HANDWRITING ABILITIES OF LOW-SES ELEMENTARY STUDENTS COMPARED TO GRADE-LEVEL EXPECTATIONS

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Introduction

This research study focuses on handwriting legibility, due to its contribution to overall academic success. There is increased susceptibility for low-socioeconomic (low-SES) status students to struggle with handwriting. The academic interruption ensued by the COVID-19 pandemic puts low-SES students at a unique risk of limited handwriting acquisition. To offset a widening opportunity gap among students, low-SES students should receive quality handwriting education and intervention. This study utilized the Handwriting Without Tears Screener of Handwriting Proficiency, which indicated the majority of second, third, and fourth grade students in the low-SES sample population did not meet grade-level expectations for handwriting. The mean score for handwriting placement, in particular, was consistently the lowest component score across all grade levels in the low-SES sample.

Background

The COVID-19 pandemic has impacted millions of elementary students in the United States. Since the start of the pandemic, almost 15.5 million children in the U.S. have tested positive for COVID-19 as of March 2nd, 2023 (American Academy of Pediatrics, 2023). In March of 2020, schools in every state closed, and it is estimated that 1.5 million North Carolina students were immediately impacted by school closure (Ballotpedia, 2020; Common Core of Data, 2017). In North Carolina, this loss of instructional time has caused significant learning losses (The World Bank, UNESCO and UNICEF, 2021). The North Carolina Department of Public Instruction found the pandemic had a negative impact on student progress for all students, for all grades, and for almost every subject (North Carolina Department of Public Instruction, 2022).

As schools shifted to emergency remote online teaching, new procedures did not account for the needs of marginalized communities (Aguliera & Nightengale-Lee, 2020; Friedrich & Perrotta, 2022). Economically disadvantaged communities struggled to provide support for learning at home, as children were removed from traditional educational and recreational contexts. During this academic interruption, hindrances to education included limited access to childcare and to online instruction (Garcia & Weiss, 2020, pgs. 22-23). This is especially concerning considering that children from economically disadvantaged backgrounds have a higher risk of academic, social, and psychological challenges. Additionally, the COVID-19 pandemic has widened the pre-existing opportunity gaps associated with access to basic needs such as food and shelter (Garcia & Weiss, 2020, pgs. 18-22).

Children of low-socioeconomic status are predisposed to be more impacted by academic interruption. Being of low-SES in childhood impacts one's academic career, with handwriting having a significant positive correlation with academic success (McCarroll & Fletcher, 2017). Satisfactory handwriting is important for students to demonstrate their knowledge and produce academic achievements, as well as to foster a sense of competence (Roberts et al., 2014). Handwriting involves complex motor learning as it integrates visual-perceptual skills and fine motor skills with cognition (Stevenson & Just, 2014). As referenced by McMasters and Roberts (2016), handwriting has a strong positive correlation with reading outcomes, as well as math, spelling, and science retention in later academic years (Clark & Luze, 2014; Grissmer, et al., 2010; McMaster & Roberts, 2016). Handwriting is a significant childhood occupation and is essential for effective communication throughout one's lifespan.

Research has shown there is a strong connection between a student's socio-economic status and handwriting. Students of low socioeconomic status have differences in handwriting ability and are at a disadvantage during written examinations as both speed and neatness contribute to grading (Graham et al., 2011; O'Mahoney et al., 2008). O'Mahoney found that students who were economically disadvantaged had handwriting speeds comparable to the economically privileged students who were

two grades below them (O'Mahoney et al., 2008). Pre-pandemic, children spent 18-47% of class time on fine motor activities within the classroom, with handwriting being factored into 84% of these activities (McMaster & Roberts, 2016). Since handwriting plays a central role in the classroom, students who write slower may struggle to complete assignments within the time constraints of the school day (Engel-Yeger, 2009). When students lack these automatic handwriting skills, they must utilize more cognitive energy and the quality of writing is decreased (McCarney et al., 2013). Due to the importance of handwriting to produce academic achievements, students with handwriting difficulties are less likely to meet curriculum requirements overall. When students do not meet academic standards, their self-esteem and perceived competence may suffer (Engel-Yeger, 2009). Failure to meet academic standards exacerbates the academic, psychological, and social challenges already faced by low-SES students.

