

ORIGINAL ARTICLE - PUBLIC HEALTH

EFFECTIVENESS OF CONTEMPORARY TASK ORIENTED APPROACH BASED OCCUPATIONAL THERAPY INTERVENTION FOR CHILDREN WITH HANDWRITING AND FINE MOTOR DIFFICULTIES

Mahendran M⁽¹⁾, Sharma R K⁽²⁾, Surya S M⁽³⁾

(1) MOTh scholar, Santosh medical and dental College, Master of occupational therapy in pediatrics, Charan Singh University, Meerut, Uttar Pradesh.

(2) Professor and Dean, Santosh college of Occupational Therapy. School, Ghaziabad, Uttar Pradesh.

(3) Research scholar, school of management studies and Department of Co-operation, The Gandhigram Rural Institute (Deemed to be University) Gandhigram, Dindigul District, Tamil Nadu, India.

Abstract

AIM: To find the effectiveness of contemporary task-oriented approach-based occupational therapy intervention for children with handwriting and fine motor difficulties. **Objectives:** To screen handwriting and fine motor difficulties by using evaluation tools of children with handwriting (ETCH-M). To assess handwriting and fine motor difficulties by using fine motor skills checklist (6-12). To determine the effectiveness of contemporary task-oriented approach-based occupational therapy intervention for children with handwriting and fine motor difficulties. To evaluate the alphabet writing, numeral writing, near point copy, far point copy, dictation, sentence composition by using the Evaluation tool of children with handwriting (ETCH).

METHODOLOGY : Totally 74 subjects (37 in experimental group and 37 in control group) of age group of 6 to 12 years participated in current study.

RESULTS: Significant reducing in handwriting and fine motor difficulties, with regard to contemporary task-oriented approach-based occupational therapy intervention for children with handwriting and fine motor difficulties.

KEYWORDS : Contemporary task oriented approach, handwriting, fine motor difficulties, Occupational therapy, ETCH.

INTRODUCTION

Handwriting all the way through narration and in all cultures has been a means for children and adults to communicate ideas and information. Despite the extensive use of knowledge and word processors today, the assignment of handwriting consumes much of the school day for elementary school-aged children. At school, children are expected to copy numbers for arithmetic computations, reproduce spelling words, compose creative stories and take notes.⁵ A functional written message is needed at home, when children write “thank you” notes, play word games, dictate telephone messages and numbers.¹⁸

In the school setting, educators are accountable for handwriting instruction which usually occurs in the primary grades. Accomplishing the technicalities of handwriting in the early elementary years, children are better able to perform daily school activities which require handwriting production.⁸ Automatic creation of the written language, children are able to go forward to higher-level writing tasks such as story composition and advanced arithmetic, which necessitate incorporated and multifarious cognitive process.⁷ Children who are unable to master indispensable handwriting often experience difficulty in academic recital.⁷ Characteristic handwriting troubles present as the illegible script, evasion of writing due to the demanding effort to produce a manuscript, lack of automaticity of handwriting,

and the incapability to stay pace with written schoolwork.⁶

Children by means of handwriting difficulty are often referred to occupational therapists and learning specialists at private and public schools, children's hospitals, paediatric clinics, and private professional practice.⁴ In India, children who are experiencing difficulty with academic and school performance are mandated a free and appropriate public education as adopted by national legislation in 1995. As a result, occupational therapists working in school systems are frequently requested to evaluate certain functional problems which are interfering with a child's ability to perform educational activities.¹⁵ Complexity with handwriting production is one of them for the most part common reasons for referring school-aged children to occupational therapy in the school setting.^{3,17}

Occupational therapists repeatedly evaluate children who are experiencing trouble with handwriting. The role of the occupational therapist is to establish which domains of handwriting are problematic for student.¹⁴ Influential which,



Please Scan this QR Code to
View this Article Online
Article ID: 2023:03:03:05
Corresponding Author : Mahendran M
e-mail : Maherichy987@gmail.com

if any, essential sensory, the visual motor, the cognitive or psychosocial deficit is inquisitive with handwriting invention, and which environment variables are affecting recital in the classroom, are addressed by the pediatric occupational therapy practitioner.¹³ A scrupulous occupational therapist evaluation of a child's handwriting typically includes in sequence and gathered her from interviewing the teacher, parent, and supplementary team members, observing the child inscription in the classroom, comparing the child's handwriting production to that of peers, and administering formal and informal tests.^{5,9}

