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Early and appropriate remediation and accommodation for dysgraphic students

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Early and Appropriate Remediation and Accommodation for Dysgraphic Students

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ABSTRACT

The literature and studies discussed in this document will examine the learning disability know as Dysgraphia. Dysgraphia is an often-misunderstood learning disorder, which can cause many difficulties for children socially and academically, and later for adults in the workplace and beyond. This research document will provide essential information regarding Dysgraphia including identification, assessment, and accommodations.

INTRODUCTION

Handwritten language is a complex task requiring multiple neurological systems to work in concert with each other. Students with handwriting difficulties will have many problems in school, and as adults they will be judged by the poor quality of their written work. Handwriting problems are known as Dysgraphia. In Greek *dys* means difficult and *graph* means writing or drawing. Dysgraphia then can be defined as difficulty with writing. Dysgraphia is "an inability to produce clear accurate handwriting in a functional amount of time despite sufficient teaching, motivation, and mental and physical health" (Eide & Eide, 2006, p. 377). According to Eide et al (2006), Dysgraphia affects close to twenty percent of children and is seen more often in boys but there are still plenty of girls that suffer too (p. 377).

My eight-year old son has dysgraphia due in part to visual-motor and visual-perceptual integration issues. There are many academic definitions of dysgraphia that cover the gamut of writing problems from basic letter formation (penmanship) to the more complex process of composition (see Appendix A for handwriting samples, pp. 27-28). For the purposes of this examination, I have focused my research on the area of Dysgraphia that addresses difficulties with the handwriting process, meaning the formation and clarity of the written work both letters and numbers, and the development of automaticity or fluency of the handwriting whether

manuscript or cursive, rather than the more advanced writing skill involved in composition often termed a disorder of written expression. The handwriting process requires a complex set of neurological processes that must occur simultaneously and sequentially; for this reason handwriting is a higher order process of the brain.

In part due to the complexity of the handwriting process, dysgraphia is often operating in tandem with at least one additional learning difficulty or disability. Dysgraphic students will often have an odd pencil grip, write at a markedly slower speed, display poorly formed letters including size, shape, orientation (reverse or inverted), have variable location on the line(s), and inconsistent spacing between letters and words. Handwriting conventions such as capitalization are often not followed; writing often contains spelling mistakes, and written work often contains incomplete sentences and missing objects, subjects, along with additional errors. Because dysgraphia is often seen in children with at least average intelligence, dysgraphic students are often seen as lazy and not learning disabled (Hamstra-Bletz & Blote, 1993, p. 689). My own son possesses an IQ over 125 points, yet was described by his second grade teacher as *disruptive* because he would shutdown when it was time to do writing tasks; this shut-down is a common avoidance technique for dysgraphic students (Thorne, 2006, p.1).

The current educational focus for writing instruction has been process-oriented. What does this mean for the dysgraphic student in the classroom? Students are being asked to write more and more often and when they cannot match their written output to their verbal skills it can be devastating personally and academically. According to Bain, Bailet, and Moats (2001), "teachers and parents may covertly believe that handwriting…is under the direct control of the student; the student could 'perform better if only more effort were put into the task'" (p. 77). Markham (1976) also addressed teachers feelings about poor handwriting; "papers with better

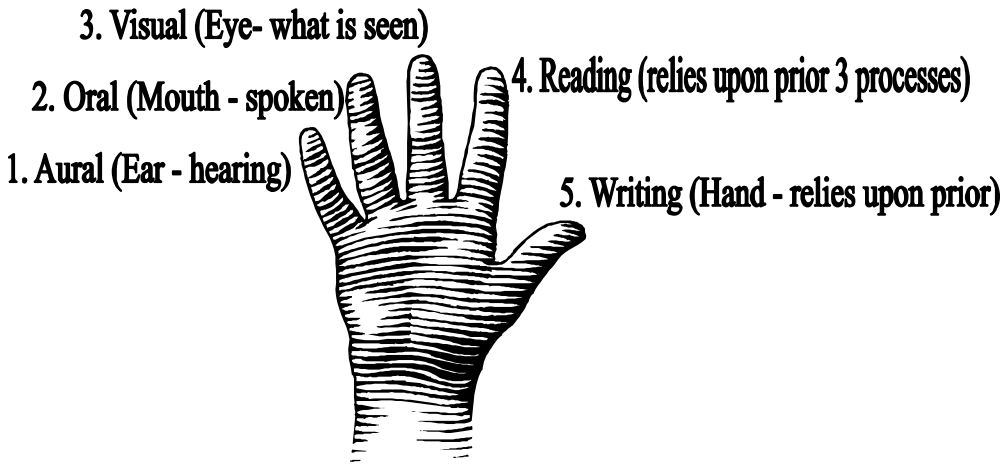
handwriting consistently received higher scores than did those with poor handwriting regardless of the quality of content" (p.280). Every classroom I have been in lately features student work posted on the walls, dysgraphic students have the constant visual reminder that their writing does not match that of their peers; overtime these students begin to develop a lack of self-efficacy. I have been on a journey of discovery on the topic of Dysgraphia for the past three years, and have come to realize the importance of providing Dysgraphic students early and appropriate remediation and accommodations to enable and ensure academic success.

