



REL Appalachia Ask A REL Response

Early Childhood; Literacy

June 2019

Question:

What does the research say about the association between handwriting instruction and reading development in early childhood (PreK – grade 3)? What interventions exist to improve handwriting for young children?

Response:

Thank you for your request to our REL Reference Desk regarding evidence-based information about handwriting instruction and reading development. Ask A REL is a collaborative reference desk service provided by the 10 Regional Educational Laboratories (RELs) that, by design, functions much in the same way as a technical reference library. Ask A REL provides references, referrals, and brief responses in the form of citations in response to questions about available education research.

Following an established REL Appalachia research protocol, we searched for peer-reviewed articles and other research reports on handwriting instruction. We focused on identifying resources that specifically address the relationship between handwriting instruction and reading development in early childhood, as well as interventions to support young children's handwriting. The sources included ERIC and other federally funded databases and organizations, research institutions, academic research databases, and general Internet search engines. For more details, please see the methods section at the end of this document.

The research team did not evaluate the quality of the resources provided in this response; we offer them only for your reference. Also, the search included the most commonly used research databases and search engines to produce the references presented here, but the references are not necessarily comprehensive, and other relevant references and resources may exist. References are listed in alphabetical order, not necessarily in order of relevance.

References

Cahill, S. M. (2009). Where does handwriting fit in? Strategies to support academic achievement. *Intervention in School and Clinic*, 44(4), 223–228. Abstract retrieved from <https://eric.ed.gov/?id=EJ830745>; full text available at https://www.researchgate.net/profile/Susan_Cahill2/publication/249832712_Where_Does

[Handwriting Fit In Strategies to Support Academic Achievement/links/56c5eaab08ae8cf828fe6e36.pdf](https://www.researchgate.net/publication/56c5eaab08ae8cf828fe6e36)

From the abstract: “In today’s environment of high-stakes testing, handwriting is a skill that is often overlooked in order to focus on other areas of the curriculum. However, research indicates that handwriting is tied to academic achievement, especially composition and literacy skills. This article provides strategies that can be used to support students with disabilities in the areas of handwriting, motor skill development, and practice during functional tasks.”

Dinehart, L., & Manfra, L. (2013). Associations between low-income children’s fine motor skills in preschool and academic performance in second grade. *Early Education and Development*, 24(2), 138–161. Abstract retrieved from <https://eric.ed.gov/?id=EJ1010187>; full article available at https://www.researchgate.net/publication/259841178_Associations_Between_Low-Income_Children's_Fine_Motor_Skills_in_Preschool_and_Academic_Performance_in_Second_Grade

From the abstract: “Given the growing literature pertaining to the importance of fine motor skills for later academic achievement (D. W. Grissmer, K. J. Grimm, S. M. Aiyer, W. M. Murrah, & J. S. Steele, 2010), the current study examines whether the fine motor skills of economically disadvantaged preschool students predict later academic performance in 2nd grade. More specifically, we expand on the current literature and evaluate whether 2 types of fine motor skills—fine motor object manipulation and fine motor writing—predict academic achievement above and beyond the effects of demographic characteristics and early language and cognition skills. Results indicate that performance on both fine motor writing and object manipulation tasks had significant effects on 2nd-grade reading and math achievement, as measured by grades and standardized test scores. Stronger effects were yielded for writing tasks compared to object manipulation tasks. Practice or Policy: Implications for researchers and early childhood practitioners are discussed.”

Dinehart, L. H. (2014). Handwriting in early childhood education: Current research and future implications. *Journal of Early Childhood Literacy*, 15(1), 97–118. Abstract retrieved from <https://eric.ed.gov/?id=EJ1053149>; full text available at https://www.researchgate.net/publication/264763007_Handwriting_in_early_childhood_education_Current_research_and_future_implications

From the abstract: “Early fine motor writing skills are quickly becoming recognized as an important school readiness skill associated with later academic success (Dinehart & Manfra, 2013; Grissmer et al., 2010; Son & Meisels, 2006). Yet, little is known about the development of handwriting, the extent to which it is of value in the early childhood classroom and the best means by which to teach handwriting, or at least handwriting readiness, to young children. The current work reviews the literature on handwriting and its place in early childhood education. Overall, this article serves as a call for (a) researchers to continue examining the role of handwriting in the early education and development of

young children and (b) practitioners to develop and implement programmes they know to be best practice in teaching early handwriting or handwriting 'readiness' skills."