Handwriting is a multifarious activity that involves widespread research in regulating to master the mandatory skills. Elementary-age children spend a large part of their day participating in fine motor activities connecting handwriting in subjects such as math, reading, spelling, social studies, and science.^{8,20} The relevance of handwriting to a child's education is signified determine the effects of group-task-oriented training on gross and fine motor function, activities of daily living (ADL), and social function of children.^{1,12}

Prime of life of evidence-based motor intercession children with handwriting difficulties, an implementation by the quantity of in-class time spent in executing activities that require the skill of handwriting.^{2,10} The contacted Multi-sensory Approach compared to a Task-Oriented Approach on Handwriting Legibility amongst Elementary School Children revision was preschool students spend an average of 37% of their school day engaged in fine motor activities, of which 10% are paper-and-pencil tasks.^{11,22} Handwriting and writing program co-taught by teachers and occupational therapists for first-grade children students spend up to 46% of their day completing fine motor activities, of which 42% are paper-and-pencil tasks.^{19,28}

Handwriting associated activities start near the beginning of a child's education and increase in importance as the child advances in his or her basic education.^{21,24} petite-group format with entrenched individualized supports allows the therapist to guide and monitor student performance, Handwriting difficulties may affect up to 27% of school-age children, with up to 60% of the school day constant to fine motor activities.²³ Hence, the early identification and remediation of handwriting deficiencies before the child reaches middle and high school when handwriting demands increase in convolution and intensity can prevent difficulties allied with handwriting.²⁵

Handwriting/fine motor difficulties are well documented as serious hindrances to academic learning for kindergarten and elementary school children.²¹ Intercession techniques to

remediate these troubles have been researched by educators and occupational therapists.²⁶ Efficient occupational therapy interventions have been found to include visual-motor tasks, kinaesthetic and dexterity training, and motor planning strengthening actions. Occupational therapists, mandated by the persons with Disabilities Education Act, work with these students in the school setting to enhance handwriting and fine motor skills to meet classroom curriculum hassle. In India, teachers have reported a high occurrence of students with these deficits in their classrooms yet reported a low occurrence of referral to occupational therapists for intervention.¹⁵