LITERATURE REVIEW

Writing

Written language is a fairly new development along the language timeline; spoken language may be close to one million years old but written forms of language are five-thousand years young, and the first phonetic alphabet appeared only 3500 years ago. Vlachos and Karapetsas (2003) described handwriting as "a multicomponent task, which implies that the production of writing strokes is the overt manifestation of multiple cognitive, psychomotor, and biophysical processes" (p. 1281). This view of handwriting is a complex multicomponent task is a view shared by scholors including Bain et al (2001), Eide et al (2006), Hooper (2002, Levine (2003), and Mather (2003). Also addressing the complexity of handwriting, Smits-Engelsman and Van Galen (1997) stated "Handwriting requires extended time for a high level of proficiency to develop" and is sensitive to neurological differences (p. 164). Writing requires multiple skills including phonemic (distinguishing sounds) analysis, transcription (capitalization, punctuation, spelling, and grammar) rules, and morphemic (word, prefix, or suffix) analysis (LeBrun & VanDeCraen, 1975).

Berninger (2000) focused upon the development of langage systems and stated, "The functional writing system develops and draws on the functional aural, oral, and reading systems in process" (p. 66).



The Aural language is the first language system that develops and it begins with the first sounds heard by infants that correlate to speech. Second, the Oral language system develops beginning with the first sounds uttered by the child with the underlying motivation to reproduce the aural language they have heard and continue to hear. The Visual language system is the third to develop and relates to recognizing that written language represents the Aural and Oral language systems that have been developed and continue to be modified. Reading is the next language system to develop and is also visual in nature. The fifth and final step in the language development process is writing involving use of the hand to produce written language. The language system process relies on the evolution of knowledge building upon previously gained skills and is often being modified and restructured simultaneously. The first four language systems are required prerequisites or readiness skills for the development of the fifth and final language system of writing.

Lebrun et al (1975) discussed writing readiness; "Kindergartens should pave the way for writing instruction by fostering those abilities indispensable to the acquisition of writing skills"

(p. 206). Writing readiness requires the child to have developed a dominant hand for tasks including using scissors, eating, using various writing instruments; this hand dominance is often referred to as *midline crossing*, and is also known as cross lateral integration. Midline crossing can be defined as using the same hand to reach for items on either side of the body. Midline crossing seems like a simple skill, et, Screws and Eason (1998) stated when children achieved midline crossing (hand dominance) it indicates a certain level "of neurological development" (p. 201). Marr Winsor, and Cermak (2001) identified various prerequisites for writing including:

> Small motor development, eye-hand coordination, utensil or tool manipulation, basic stroke formation, alphabet letter recognition, and orientation to written language…dominant hand use, midline crossing with the dominant hand, proper posture and pencil grip, and ability to copy the first nine shapes of the Developmental Test of Visual-Motor Integration. (p. 2)

Delayed acquisition of various childhood milestones appears to indicate neurological differences (slower brain hemisphere specialization, for instance) that will also become academic barriers. Screws et al (1998) also concluded that "Tasks which require midline crossing use more complex mental processes" (p. 202). Neurological (brain) development and specialization then plays a role in Dysgraphia.

Researchers have established that Language processing is lateralized in the left hemisphere of the brain. Mather (2003) stated that Dysgraphia is due in part to the left hemisphere of the brain not being fully developed before the introduction of handwriting; the right hemisphere of the brain will become involved in the learning of writing tasks rather than the left hemisphere (p. 307). Mather (2003) found a link between specific processing issues of the brain, specifically having to due with underdeveloped right and left-brain hemispheres, and

children suffering from dysgraphia and dyslexia. He concluded that premature introduction of written language to children who have not reached certain developmental milestones indicating left hemisphere readiness, including established middle crossing, will be those children who suffer with dyslexia and dysgraphia. These children will not have the proper left hemisphere motor dominance needed to properly integrate the various neurological processes needed for the acquisition of handwriting skills.

Dysgraphia has been associated with visual-motor integration, visual perceptual integration difficulties, working memory deficits, attention issues, fine motor coordination and is often associated with Attention Deficit Disorder/Attention Deficit Hyperactive Disorder (ADD/ADHD), Dyslexia, Auditory Processing Disorder (APD), Non-Verbal Learning Disorders (NLD), Sensory Integration/Processing Disorders, and Autism Spectrum Disorders including Asperger's (Cratty, 1994; Levine, 2003; Mayer, 1996). Exner and Henderson (1995) discovered that cognitive skills including attention, memory, perception, and language affect the learning of motor skills. Handwriting is considered a fine motor skill and it also cannot function properly if various gross motor skills are not in place (Lerner, 2006, p. 458). Mayer (1996) stated, "Handwriting difficulties frequently occur with other learning problems" (p. 6). There is generally agreement among scholars that Dysgraphia is indeed sometimes seen in concert with other learning disabilities (Deiner, 2005; Eide et al, 206; Levine, 2003; and Vail, 1989).

Vlachos and Karapetsas addressed Dysgraphia as a unique learning disability; "dysgraphia may contribute significantly to a child's learning difficulty…and is a matter of both educational and medical significance" (p.1281). Within the public education system, writing instruction has become focused primarily on the content of the written work "with attention to handwriting legibility, spelling, punctuation, and grammar becoming [*sic*] secondary" (Mayer,

1996, p. 19). Lee-Corbin et al (1996) concluded that poor handwriting has a direct and negative affect on student achievement (p. 142). Mayer (1996) stated "that anyone with a handwriting difficulty, by definition, has a learning disability" (p. 3). Today's students are required to write more (volume) and more often. The *show what you know* idea has begun to almost be exclusively in written form. Mayer (1996) concluded "school can be formidable since writing is the most common means by which students express what they have learned" (p. 92).

