



Somatosensory Processing & Handwriting Proficiency



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BACKGROUND

- ▶ Somatosensation includes the combination of haptic perception, proprioception and tactile input (Dougherty, 2015), which provides important information, such as body awareness and skilled motor planning (Kramer & Hinojosa, 2010).
- ▶ Handwriting facilitates neuronal pathway development in areas of the brain associated with fine motor control, neuromuscular coordination and balance, and reception of sensory stimuli (Kalat, 2015).
- ▶ Proficient handwriting correlates with increased motivation, self-esteem, and memory retention for school-aged children (Donica et al., 2012).
- ▶ 80-85% of school-based referrals for OT are for handwriting and fine motor deficits (Schneck & Amundson, 2010).
- ▶ 90% of surveyed OTs in the United States listed multisensory techniques as a main approach to handwriting intervention (Feder, Majnemer, & Synnes, 2000). The multisensory approach uses somatosensory strategies within intervention.
- ▶ Although multisensory interventions for handwriting remediation are used frequently, their efficacy has not been well researched (Zwicker & Hadwin, 2009).



Methods

Research Design: Exploratory Correlational

Setting: The Friends School in San Francisco, CA & Bacich Elementary School in Kentfield, CA

Participants: 74 typically developing second grade students between the ages of 7.0-8.11 years

Independent Variable: Somatosensory Processing

Dependent Variable: Handwriting Proficiency

Data Administration: In class individual and small group testing was completed. Teacher and parent/guardian questionnaires were also completed. Inter-rater reliability in test administration was established at the .98 level prior to testing

Data Analysis: Descriptive Statistics, Pearson Product Moment Correlation Coefficient ($p = .05$), SPSS Version 22.0

Assessment Measures

Minnesota Handwriting Assessment (MHA): This assessment measures handwriting size, form, alignment, legibility, spacing, and speed. Test range: 1st-2nd graders.

Beery-Buktenica Developmental Test of Visual Motor Integration, Sixth Edition: Motor Coordination Subtest (VMI- MC): This assessment includes three part test that measures visual motor integration, visual perceptual ability, and motor coordination. The motor coordination subtest was used to measure the precision of motor output that is informed by effective tactile discrimination and proprioception. Test range: 2-100 years.

Quick Neurological Screening Test, 3rd Edition (QNST-3): This assessment measures motor coordination and sensory integration. The three subtests used to measure somatosensation were: finger to nose (proprioception and kinesthesia), rapid reversing hand movements (kinesthesia and proprioception), and palm and form recognition (tactile discrimination and haptic skill). Test range: 4-80 years.

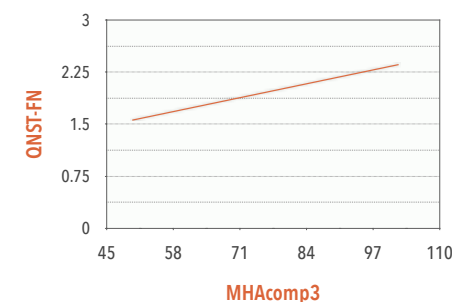
Results

Sample Size: $N = 74$

Statistically significant correlations:

- ▶ Quick Neurological Screening Test - Finger to Nose Subtest (QNST-FN) and Minnesota Handwriting Assessment Components: Form, Size, and Alignment (MHAcomp3) ($r = .257, p < .05$)
 - As the student becomes more able to precisely touch the tip of the nose with the index finger, handwriting proficiency also increases.
- ▶ Quick Neurological Screening Test - Finger to Nose Subtest (QNST-FN) and Minnesota Handwriting Assessment Size Component (MHA-Size) ($r = .267, p < .05$)
 - As the student becomes more able to precisely touch the tip of the nose with the index finger, handwriting size becomes more effective.

Relationship Between Quick Neurological Screening Tool Finger to Nose Subtest and Minnesota Handwriting Assessment Size, Form, and Alignment Subtests



Notes. MHAcomp3 = Minnesota Handwriting Assessment Size, Form, and Alignment Subtests. $n = 74$
QNST-FN = Quick Neurological Screening Tool Finger to Nose Subtest. $r = .257$
 $*p < .05$

Objective

The objective of this study was to examine the relationship between somatosensory processing and handwriting proficiency in typically developing second grade children.

The researchers hypothesized a positive correlation between somatosensory processing and proficient handwriting.

Discussion

- ▶ Our research revealed two statistically significant links between somatosensory processing and handwriting proficiency, therefore somatosensory processing is a necessary component required to produce legible handwriting.
- ▶ Proficiency in somatosensory skill is necessary for children's development and may contribute to handwriting proficiency.
- ▶ Understanding the relationships between somatosensory skill components and their contribution to handwriting ability can help occupational therapists provide effective, evidence-based interventions to students who have difficulties with handwriting.

IMPLICATIONS

- ▶ Additional research is recommended to examine the links between somatosensory processing ability and handwriting proficiency.
- ▶ Further research should focus on somatosensory skills as they relate to handwriting performance in specific handwriting components such as legibility, form, size, alignment, and spacing.
- ▶ Development of new assessments to measure somatosensory components and how they apply to handwriting development and proficiency are indicated.