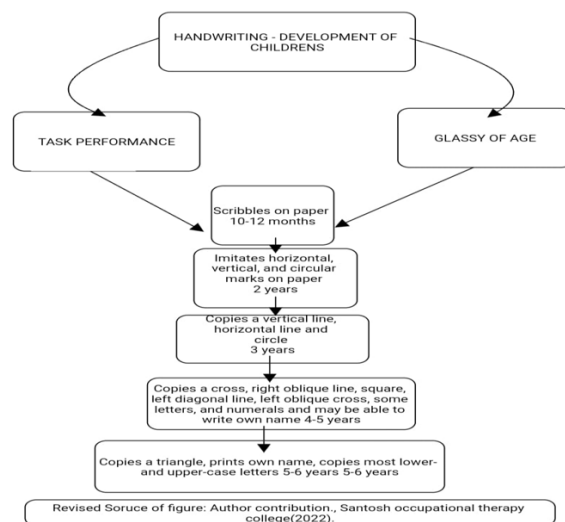


Figure:1

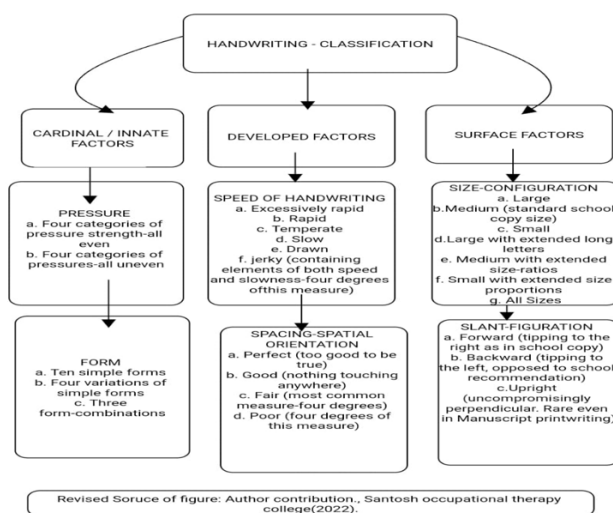
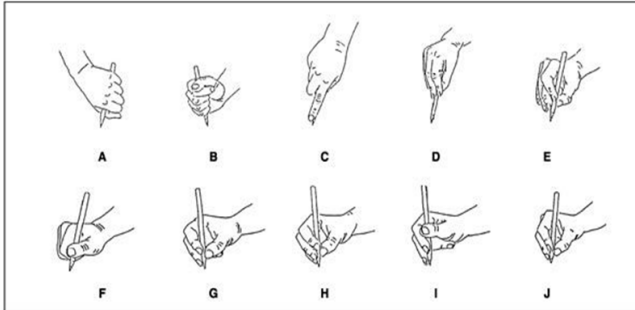


Figure:2

Paediatric occupational therapists Intervention application of weights as a treatment modality focusing on higher-level processes employ a task-oriented approach includes the use of various strategies while teaching handwriting such as the use of sensory-motor approach.²⁷ A task-oriented approach is based on the assumption that handwriting acquisition

requires direct instruction and practice in different tasks and environments²¹ and is often associated/combined with motor learning principles of practice was more pronounced for the judgments of boys because, in Grades2, their conduct was perceived as less adequate than was girls' behavior.^{29,30}



A = radial cross palmar grasp; B = palmar supinate grasp; C = digital pronate grasp, only index finger extended; D = brush grasp, E = grasp with extended fingers; F = cross thumb grasp; G = static tripod grasp; H = four fingers grasp; I = lateral tripod grasp; J = dynamic tripod grasp.

Figure:3

Resources: J. Case-Smith & C. Pehoski (Eds.). *Development of hand skills in the child*

AIMS

To find the effectiveness of contemporary task-oriented approach-based occupational therapy intervention for children with handwriting and fine motor difficulties.

OBJECTIVES

- To screen handwriting and fine motor difficulties by using evaluation tools of children with hand writing (ETCH-M).
- To assess handwriting and fine motor difficulties by using fine motor skills checklist (6-12)
- To determine the effectiveness of contemporary task-oriented approach-based occupational therapy intervention for children with handwriting and fine motor difficulties.
- To evaluate the alphabet writing, numeral writing, near point copy, far point copy, dictation, sentence composition by using the Evaluation tool of children with hand writing (ETCH).

HYPOTHESIS

NULL HYPOTHESIS: The null hypothesis states that there will be no significant “Effect of Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties.”

ALTERNATIVE HYPOTHESIS: The alternative hypothesis states that there will be a significant “Effect of Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties.”

METHODOLOGY

STUDY DESIGN: The study is done with two groups of pre-

test and post-test of quasi-experimental design (Pre-Post Experimental Study).

- Experimental group=pretest and post-test.
- Control group = pre-test and post-test.

SOURCE OF DATA: Brain child rehab centre, Karur, Tamilnadu.

SAMPLE SIZE: 1. Consecutive samples of 74 subjects will be taken in this study.

2. The subjects will be divided into two groups the experimental (regular paediatric occupational therapy)and control group (irregular without occupational therapy) (37 each).

METHOD OF DATA COLLECTION

INCLUSION CRITERIA:

- Children with handwriting and fine motor difficulties
- Between the ages 6-12 years.
- Both males and females will be included.

EXCLUSION CRITERIA:

- Age should not be more than 12 years or less than 6 years.
- Lack of voluntary control or cognitive function.
- Lack of basic head stability during upright positioning.
- Vision or hearing is not sufficient to participate in self-rating scales.
- Children with neurologic problems.

SAMPLING TECHNIQUE: Random sampling technique was adopted.

MATERIALS AND TOOLS REQUIRED

MATERIALS REQUIRED: Testing materials are the examiner's manual, master response booklets, master score sheets, task sheets, wall charts, quick reference sheets, scoring card, a stopwatch, and two No. 2 pencils. The stopwatch and pencils are not included in the test kit. A description of materials follows below.