School-based occupational therapists often receive referrals for students with handwriting difficulties. Using a consultative approach, the occupational therapist works with the student and teacher to identify issues in the motor, sensory, psychosocial, or cognitive aspects of handwriting (Stevenson & Just, 2014). The primary instructor of handwriting skills in the classroom is the teacher, however, teachers often feel unequipped to provide quality handwriting instruction (Donica, Larson, & Zinn, 2012). The Handwriting Without Tears (HWT) program was created by occupational therapists (Ahuja, 2013), providing evidence-based, multisensory handwriting instruction at the classroom or institutional level (Donica, 2015). The Screener of Handwriting Proficiency (SHP) utilized within the HWT program targets the measurable printing skills: memory, orientation, placement, and sentence skills. The screener's entry level expectation for second grade is that students are able to print all capital letters, numbers, and a four-word sentence. Their first and last names are also expected to be in title case. As students prepare to learn cursive writing, it is expected that children will be proficient in all printing skills upon entry into third grade. This includes the ability to print all letters, numbers, and a four-word sentence, as well as have written their first and last names in title case (Learning Without Tears, n.d.a).

Purpose of the study

The purpose of this research study is to measure the handwriting abilities of elementary students compared to grade-level expectations. This is to help teachers know what they can target to help their students.

Hypothesis

Using the Screener of Handwriting Proficiency with second, third, and fourth graders will show a need for handwriting remediation across all ages.

Methodology

Participants

Participants were 53 second, third, and fourth graders from the ECU Community School (ECUCS). ECUCS is a laboratory school of East Carolina University, formed in partnership with Pitt County Schools in 2017. ECUCS functions with the goal of supporting the whole child through innovative teaching methods (ECU College of Education, 2023). The entire school population is 120 students and 95% of students transferred from a low-performing school. Ninety-two percent of the school population is at the poverty level according to the federal definition and most students are considered academically at-risk. Based upon the school's administration of a biopsychosocial screener, 82% of the students have experienced at least one adverse childhood experience, with 26% of students having experienced four or more adverse childhood experiences. The ethnic background of the student population is 96% African American, 1% Asian, 1% Hispanic, 1% 2 or more races, and 1% White (T. Cole, personal communication, February 10, 2023).

Instrument

The Handwriting Without Tears Screener of Handwriting Proficiency (SHP) is a handwriting assessment tool used by educators to identify students in need of handwriting remediation. The SHP can be administered to an entire class in about 15 minutes. Once administered, using scoring criteria, the data is entered online to determine the student's overall performance as well as individual performance in memory, orientation, placement, and sentence skills as compared to grade-level expectation. This allows the administrator to generate individual student and class reports which illustrate the student's performance in a box plot format and generates specific remediation strategies based on the student's outcomes. Educators using the SHP are assisted through personalized learning strategies from Handwriting Without Tears. Teachers can then better focus their handwriting instruction on students' areas of need. The SHP can be used to measure specific skill areas three times during the school year.

Procedure

Permission was granted by the East Carolina University & Medical Center IRB (#22-001238). Parent consent was obtained for all assessments included in this study. The gender and grade of each student was collected through the parent consent form. The SHP was administered to six classes (two each grade) of second, third, and fourth graders at the ECU Community School. Classes consist of 14 students each. Classes were assessed approximately one per week over a 6-week period. The assessment was administered to the entire class at the same time (arranged with each teacher) and required about 15 minutes to conduct. Some students were assessed individually if they were absent on the day of the classroom assessment.

Afterward, each student's printing skills paper was scored into the Handwriting Without Tears Screener online tool. Students were scored based on their handwriting memory, orientation, placement, and sentence skills. The online scoring mechanism generated a classroom report that provided entire classroom aggregate scores as well as an individual student data report for each student. The Screener

can be used three times throughout the year at entry, mid-year, and end-of-year test points. Students at the Community School were screened in October, which falls within the beginning of the year test point.

Each consenting participant in the study received a gift card for $20, funded through ECU's Office of Research, Economic Development and Engagement, as well as the Honors College.