Dysgraphia and Academic Achievement

In order to gain academic success students must write; writing has become the main "form of demonstrating learned knowledge" (Mayer, 1996, p. 11). Hooper (2002) stated "Writing has become a critical life skill that is intimately linked to basic literacy…and, more recently, the high-stakes testing trend (p. 2). Berninger(2003) also stated "Writing disabilities are less understood, even, than reading disabilities," and idea supported by Hooper (2002) (p.1). Mayer (1996) outlined several academic difficulties that may arise for dysgraphic students in school including "legibility, fluency, thought processes, organization, memory, and academic motivation" (p.11). Dysgraphic students are often first recognized because the unintelligble nature of their handwritten work. More often than not, these students are then asked to rewrite their work and told to work harder. Ironically, dysgraphics failure to produce proper script is not due to lack of effort; because the automaticity of handwriting has not been developed these dysgraphic students often require all of their working memory just to produce the letter and number shapes on the page much less write them with proper size, orientation on the line, spacing between, and legibly. Further addressing handwriting problems, Levine (2003) stated "When a mind is forced to strain excessively to meet production demands, academic output failure may ensue" (p. 4). Certain dysgraphic students may also possess akward pencil grips due

in part to poor motor control, these students may be able to produce legible handwriting; however, these efforts "are laborious and usually quickly cause fatigue and cramping" (Eide et al, 2006, p. 381; see Appendix C for various pencil grip illustrations, pp. 31-32).

Automaticity or Fluency is defined as the "ability to express oneself readily and effortlessly; flowing or moving smoothly;" as discussed above dysgraphic students are not able to produce handwritten work readily or effortlessly. The Dysgraphic's writing is often "dysfunctionally slow" and even if the handwriting is clear the fluency or lack thereof means that the "handwriting is still…nonfunctional" (Eide et al, 2006, p. 380). As stated earlier, dysgraphia can be caused by a dysfunction in one or more of several brain or neurological functions required for the process of handwriting.

Following is a table addressing the five major functional components of neurological processing required for the production of handwriting:

Five Major Functional Components for Handwriting

Generating Linguistic Template	1. Involves deciding which words to write. 2. Sending the motor system the signals necessary to form those words.
Planning and Implementing Motor Output	Follow the motor maps that tell the muscles in the fingers, hands, and arms how to form the letters.
Integrating Sensory Feedback	To monitor and modify written output in the somatosensory system and the proprioceptors.
Integrating Visual Feedback	To monitor and modify written output; requires satisfactory hand-eye coordination.
Attention	Oversees the whole writing process using working memory.

(Eide et al 2006, pp. 383-392).

Organization of written work becomes nearly impossible for the dysgraphic student because they continue to struggle with various functional components that are required for handwriting. This may first becomes noticable during first or second grade when students are asked to begin composing paragraphs. The California State Board of Education (2006) content standards for grade one writing demand "Students write clear and coherent sentences and paragraphs that develop a central idea." Bain et al (2001) surmised that an individual's handwriting fluency or automaticity determines the amount of working memory available for the composing aspect of writing (p. 78). Working memory cannot be accessed for organization of written work until handwriting is automatic freeing the working memory for the task of composition. Screws et al (1998) concluded "that tasks which require midline crossing use more complex mental processes" (p. 202). The dysgraphic student loses out on developing higher level cognitive, linguistic, and composing processes because they remain overly taxed with the process of handwriting (Eide et al, 2006; Levine, 2004; Mayer; 1996).

In part due to the overwhelming challenges of writing for the dysgraphic student, the dysgraphic will often underproduce in comparison not only in relation to their own verbal abilities and the work of their peers. It has been widely documented that dysgraphic students become labeled as lazy, unmotivated by parents, teachers and peers (Eide et al, 2006; Levine, 2003; Mayer, 1996; Paquette & Tuttle, 2003; & Vail, 1989). My son's second grade teacher continually stated my son "just needs to learn to be a student;" a not so subtle statement pointing to a lack of motivation (personal communication, M. Martinez, 2006). Aside from the physical pain that many dysgraphic students experience due to poor motor coordination and various akward grips and writing postures, there is emotional pain. Lack of written output from a student who is otherwise intelligent and verbally capable is often puzzling to parents and teachers who

may find that they are constantly battling with the student over the quality of written output or the lack of written output also known as unfinished assignments (Bain et al, 2001; Eide et al, 2006; and Levine, 2003). Levine (2003) went so far as to posit that laziness is a myth; "Every kid would prefer to do his homework and be praised for its quality….it's all a part of a natural search for both recognition and self-satisfaction" (p. 9). Afterall this is in fact how one will learn to develop a sense of themselves as a productive member of society by working hard and receiving recognition of their efforts; what a boost to self-esteem. My own son brings home mounds of unfinished work, and when we are sorting through the papers it often triggers a frustration explosion (for lack of a better description) because he will say "I wanted to finish this…" or "They didn't give me enough time…" or "I had a really good idea about that story…;" I can see the shame that he feels for his inability to complete a task in the same manner as his classmates. Scaffolding is an important pedagogical strategy – building upon previous knowledge and ability in the same what that language systems develop building upon previous acquisitions – that I see my son's academic scaffold as incomplete and unstable. Roit and McKenzie (1985) stated "The learning disabled student may forever have his potential for growth in written language confined to good spelling and clear handwriting instead of meaningful thought" (p. 258). As a learning disability, Dysgraphia, if left unaddressed, will forever affect a student's academic potential.