Table: 1 the seven tasks of the etch-m (etch-m) measure the fol-

A.	Task I writing alphabet from memory
B.	Task ii writing numerals from memory
C.	Task iii near-point copying
D.	Task iv far-point copying
E.	Task v manuscript-to-cursive transition
F.	Task vi dictation
G.	Task vii sentence composition

OUTCOME MEASURES:

- Evaluation tool of children with handwriting (ETCH)

The ETCH contains seven cursive writing tasks and six manuscript writing tasks plus items addressing the child's ability to handle the writing tool and paper. Although each task represents a distinct handwriting skill used by children in educational settings, the entire test should be administered as a unit.

RELIABILITY

A study measuring test-retest reliability of the ETCH-Manuscript with early elementary children is in progress. The study will provide information related to the stability of the children's ETCH scores over time. In other words, an acceptable level of test-retest reliability will give a practitioner confidence that when a child's test scores change from the beginning to the end of the academic year, it truly reflects changes in performance and not test error. Another study addressing ETCH-Cursive test-retest reliability is also needed.

VALIDITY

Studies using the ETCH and other tests that measure areas such as visual-motor control, motor planning, self-esteem, and in-hand manipulation related to handwriting are suitable validity investigations. The relationship of these performance components with functional handwriting of groups of children with various conditions (e.g., attention deficit hyperactive disorder, learning disabilities) would be worthwhile to examine. A critical and planned validity study will address the relationship of legible letter and legible word percentages to the readability of handwritten passages. Legibility percentages of the manuscript and cursive handwriting samples from the ETCH will be compared to educators' judgments about easy-to-read and difficult-to-read samples.

VARIABLES

- Independent variables- Contemporary task-oriented approach + Occupational therapy intervention
- Dependent variables- Handwriting and fine motor difficulties.

Table: 2 Experimental group: pediatric occupational therapists intervention based on contemporary task-oriented approach –session schedule- handwriting and fine motor difficulties.

Table: 2 Treatment-protocol

Week 1	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Pre-Handwriting assessment ETCH-M
Session 2:	Bandage grab Handwriting patterns to music	Feel the pressure multisensory stimulation Tip to tail
Session 3:	Rubber band stretch Doodle loops	Alphabet write Letter lists
Week 2	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Alphabet write Dictation
Session 2:	Bandage grab Handwriting patterns to music	Near-point copy Eyes shut patterns
Session 3:	Doodle loops Heavy/light	Far-point copy Feel the pressure
Week 3	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Dictation Eyes shut writing
Session 2:	Bandage grab Handwriting patterns to music	Free-writing
Session 3:	Heavy/light Doodle loops	Near-point copy Eyes-shut writing
Week 4	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Far-point copy Eyes shut writing
Session 2:	Bandage grab Handwriting patterns to music	Free-writing
Session 3:	Rubber band stretch Doodle loops	Dictation Feel the pressure
Week 5	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Near-point copy Eyes-shut patterns
Session 2:	Bandage grab Handwriting patterns to music	Far-point copy Eyes shut writing
Session 3:	Feel the pressure Doodle loops	Free-writing Carbon paper
Week 6 & 7	Warm-up	Main activities
Session 1:	Arm wake-up Pencil aerobics	Alphabet write Letter lists
Session 2:	Bandage grab Handwriting patterns to music	Write a letter
Session 3:	Doodle loops	Post-Handwriting assessment ETCH-M

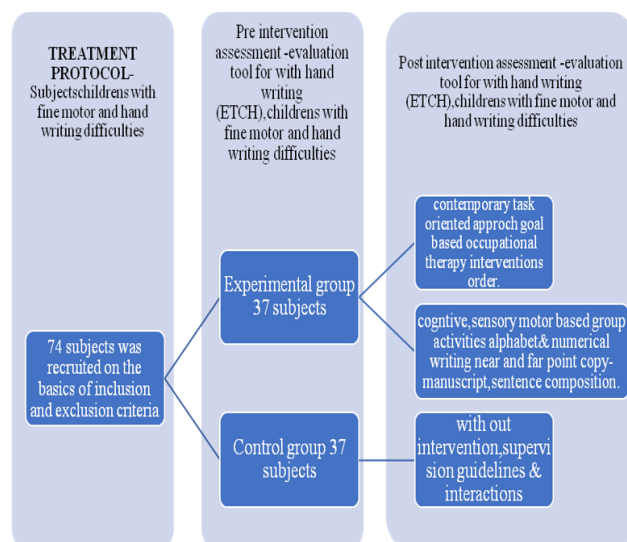


Figure:4

INTERVENTION

A total of 74 subjects will be taken in this study. The subjects will be selected from the age group between 6 to 12 years with handwriting and fine motor difficulties. The subjects will be divided into two groups; a control group (without or irregular therapy children) and an experimental group (regular occupational therapy children).

