for letter writing.

The limitations of this study included the time needed to fully teach the participant how to appropriately form and size all the letters in his first name. The preschool setting of the participant was only open Monday-Thursday. The participant often regressed over the three-day weekends. Another limitation was the lack of emphasis placed on maintenance of letters previously taught once a new letter was introduced. The participant became inconsistent with his letter writing for previously learned and taught letters in his name, therefore he showed regression for maintenance of letters.

To continue the study, the first author would recommend that a component for maintenance be added to the intervention. Since the participant required daily practice for previously taught letters, we would recommend that data collection and along with this procedure be implemented twice a day with each session lasting no more than 20 minutes. Lastly, the first author would recommend creating homework packets with the *HWT*® worksheets and additional practice for writing his name to be sent home with the participant. The first author knows that the participant's mother would work on these skills at home. This recommendation is particularly crucial because the school year is almost over and the participant will have three months off. As mentioned previously, the repetition and added practice is necessary for the participant to fully maintain this skill. The first author thoroughly enjoyed working with the participant and is looking forward to finishing out the school year with him.

The present outcomes replicate much of our prior research using some or most of the materials from *HWT*® in preschool classrooms (Cosby et al., 2009; Delegato et al., 2013; Griffiths et al., 2013; LeBrun et al., 2012; Thompson et al., 2012). We have been successful implementing HWT® in small rural districts or large urban school districts. Clearly, it appears time to have other researchers implement and evaluate HWT in different or contrasting settings.

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Ms. Aoyama is now teaching early childhood special education in the Fort Collins Colorado Public Schools. Requests for reprints may be addressed to the authors, Department of Special Education, Gonzaga University, Spokane, WA

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