Classifications of Dysgraphia

Dysgraphia affects twenty-five to forty percent of the general population with boys more often than girls at a ratio of about three to one (Eide et al, 2006, p. 377). Among scholars it is generally accepted that there are three types of dysgraphia: 1. Dyslexic, 2. Motor, and 3. Spatial

(Bain et al, 2001; Hannell, 2006; Lerner and Kline, 2006; Paquette and Tuttle, 2003; Wright and Wright, 2005).

1. Dyslexic Dysgraphia	✓ Handwritten spontaneous and complex work is illegible. ✓ Poor spelling (oral or written). ✓ Drawing and copying of text relatively normal. ✓ Normal finger-tapping speed – an indicator of fine-motor skill.
2. Motor Dysgraphia	✓ Both spontaneous and copied text is illegible. ✓ Oral spelling is normal. ✓ Drawing may be a problem. ✓ Finger-tapping speed is abnormal.
3. Spatial Dysgraphia	✓ Both spontaneous and copied text is illegible. ✓ Oral spelling is normal. ✓ Drawing is very problematic. ✓ Finger-tapping speed is normal

(International Dyslexia Association (IDA), 2000; and Paquette & Tuttle, 2003).

Motor dysgraphics are often referred to as being clumsy and not being very good with various motor activities. Spatial dysgraphics have problems understanding space; sometimes considered to have poor depth perception or hand-eye coordination.

Assessment

Feifer and Defina (2002) produced the *90-Minute Dysgraphia Evaluation*, which recommended a broad group of assessments to provide parents, educators, and other education specialists with a clear picture of a student's of strengths and weaknesses (Appendix B contains the complete list of evaluations, p. 29-30). Feifer and Defina (2002) outline eight broad categories where student assessment should take place: 1. Measure of Intelligence, 2. Constructional Dysgraphia, 3. Working Memory, 4. Executive Functions, 5. Writing and Spelling Skills, 6. Phonological Awareness, 7. Retrieval Fluency Measure, 8. Family History.

As a part of the complete evaluation document, Feifer and Defina (2002) outline various tests that can be used in each of the seven academic categories. The final category to evaluate is related to family history.

Since Dysgraphia, as well as other possible co-morbid conditions, can have a genetic component, a history of familial health and academic problems should be obtained (Eide, et al, 2006; Feifer & Defina, 2002; Hooper, 2002; Levine, 2003; and Mayer, 1996). Hannell (2006) supported the idea of a "comprehensive assessment to eliminate other, similar conditions" p. 118. The professionals involved in the assessment process (and will then often provide prevention, remediation, and accommodation services or support) include Special Education teachers, Educational therapists, Learning Disability Specialists, Adaptive Physical Educators along with Occupational Therapists, the school nurse, school Psychologist, sometimes additionally pediatricians and neurologists (Mayer, 1996; Lie et al, 2000). Eide et al (2006) insisted upon a "thorough examination covering language, memory, attention, reading, motor, and sensory functions;" they also called for prenatal, birth and further health information, current development of fine and gross motor skills, language and reading abilities, academic performance, favorite activities, and possible attention issues (p. 393). Dysgraphia falls under the umbrella of Specific Learning Disability because it is a critical skill for core curriculum success (Miller, Carpenter, Rakes & Choate, 2004, p. 214).

Specific Learning Disability

What is a specific learning disability? Generally specific learning disability is defined as a discrepancy between a student's perceived ability and actual performance where the student demonstrates difficulty in a particular area or areas of learning; skills of listening, speaking, reading, writing, and/or mathematics may be negatively affected (Baumel, 2003; Deiner, 2005;

Lie, O'Hare, & Denwood, 2000; and Sovik, 1984). How does Dysgraphia qualify as a Specific Learning Disability? Dysgraphic students verbal answers out pace their written answers; their actual performance on written examinations is most often much below their ability to verbally express themselves. Dysgraphia (known as a *Disorder of written expression* by those in the education field) certainly fits the definition of a specific learning disorder and this serves to qualify dysgraphic students for special education services under the current federal Individuals with Disabilities Education Act (IDEA) legislation. Temple (1988) discovered that dysgraphia was not just a developmental delay based on her evaluation of a 47-year-old dysgraphic man. There is evidence that dysgraphia is a persistent condition for most students, Hamstra-Bletz and Blote (1993) found that second grade students with dysgraphia still have significant writing problems in sixth grade. Smits-Engelsman et al (1997) recommended that dysgraphic students receive additional direct handwriting instruction; "children's poor handwriting improved after a specific physiotherapy program" (p. 179). The above assessments are also critical in identifying a student's specific form of dysgraphia. This knowledge will be invaluable in creating the Individualized Education Plan (IEP) outlining the various prevention, remediation strategies and accommodations along with the various specialists that will be provided to the student to address their specific learning disability.