The therapy is planned for Three months. It will be at 45 minutes group session with the frequency of six days a week. Total of 07 treatment sessions (each session of 6 days) is planned for children in both control and experimental group.

STUDY PLACE

Brainchild rehab centre, Karur, Tamilnadu.

DATA COLLECTION OR STATISTIC ANALYSIS

- This study used two groups of populations were collected

the data of pre and post-intervention.

- The entire statistical test was performed using statistical package for social sciences (SPSS) version 21 & graph pad instate software version 3.1 respectively.

RESULTS

The study involved 74 subjects and carried out over 90 -days for quasi experimental design. The subject was allotted two groups one experimental and group one control group. The control groups enhance conventional interaction activities and the experimental group performed a Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties, the results show the experimental group was statistically significant and the null hypothesis was rejected respectively.

Table: 3 Contemporary Task-Oriented Approach Based Paediatric Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties pre and post Samples

Statistics-SPSS

Tasks of the ETCH-M	Pre experimental test mean value, (SD value)	Post experimental mean value, (SD value)	P value	Pre control test mean value, (SD value)	Post control test mean value, (SD value)	P value
Alphabetic Upper-Case Letter	42.97 (20.37)	72.08 (16.84)	0.0001	43.00 (20.33)	43.00 (20.47)	0.0000
Alphabetic Lower-Case Letter	42.76 (12.45)	64.54 (11.40)	0.0001	43.70 (12.36)	43.54 (12.48)	0.8614
Numbers	39.05 (14.33)	64.76 (13.34)	0.0001	39.03 (14.87)	39.43 (14.11)	0.9036
Near Point Copy	45.08 (15.31)	71.00 (11.19)	0.0001	45.05 (15.52)	44.89 (16.09)	0.9355
Fair Point Copy	53.00 (19.60)	73.97 (14.72)	0.0001	55.68 (19.88)	55.41 (19.33)	0.8798
Dictation	52.57 (20.94)	72.68 (17.22)	0.0001	52.59 (20.78)	52.68 (20.68)	0.7525
Sentence Competency	44.49 (19.27)	73.11 (16.92)	0.0001	44.59 (19.34)	45.27 (19.54)	0.7308
Total Letters Legibility	45.81 (20.39)	64.86 (20.91)	0.0001	47.73 (20.34)	48.38 (20.38)	0.7308

Table: 4 Demographic Characteristics of Subjects

S.NO	BASELINE OF CHARACTERISTICS	GROUP 1 CONTROL GROUP	GROUP 2 EXPERIMENTAL GROUP
1	Number of subjects	37	37
2	Age range	6-12	6-12
3	Mean age	9.44	10.33
4	Gender male/ female	18/19	18/19
5	Handwriting and Fine Motor	handwriting /evaluation	handwriting / evaluation
6.	Task completion	Total letter legibility	Total letter legibility

After tabulation and statistical analysis, these study results have shown significant improvement in handwriting and fine motor skills among children.

DISCUSSION

The purpose of the study is to determine the Effectiveness of “Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties.

The evaluation tool for children with handwriting (ETCH-M) scale is the pre-test and post-test measurement tool. This scale is used to evaluate the level of hand writing and fine motor difficulties among 6-12 years children's. Initially, Handwriting and fine motor difficulties children were selected based on the inclusion criteria were assessed using the evaluation tool for children with handwriting to get the pre-test values. Contemporary task orientation approach-based occupational therapy sessions were scheduled and administered for 3 months one week. 7 sessions per week on alternative days each session lasted for 1 an hour after the treatment sessions the post-test values were collected and tabulated.