Hoy, M. M., Egan, M. Y., & Feder, K. P. (2011). A systematic review of interventions to improve handwriting. *The Canadian Journal of Occupational Therapy*, 78(1), 13–25. Abstract retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/21395194>

From the abstract: "BACKGROUND: Handwriting difficulties are among the most common reasons for referral of children to occupational therapy. PURPOSE: To determine the effectiveness of handwriting interventions. METHODS: A systematic review was carried out. Included studies were randomized or nonrandomized controlled trials of interventions that could be used by an occupational therapist to improve written output (printing or writing) among school-aged children identified as having difficulties with handwriting. Electronic searches of relevant databases were conducted up to January 2010. FINDINGS: Eleven studies met the inclusion criteria. These studies tested (1) relaxation and practice with or without EMG, (2) sensory-based training without handwriting practice, and (3) handwriting-based practice (including sensory-focused or cognitive focused handwriting practice). Regardless of treatment type, interventions that did not include handwriting practice and those that included less than 20 practice sessions were ineffective. IMPLICATIONS: Effective occupational therapy for improving handwriting must include adequate handwriting practice."

James, K. H. (2017). The importance of handwriting experience on the development of the literate brain. *Current Directions in Psychological Science*, 26(6), 502–508. Retrieved from <https://pdfs.semanticscholar.org/9f36/948e150ec7e28d40d0581164af478b2d1824.pdf>

From the abstract: "Handwriting experience can have significant effects on the ability of young children to recognize letters. Why handwriting has this facilitative effect and how this is accomplished were explored in a series of studies using overt behavioral measures and functional neuroimaging of the brain in 4- to 5-year-old children. My colleagues and I showed that early handwriting practice affects visual symbol recognition because it results in the production of variable visual forms that aid in symbol understanding. Further, the mechanisms that support this understanding lay in the communication between visual and motor systems in the brain: Handwriting serves to link visual processing with motor experience, facilitating subsequent letter recognition skills. These results are interpreted in the larger context of the facilitatory effect that learning through action has on perceptual capabilities."

McCarroll, H., & Fletcher, T. (2017). Does handwriting instruction have a place in the instructional day? The relationship between handwriting quality and academic success. *Cogent Education*, 4(1), 1–10. Abstract retrieved from <https://eric.ed.gov/?id=EJ1168432>; full text available at https://pdfs.semanticscholar.org/bd1b/5d34ea0e80532ea5f47486bab5e058ed7773.pdf?_ga=2.180105261.843915899.1558312912-865989865.1558312912

From the abstract: “Handwriting is a foundational skill needed by students to demonstrate competency in reading, writing, and math. Occupational therapists who work in schools are tasked with providing remedial services for students who demonstrate deficits in underlying handwriting mechanics, as opposed to deficits in following handwriting conventions. Despite this, therapists frequently find the referred student has none of the expected mechanical constraints, but instead lacks knowledge of letter, number, and punctuation mark formation. This is often an outcome of not being exposed to explicit handwriting instruction. As a result, the researchers sought to determine whether a relationship exists between academic success in reading, writing, and math and the quality of handwriting by comparing standards-based report card grades in reading, writing, and math to scores from the ‘Handwriting Without Tears Screener of Handwriting Proficiency.’ Results indicated a significant positive correlation exists between academic success in writing and reading and quality of handwriting. The implications of this research suggest there is a further need to explore whether instructional time should be allocated for handwriting instruction in the classroom, potentially contributing to increased academic success for students.”