Intervention Techniques

Prevention

In this case, prevention would equate to ensuring that all writing readiness skills are in place. Mather (2003) concluded that premature introduction of written language to children who have not reached certain milestones in neurological development will be the same children who suffer with dysgraphia. Miller et al (2004) stated, "developing readiness skills in

handwriting…is as important as in other subject areas" (p.214). Lee-Corbin et al (1996) concluded, "weak fine motor control and poor hand to eye coordination are major contributory factors to underachievement" (p.140). LeBrun et al (1975) stated that students who "exhibit unusual clumsiness" when involved in various writing readiness skills "should be referred for psychomotor treatment" (p. 206).

As mentioned in the Writing section above, Marr et al (2001) outlined a list of writing readiness skills and in addition stated " Evaluating visuomotor skills may help pinpoint children who need close monitoring or specific interventions to prevent the development of handwriting problems" (p. 11). Taylor (2001) provided a number of prewriting activities including painting at an easel, coloring with crayons or markers, drawing with encouragement for more detail, tracing and copying patterns, and acquiring the language of instruction (bottom, middle, top, etc) (2001, pp. 46-47). In many cases the development of the prewriting prevention skills for certain students (those late to acquire midline crossing and left brain hemisphere readiness) would mean no formal handwriting instruction until first or second grade; this view is supported by LeBrun et al (1976, p. 206) and Stott (1977, p. 21). The current state of the education system in the United States; however, would find this idea to be a ridiculous standard to uphold. One must wonder if addressing the acquisition of these readiness skills would reduce a great number of learning disabilities or difficulties that otherwise seem to be exploding around the country.

Remediation

Writing can be a significant learning difficulty for students, and Eide et al stated "Until a child develops sufficient speed and automaticity, handwriting should be treated not as a major route of communication or a means of demonstrating subject mastery but as its own discipline" (p. 401). Most students receive handwriting instruction these days as early as three or four years

of age. These students may or may not have fully developed the prewriting skills outlined above. A parent or childcare provider, which in most cases knows very little about writing readiness skills or handwriting instructional strategies, often initially facilitates the handwriting instruction. Smits-Engelsman et al (1997) recommended that dysgraphic students receive additional direct handwriting instruction; "children's poor handwriting improved after a specific physiotherapy program" (p. 179). Additional direct instruction is required for dysgraphic students (Hamstra-Bletz & Blote, 1993; Lerner & Kline, 2006; Mayer, 1996; Smits-Engelsman & Van Galen, 1997; Stott, 1977). "Direct instruction does not mean handing a student a ditto sheet of letter forms to be copied" but involves a comprehensive overview of the letter's spatial orientation on the lined paper, beginning, middle, and end points of the letter, identification of letters that share beginning strokes (California Department of Education, 1994, p. 40). The main goal of direct handwriting instruction is automaticity or fluency of handwriting, which includes proper letter formation, spelling, and grammatical rules.

Bain et al (2001) identified nine basic elements that should be included when teaching letter and number formation:

Modeling	First step in teaching smooth letter production.
Noting critical attributes	Describing critical letter attributes.
Physical prompts and cues	Help learner focus on most critical dimensions of letter formation.
Tracing	Allows learner to practice combining discrete elements into a harmonious whole.
Copying	Helps with a beginning level of automaticity.
Self-verbalizing	Resemble and replace teacher's initial cues
Repetition	Leads to mastery.
Self-correction & feedback	Leads to mastery.
Writing from memory	Mastery, higher-level skills for composition can now receive the student's attention.

(p. 85).

Providing students with verbalized numbered strokes was a more effective method of modeling and identifying attributes of various letter and number formations, rather than relying on spatial terms including up and down or other such verbalization methods (see numbered diagram in Appendix C, p. 31-32). Bain et al (2001) cited a study that established having students practice by "pairing the letter name with the letter formation" permits more efficient use of the motor maps, and almost more importantly it was discovered "writing a letter a few times was more effective than… writing rows of the same letter several times," and idea supported by

Bain et al (2001) (p. 87). There are various direct handwriting instruction methods readily available including Olsen's (1998) Handwriting Without Tears, programs provided by Lindamood-Bell, Slingerland, and Orton-Gillingham for manuscript (printing) and for cursive Mary Benbow's Loops and Other Groups, and Handwriting Through Music (Peter & Weir, 1974). Part of the remedial strategy should include determining the individual needs of the student and matching them to the appropriate remedial handwriting program or programs. (Eide et al, 2006, p. 397).

Sovik (1984) supported the idea of remedial instruction when he discovered that a group of dysgraphic students representing all three forms of dysgraphia "improved their writing significantly….once they were taught systematically (with verbal and motor explanation) the fundamental characters and combinations of letters…in accord with their individual writing" (p. 146). The idea behind remediation techniques is to retrain the motor memory (including the left hemisphere of the brain) in the proper formation of letters and numbers. Attention should also be given to the students posture at the desk, paper, paper position on the desk, and pencil grip (Bain et al, 2001; Eide et al, 2006; Taylor, 2001).