These results are supported by Jo Tennyson et.al(Humboldt state university ,2006) Effective occupational therapy interventions have been found to include visual-motor tasks, kinaesthetic and dexterity physical activity, and motor planning/strengthening activities. Occupational therapists, instructed by the Individuals with Disabilities Education Act, work with these students in the school setting to enhance handwriting/fine motor skills to meet classroom curriculum demands Handwriting/fine motor difficulties are well standard as thoughtful hindrances to the academic scholarship for kindergarten and elementary school children.

CONCLUSION

Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with a variety of Handwriting and Fine Motor difficulties and its role in enhancing participation and improving handwriting of fine motor skills and also to facilitate children's academic performance and task orientation day to day life meaningfully. The contemporary task-Oriented Approach focuses on the child's goal setting and decision making, thereby enhancing motivation and promoting active commitment to recovery. Task analysis includes an understanding of the nature task, Internal and external factors contexts that both facilitate and impede performance.

LIMITATION

- The sustained period of the attention span of the children was not constant for the entire 45 minutes of intervention.
- Children in the control group were irregular in interactive activities and follow-ups.
- For children in the experimental group, other treatments were not indicative, only Contemporary Task-Oriented Approach Based Occupational Therapy Interventions were carried out.
- This study carried out on a particular state-district population area of people
- This study was done in a partial duration of time
- This study was done under a school-based intervention

RECOMMENDATIONS

- This study review for Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties is tremendously positive, further studies with larger sample sizes and more demanding methodologies are still suggested.
- Further investigation from different states and regions is essential to find out the effectiveness of Contemporary Task-Oriented Approach Based Occupational Therapy Intervention for Children with Handwriting and Fine Motor difficulties.
- Negligible variations can be done in the period of intervention such as reducing the length of each period and increasing the number of sessions.

ACKNOWLEDGMENT

It is my well-regarded pleasure to present this dissertation and wholeheartedly thank each and everyone who helped me with this article. I express my honest thanks to Dr. P Mahalingam, Chairman, Santosh medical College for providing opportunity and such a good learning environment. I am enormously thankful to Sundaresan Ramachandran, Managing director.MRM Speech therapy clinic, Trichy, Tamil Nadu 620018 (Department of Speech therapy) for his invaluable analysis tools supported. I am gratified to L.Vishnu, managing director. Brainchild Rehab Centre, Karur, Tamil Nadu 639001, for providing valuable assistance in data collection. I also thank my institution and my faculty members without whom this project would have been a distant reality and I also extend my heartfelt thanks to my family and well-wishers. Last but not least I thank God, my parents for all the blessings.

REFERENCES

1. Amundson, S.J. Handwriting: Evaluation and intervention in school settings. In J. Case-Smith & C. Pehoski (Eds.). Development of hand skills in the child Rockville, MD: American Occupational Therapy Association. (1992) (pp. 63-78).
2. Amundson, S.J., & Weil, M. Prewriting and handwriting skills. In. Case-Smith, A.S. Allen, P.N. Pratt (Eds.). Occupational therapy for children . St. Louis, MI: Mosby-Year Book.(1996)(pp. 524-541)
3. Beery, K. E., & Buktenica, N.A... Developmental test of visual-motor integration- Revised. Chicago, IL: Follett Publishing.(1989)(vol.11)
4. Benbow, M. Course: Neuro kinesthetic approach to hand function and handwriting. Organized by: Advanced Rehabilitation Institutes, Toronto, Ontario(1996)(vol.17)
5. Benbow, M., M. Principles and practices of teaching handwriting. In A. Henderson & C. Pehoski (Eds.), Hand function in the child: Foundations for remediation .St. Louis, MI: Mosby- Year Book.(1995)(pp. 255-281)
6. Bonney, M.A. Understanding and assessing handwriting difficulty: Perspectives from the literature. Australian Occupational Therapy Journal, (1992)(vol.3) 39(3), 7-15.
7. Bruininks, R.H. (1978). Bruininks-Oseretsky test of motor proficiency. Circle Pines, MN: American Guidance Service.
8. Bundy, A. Assessment and intervention in school-based practice: Answering questions and minimizing discrepancies. Occupational and Physical Therapy in Educational Environments, (1995)(vol.2) pp 69-88
9. Campbell, S.K. Measurement in developmental therapy: Past, present, and future. Physical and Occupational Therapy in Pediatrics (1989)(vol.1) , 9, 1-14.
10. Canadian Association of Occupational Therapists. Canadian Association of Occupational Therapists 1996 Statistics, the National, 14, 6.(1997)(vol.1)
11. Cermak, S.A. Fine motor functions and handwriting. In A.G. Fisher, E.A. Murray & A. Bundy (Eds.), Sensory integration: Theory and practice . Philadelphia, PA: F.A. Davis.(1991)(pp. 166-170)