Santangelo, T. & Graham, S. (2015). A comprehensive meta-analysis of handwriting instruction. *Educational Psychology Review*, 28(2), 225–265. Abstract retrieved from <https://eric.ed.gov/?id=EJ1100680>; full text available at [https://www.researchgate.net/publication/282478667 A Comprehensive Meta-analysis of Handwriting Instruction](https://www.researchgate.net/publication/282478667_A_Comprehensive_Meta-analysis_of_Handwriting_Instruction)

From the abstract: “While there are many ways to author text today, writing with paper and pen (or pencil) is still quite common at home and work, and predominates writing at school. Because handwriting can bias readers’ judgments about the ideas in a text and impact other writing processes, like planning and text generation, it is important to ensure students develop legible and fluent handwriting. This meta-analysis examined true- and quasi-experimental intervention studies conducted with K–12 students to determine if teaching handwriting enhanced legibility and fluency and resulted in better writing performance. When compared to no instruction or non-handwriting instructional conditions, teaching handwriting resulted in statistically greater legibility (ES = 0.59) and fluency (ES = 0.63). Motor instruction did not produce better handwriting skills (ES = 0.10 for legibility and -0.07 for fluency), but individualizing handwriting instruction (ES = 0.69) and teaching handwriting via technology (ES = 0.85) resulted in statistically significant improvements in legibility. Finally, handwriting instruction produced statistically significant gains in the quality (ES = 0.84), length (ES = 1.33), and fluency of students’ writing (ES = 0.48). The findings from this meta-analysis provide support for one of the assumptions underlying the Simple View of Writing (Berninger et al., ‘Journal of Educational Psychology,’ 94, 291–304, 2002): text transcription skills are an important ingredient in writing and writing development.”

Additional Organizations to Consult

Understood.org: <https://www.understood.org/en>

From the website: “Our goal is to help the millions of parents whose children, ages 3–20, are struggling with learning and attention issues. We want to empower them to understand their children’s issues and relate to their experiences. With this knowledge, parents can make effective choices that propel their children from simply coping to truly thriving.”

- The Unexpected Connection Between Handwriting and Learning to Read: <https://www.understood.org/en/community-events/blogs/expert-corner/2018/09/24/the-unexpected-connection-between-handwriting-and-learning-to-read>

Methods

Keywords and Search Strings

The following keywords and search strings were used to search the reference databases and other sources:

- (handwriting OR “fine motor”) AND (impact* OR relationship* OR correlat* OR effect*) AND (reading OR literacy) AND (“early childhood” OR “primary grades” OR “early elementary”)
- (handwriting OR “fine motor”) AND (instruct* OR intervention OR teach*) AND (“early childhood” OR “primary grades” OR “early elementary”)

Note. Using the search terms penmanship OR “graphomotor skills” OR “visual motor skills” did not yield any additional resources about this topic.

Databases and Resources

We searched ERIC, a free online library of more than 1.6 million citations of education research sponsored by the Institute of Education Sciences (IES), for relevant resources. Additionally, we searched the academic database ProQuest, Google Scholar, and the commercial search engine Google.

Reference Search and Selection Criteria

In reviewing resources, Reference Desk researchers consider—among other things—these four factors:

- **Date of the publication:** Searches cover information available within the last ten years, except in the case of nationally known seminal resources.
- **Reference sources:** IES, nationally funded, and certain other vetted sources known for strict attention to research protocols receive highest priority. Applicable resources must be publicly available online and in English.
- **Methodology:** The following methodological priorities/considerations guide the review and selection of the references: (a) study types—randomized controlled trials, quasi experiments, surveys, descriptive data analyses, literature reviews, policy briefs, etc., generally in this order; (b) target population, samples (representativeness of the target

population, sample size, volunteered or randomly selected), study duration, etc.; (c) limitations, generalizability of the findings and conclusions, etc.

- Existing knowledge base: Vetted resources (e.g., peer-reviewed research journals) are the primary focus, but the research base is occasionally slim or nonexistent. In those cases, the best resources available may include, for example, reports, white papers, guides, reviews in non-peer-reviewed journals, newspaper articles, interviews with content specialists, and organization websites.

Resources included in this document were last accessed on May 20, 2019. URLs, descriptions, and content included here were current at that time.

This memorandum is one in a series of quick-turnaround responses to specific questions posed by education stakeholders in the Appalachia region (Kentucky, Tennessee, Virginia, and West Virginia), which is served by the Regional Educational Laboratory Appalachia (REL AP) at SRI International. This Ask A REL response was developed by REL AP under Contract ED-IES-17-C-0004 from the U.S. Department of Education, Institute of Education Sciences, administered by SRI International. The content does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. government.