Results

Participants

The students who participated in this study included second grade (N=19; males=6 and females=13), third grade (N=19; males=12 and females=7), and fourth grade (N=15; males=7 and females=8). The total sample population was 53% female and 47% male.

Because of the developmental differences between each grade, SHP scores were calculated based on each grade. The overall SHP scores for second grade ranged from 74% to 99%, third-grade 65% to 96%, and fourth-grade 84% to 99%. Overall, second grade students scored below the expectation of 91% (M=87). Third grade students also scored below their expectation of 93% (M=87). Because the SHP does not have print expectations for fourth grade, expecting students to be using cursive writing, the SHP did not provide an expectation for fourth grade. However, for the purpose of this study, I set the expectation at 2% above third grade based on the difference in expectation from second to third grades. The fourth-grade students scored below the expectation of 95% (M=92). All three grades presented total scores that fell below grade level expectations.

In addition to the overall scores, the results of the screeners indicated a specific deficit in placement skills. Of the 53 participants, three students met grade-level expectations for handwriting placement. Overall, second graders scored below placement expectation of 91% (M=70, SD=17). Third grade students also scored below their expectation of 97% (M=61, SD=17). Fourth-grade students were

scored with the same placement expectation as third grade, and also scored below the expectation of 97% (M=75, SD=13).

Discussion

This study aimed to measure the handwriting abilities of low-SES elementary students compared to grade-level expectations as defined by the Screener of Handwriting Proficiency (SHP). The handwriting of second, third, and fourth graders was analyzed using the SHP, which identified a substantial deficit in the overall handwriting abilities of these students. Upon the scoring of all student screeners, results also showed a consistent deficit among all but three participants in placement skills. Placement is defined as "the ability to place letters and numbers correctly on a baseline" (Learning Without Tears, n.d.b). Handwriting placement is important for a student's writing to be legible and follow the horizontal flow of writing.

Previous research has identified that the writing task being performed influences the placement of letters. Graham, et. al (2006) found that students aligned letters closer to the baseline when copying letters rather than composing letters. The researchers also found that students with poor handwriting are more likely to have variability in the visual-spatial elements of handwriting, including placement. Students with poor handwriting are more variable in their ability to align letters on a baseline than good writers (Graham et al, 2006).

This study identified that the low-SES students struggled to reach grade-level expectations for handwriting placement skills more than they struggled with other skill areas. Since spatial working memory is necessary to perform the placement skill, this study's finding is supported by previous research which has indicated a relationship between low-SES children and spatial working memory. Hackman, Farah, and Meaney studied how one's environment within low-SES disparities can impact neural development (Hackman, Farah, and Meaney, 2010). In terms of the impact SES has on the

neurocognitive systems, SES has been proven to affect linguistic, visuospatial, and memory skills (Noble, McCandliss, & Farah, 2007). It makes sense that this low-SES student sample will present increased difficulty with handwriting placement if socioeconomic status impacts a child's visual-spatial cues.

Hackman, Farah, and Meaney also established that socioeconomic status affects cognition, academic achievement, and mental health. Due to the complexity of mechanisms causing SES-related disparities, such as prenatal factors, parental care, and cognitive stimulation, interventions should accommodate to this population (Hackman et al., 2010). Low-socioeconomic conditions impact the entire child, mentally, physically, and emotionally (Hackman et al., 2010; Tracy et al., 2008). Since the effects of poverty impact the overall wellbeing of children, performance models for children of low-socioeconomic status should take a holistic approach, as supported and proposed by Bray and Capilouto (2021).

Conclusion

This research will assist occupational therapists, teachers, and other school administrators to understand areas that need intervention among their students. By identifying handwriting problems early through the Handwriting Without Tears Screener of Handwriting Proficiency, this study will focus and guide teachers as they provide handwriting remediation. The post-pandemic achievement gap needs to be addressed amongst Economically Disadvantaged students. Helping teachers determine where students are struggling will remediate the impacts of the COVID-19 pandemic and help to close the achievement gap. Educators of low-SES students may need to address specific areas of handwriting, such as handwriting placement. Addressing the specific needs of this population is one measure we can take to remediate the impacts of the pandemic and provide educational equity for North Carolina's economically disadvantaged students. This research may indicate an increased need for OT services in schools to meet handwriting deficits.

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