12. Cornhill, H., & Case-Smith, J. Factors that relate to good and poor handwriting. *American Journal of Occupational Therapy*, 50,(1996)(pp. 732-739)
13. Cornhill, H., & Case-Smith, J. Factors that relate to good and poor handwriting. *American Journal of Occupational Therapy*, (1996)(pp. 732-739)
14. Crowe, T.K. Pediatric assessments: A survey of their use by occupational therapists in northwestern school systems. *Occupational Therapy Journal of Research*, (1989)(pp. 273-286)
15. DeGangi, G.A., & Royeen, C.B. Current practice among Neurodevelopmental Treatment Association members. *American Journal of Occupational Therapy*, (1994)(pp. 803-809)
16. Fisher, A.G. Functional measures, part 1: What is a function, what should we measure, and how should we measure it? *American Journal of Occupational Therapy*, (1992)(pp. 183-185)
17. Gardner, M.F. Test of visual-perceptual skills (non-motor) - Manual. Seattle, WA: Special Child Publications. (1982)(vol. 2)
18. Gliner, J.A. Purposeful activity in motor learning theory. *American Journal of Occupational Therapy*, (1985)(pp. 28-34)
19. Goodgold-Edwards, S.A., & Cermak, S. A. Integrating motor control and motor learning concepts with neuropsychological perspectives on apraxia and developmental dyspraxia. *American Journal of Occupational Therapy*, (1990)(pp. 431-439.)
20. Graham, S. A review of handwriting scales and factors that contribute to variability in handwriting scores. *Journal of School Psychology*, (1986) (pp. 63-71)
21. Hamstra-Bletz, L., & Blote, A. Development of handwriting in primary school: A longitudinal study. *Perceptual Motor Skills*, (1990),(pp. 759-770)
22. Jarus, T. Motor learning and occupational therapy: The organization of practice. *American Journal of Occupational Therapy*, 48, (1994) (pp.810-816)
23. Law, M., Polatajko, H., Baptiste, S., Townsend, E. Core concepts of occupational therapy. In Canadian Association of Occupational Therapists, *Enabling occupation: An occupational therapy perspective*. Ottawa, ON: CAOT Publications ACE.(1997) (pp. 29-56)
24. McHale, K., & Cermak, S.A. Fine motor activities in elementary school: Preliminary findings and provisional implications for children with fine motor problems. *American Journal of Occupational Therapy*, (1992) (pp. 898-903).
25. Maeland, A.E. Handwriting and perceptual-motor skills in clumsy, dysgraphia, and normal children. *Perceptual and Motor Skills*, (1992) 75 (pp. 1207-1217)
26. Mather, N., & Roberts, R. Informal assessment and instruction in written language: A practitioner's guide for students with learning disabilities. Brandon, VT: Clinical Psychology Publishing.(1995)(vol.1)
27. Poole, J.L. Application of motor learning principles in occupational therapy. *American Journal of Occupational Therapy*, (1991) 45 (pp. 531- 537)
28. Reisman, J.E. Development and reliability of the research version of the Minnesota Handwriting Test. *Physical and Occupational Therapy in Pediatrics*, (1993) 13 (pp. 41-55)
29. Reisman, J.E. Poor handwriting: Who is referred? *American Journal of Occupational Therapy*, (1991) 45 (pp.849-852)
30. Rodger, S. A survey of assessments used by pediatric occupational therapists. *Australian Occupational Therapy Journal*, (1994) ,41, (pp.137- 142)
31. Sassoon, R.. *Handwriting: A new perspective*. Cheltenham, U.K.: Stanley Thrones.(1990)(vol. 2)
32. Schmidt, R.A.. *Motor control and learning: A behavioral emphasis* (2nd Ed.) Champaign, IL: Human Kinetics.(1988) (vol. 1)