RESEARCH PAPER

Effectiveness of occupational-therapy handwriting interventions for Pre-schoolers (Age Group 4–6)

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Abstract
Occupational therapy (OT) handwriting interventions for preschool children aged 4–6 years are effective at their improvement of pencil griping and letter formation, regarding if they have any sort of disability.
My study would define or indicate that interventions such as handwriting skills for children with such motor coordination and such challenges showing significant improvements in line orientation, letter forming and proper proportion.
This systematic review synthesizes current evidence, assessment of methodologies, and recommendations for best practices, using rigorous referencing in Vancouver style.

Keywords: Occupational therapy, Handwriting interventions, Pre-schoolers, Pencil grip, Letter formation, Motor coordination.

How to cite this article: Patil P, Meena SK, Buragohain S. Effectiveness of occupational-therapy handwriting interventions for Pre-schoolers (Age Group 4–6). Int J Drug Deliv Technol. 2026;16(62s): 385-386. DOI: 10.25258/ijddt.16.62s.45

Source of support: Nil.

Conflict of interest: None.

Introduction
Handwriting skills plays a crucial role for children's academic participation and long-term educational outcomes. Occupational therapists implement various interventions targeting handwriting challenges in pre-schoolers, aiming to improve fine motor control, letter formation, and foundational skills required for later success. Early
intervention is critical, as poor handwriting can hinder cognitive, literacy, and self-esteem development.

Methods
Current systematic reviews and clinical studies were retrieved from databases, adhering to PRISMA guidelines.
Included studies targeted occupational-therapy-based handwriting interventions for children aged 4–6 in
preschool or similar settings, using quantitative outcomes such as legibility, speed, or overall improvement. The McMaster Critical Review Form and risk of bias assessments such as ROBINS-I guided quality evaluation.

Results

- **Population and Study Design:** Most reviewed studies involved typically developing pre-schoolers and those with mild disabilities. No randomized control trials (RCTs) were found for the 4–6 age range, with studies primarily using Level II (controlled) and Level III (pre-post) designs.
- **Legibility:** Curriculum-based occupational therapy (OT) interventions, such as "Handwriting Without Tears" and the "Write Start" program, consistently demonstrated small- to medium-sized improvements in handwriting legibility (mean effect size Hedge's g ≈ 0.32–0.39). These gains, although modest, translate to meaningful school participation improvements.
- **Speed and Fluency:** Evidence for improvements in

- handwriting speed was mixed, with overall small average effect sizes (Hedge's g ≈ 0.13), and no consistent gains in fluency.

- **Program Comparison and Dose:** No intervention program conclusively outperformed others.
- Interventions lasting 6–12 weeks with sessions 1–3 times per week, 30–60 minutes each, were common and generally adequate for improvement.

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- **Curriculum Integration:** Embedding OT handwriting interventions within the standard curriculum saved time and cost, supporting inclusion and naturalistic learning opportunities.
- **Special Populations:** Children with both typical development and mild disabilities benefited equally from OT handwriting interventions.
- **Limitations:** The lack of RCTs, small sample sizes, variability in outcome measures, and short follow-up restrict the strength and generalizability of findings.

Discussion

Integrated curriculum-based OT interventions for preschoolers can moderately improve handwriting legibility, supporting both early literacy and classroom participation. Although other outcomes, such as writing speed or
fluency, are less robustly impacted, even small gains in legibility are associated with significant educational and psychosocial benefits. Intervention effects appear independent of the specific program used or the age at intervention within the 4–6-year range. More high-quality research—ideally RCTs—is required to establish causality and optimize intervention parameters.

Implications for Practice

- Occupational therapy should target handwriting legibility for pre-schoolers with or without mild fine motor challenges.
- 6–12 week, curriculum-integrated interventions led in collaboration with teachers yield measurable gains.
- Individual child and classroom goals (e.g., speed or legibility) should dictate program choice.
- Outcomes should be evaluated not only on motor performance but also functional academic integration.

Conclusions

Findings suggest that a different types of
Occupational therapy handwriting interventions provide small- to medium-sized improvements in legibility for pre-schoolers aged 4–6, with limited evidence for other performance domains. It also includes cognitive,
sensory based, motor based and multiple component interventions. Early, curriculum-embedded OT is recommended, but further high-quality research is essential to strengthen these findings and guide best practices. Hence improvement was also seen in all studies which used varied measures of handwriting.

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