Accommodation

Temple (1988) studied a middle-aged man and concluded that his "dyslexia and dysgraphia have persisted in a problematic fashion for the 30 years since he left school" (p. 204). Many people view the use of accommodations as providing certain students with an extra advantage; however, "accommodations…should…be thought of…as ways of getting a child into the kinds of work that are best suited to promoting her education" (Eide et al, 2006, p. 19). Accommodations can be categorized as short-term (temporary) or long-term, conventional adaptations, and assistive technologies. These categories overlap many long-term

accommodations can be achieved either with conventional or technological means. Accommodations are also very individual in nature and vary depending on the needs of the individual. The Special Education Division (1994) of the California Department of Education acknowledged that students with Dysgraphia would benefit academically from a list of eighteen identified remedial and accommodating strategies that vary from conventional to technological (pp. 39-41).

Conventional accommodations for dysgraphic students include choice of various writing instruments, papers, and pencil grips. There are some fairly new pencils including one made by Dixon Ticonderoga called the Triconderoga®, which is a larger diameter triangular shaped pencil that also has a 'soft-touch' finish. According to Dixon Ticonderoga (2006), their triangular pencil helps promote the proper pencil grip ensuring best writing posture (of the pencil) and minimizing pain that results from less desirable pencil grips. Using a sloping surface rather than a flat one is also believed to "promote better wrist and arm position" (Olsen, 1998, p. 12). Special slanted boards are widely available for purchase, and I have discovered that a sturdy three-inch, three-ring binder works well for this purpose too. Various scribing methods also promote the dysgraphic students composition skills and related cognitive development without having his/her handwriting skills interfere with the attempts.

Dysgraphic students also may need different paper to practice handwriting and for the production of written work. Finding the right paper for the dysgraphic student should be based on the students particular needs; my own son who struggles with visual perception prefers to use paper with bright colored lines, so that he can gain better visual feedback (see Appendix D for photo and link to sources, pp. 33-35). This particular paper is called Smart Start Writing Paper the top line is blue like the sky, the bottom line is green like grass, and the middle dotted line is

red and is called the fence. This paper is helpful for instruction of manuscript (printing) because the direct instruction and verbalization can take into account the *sky, fence, and grass* or *blue, red, and green*. There is also paper that has raised lines that allows the student to feel the lines on the paper providing tactile, kinesthetic and visual feedback, this paper is called Right Line Tactile paper® (see Appendix D for photo and link to sources, pp. 33-35). Dysgraphic students should be allowed to use graph paper (available in various sized squares) or lined paper turned to create vertical columns for math (see the link for various graph paper sizes for free download in Appendix D, pp. 33-35).

On the subject of paper, students should be provided with pre-prepared paper with name, teacher's name, and etc; and can also be provided with an outline of any in class lessons that require note taking (see the example in Appendix D, p. 33-35). Paper could also be pre-numbered for various tests like spelling tests. Often, copying from the board is additionally difficult, so dysgraphic students should be given handouts of any items written or projected onto the board (California State Board of Education, 1994, p. 40-41). One method that was used extensively with my own son involved having him dictate the written work while the teacher scribed (wrote down) for him verbatim in yellow highlighter on the page, then my son would trace the yellow words. This method has been very successful in getting a more detailed written story. It is also useful to have someone scribe directly for the student, very similar to the above method without having the dysgraphic student tracing over yellow highlighter. Scribing can also be done by providing the dysgraphic student with a voice recorder, whether cassette or digital, to dictate various written assignments. The dysgraphic student, parent, teacher, and classroom aide just to name a few possibilities can then transcribe these dictated stories by typing or handwriting.

Dysgraphic students should be given the option of taking tests orally. The speed or rate of required written work should be reduced along with the volume or amount of written work; Jones (1998) described reduction in volume of written work as "reduce the copying elements of assignments and tests…. reduce the length requirements on written assignments -- stress quality over quantity" (p.1). Generally speaking, dysgraphic students should be enabled to do projects with out a mound of written text but instead draw upon areas of the student's strengths possibly a speech or a demonstration (Mayer, 1996, p. 14). Dysgraphic students could also use technology such as computers to complete projects, and this could include typing a paper rather than writing by hand, or producing a PowerPoint presentation to accompany a speech instead of a handwritten report.

University of Washington (2000) stated, "people with an LD are often neglected when considering adaptive computer technology" (p. 3). In order to have the dysgraphic student productive in the classroom setting and with various homework assignments, it is often important to provide them with assistive technology tools to "compensate rather than remedy, allowing" the student to "demonstrate his intelligence and knowledge" (University of Washington, 2000, pp. 3-4). Typing (typewriters, word processors, keyboard devices, spelling devices, and computers) and voice recorders (digital or tape) should be introduced and provided for use as a means to provide the dysgraphic student with a means to be productive in the classroom (California Department of Education, 1994; Eide et al, 2006; Hannell, 2006; Levine, 2003; Lie, O'Hare & Denwood, 2000; Mayer, 1996; Vail, 1989). The Franklin Electronic Speller and Dictionary are devices often used by dysgraphic students who struggle with spelling (University of Washington, 2000, p. 5) (see Appendix D, pp. 33-35). There are various keyboard devices that have been used over the years by dysgraphic students including two models by Alphasmart

the Dana and Neo. Another model often used is the Writer keyboard (see Appendix D, pp. 33-35). The use of classroom computers or personal laptop computers is another method of providing keyboard accommodations. Lie (2000) et al found "a generally favourable picture of the management of children with dysgraphia issued with a keyboard" (p. 98).

Software programs including *Kidspiration*™ and *Inspiration*™ allow students to use the computer program as a prewriting activity providing a better way to organize ideas for writing without the struggle and strain of actually producing handwriting (Levine, 2006, p. 189). Another software program recommended by Eide et al (2006) is *Write: OutLoud*™, a word prediction, *talking* word processing program (p. 399). There is also Math software programs like *Math Pad*™ that allows students to perform math problems "like regrouping" without using pencil and paper (Eide et al, 2006, p. 400). Please see Appendix D page thirty-five for links to various computer software programs. Computers can also be equipped with various voice-recognition software programs allowing the student to dictate directly to the computer also programs that will read back the text that has been typed by the student (Eide et al, 2006; Jones, 1998; Mayer, 1996; Wagmeister & Shifrin, 2000). However, there is a lot of debate about the effectiveness of voice-recognition software programs because of the need to train the software to the student's voice and the problems of excessive background noises when used in a classroom situation. Technological improvements in voice recognition software in the future may make this a more viable option for Dysgraphics.

CONCLUSION

Research into writing disabilities including Dysgraphia has fallen behind research into other learning disabilities. It is my hope that ongoing research will bring much needed attention to Dysgraphia as a learning disability while also providing parents, teachers, and students with

identification information, support, and more remediation and accommodation strategies. What is most important to students with Dysgraphia is that there is recognition of the disability by their teachers, families, and fellow students. A bright student, who has severe motor output difficulty (handwriting) and who also has marked word retrieval problems is often labeled as having attention problems. Maxine Young (2006), certified, licensed audiologist and speech-language pathologist, observed, "when a student with Dysgraphia was asked to do 'silent seat work' involving writing sentences (motor output difficulty) that contained the spelling words (word retrieval problems impacting sentence generation), the task was far beyond the child's ability, the results are restlessness, ease of distraction, and complete frustration" (personal communication). Giving this student a label of lazy, disruptive, ADD or ADHD will not solve the underlying problem of the Dysgraphia. For this student and all those like him, it will be extremely important that he receives early and appropriate assessment and identification in order to receive remediation and accommodations that can enable and ensure academic success.

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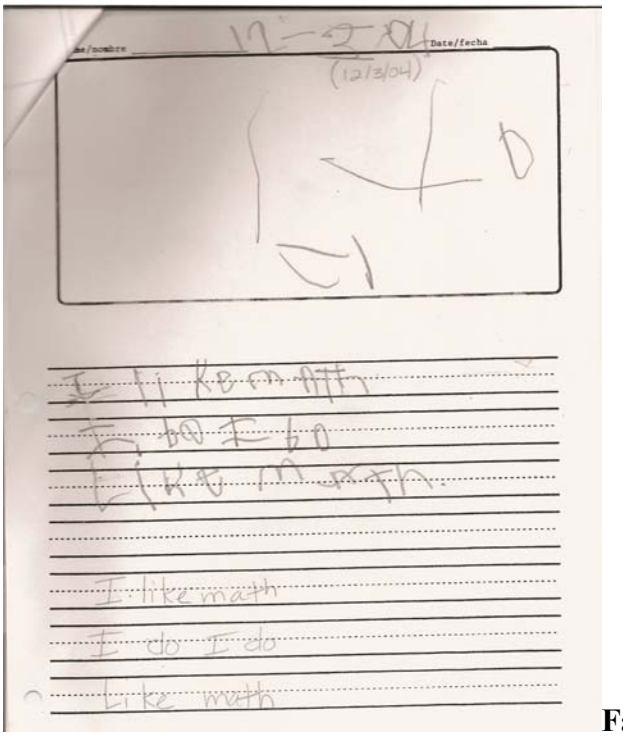
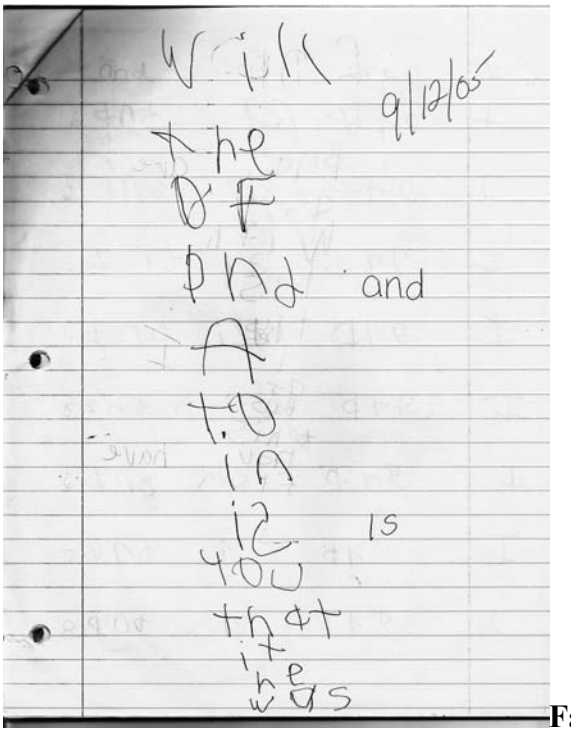
APPENDIX A

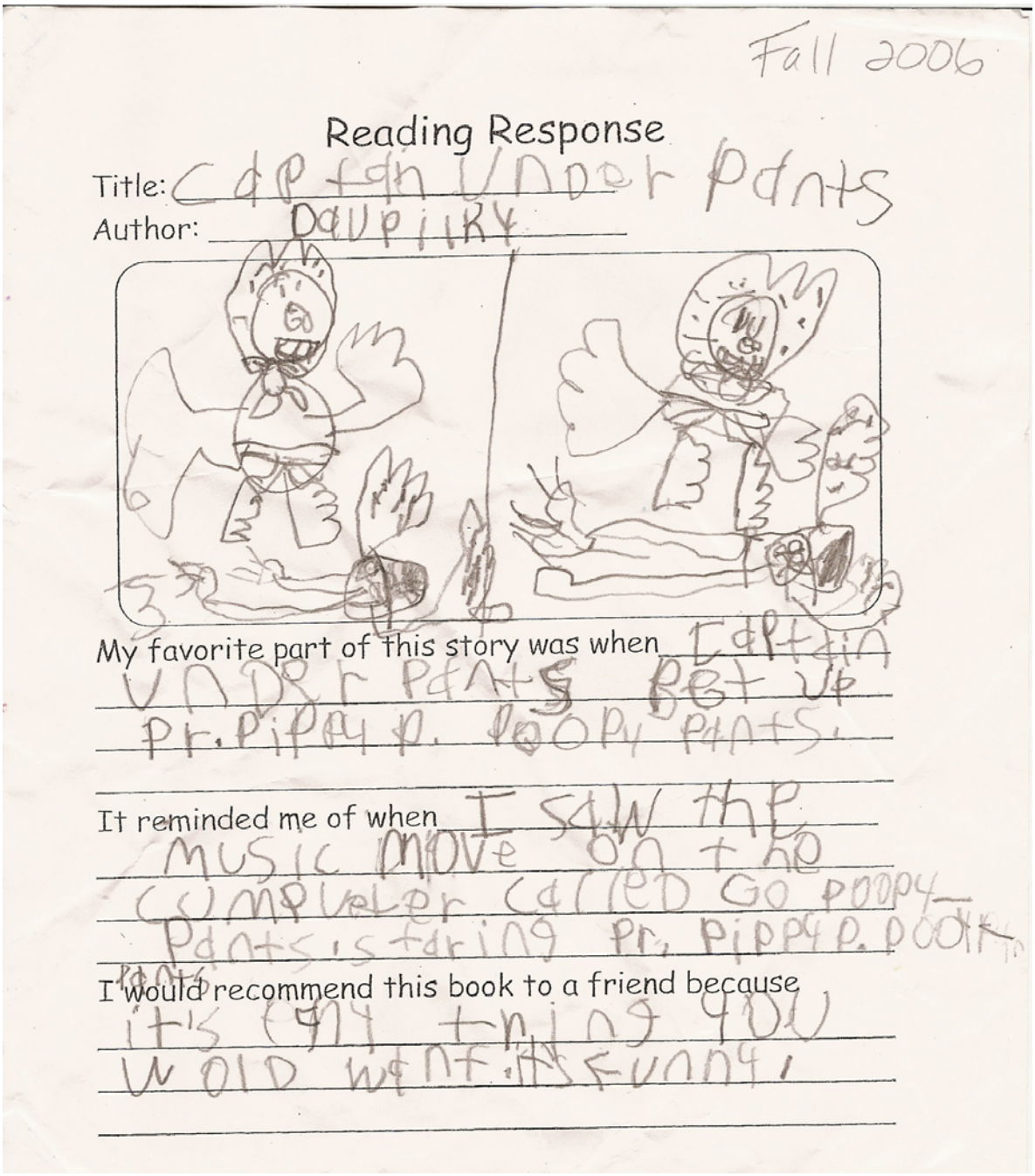
Handwriting Samples:



Fall 2004, Age 6 ½



Fall 2005, Age 7 years 4 months



Fall 2006, Age 8 years 4 months

APPENDIX B

90 Minute Dysgraphia Evaluation

By: Steven G. Feifer and Philip A. Defina (2002)

The examiner would use one test from the different categories:

Intelligence measures

- Wechsler Intelligence Scales for Children
- Cognitive Assessment System
- Differential Ability Scales
- Woodcock-Johnson III

Constructional dysgraphia

- Beery Visual-Motor Integration Test
- Bender Gestalt
- NEPSY (Design Copying)
- Process Assessment of the Learner (Copying)
- Wide range Assessment of Visual Motor Abilities
- Rey Complex Figure Test

Working memory

- Test of Memory and Learning (Digits and Letter Backwards)
- Trailmaking Test (Halstead-Reitan)
- Planned Connections (Cognitive Assessment System)
- Children's Memory Scale (Dot Locations and Sequences)
- Woodcock-Johnson III (Auditory Working Memory)
- WISC PI (Spatial span, Arithmetic & Sentence Arrangement)
- Wechsler Memory Scale(Visual reproduction & Paired Associate)
- Paced Auditory Serial Addition Test (PASAT)
- Wide Range Assessment of Memory and Learning (Finger Windows)

Executive functions

- Wisconsin Card Sort Test
- Stroop Test
- BRIEF (Behavior Rating Inventory of Executive Functions)
- Brown ADD Scales for children (3-12)
- Woodcock-Johnson III (Planning)
- Cognitive Assessment System (Planned Connections)
- Delis-Kaplan Executive Function Scale

- NEPSY (Tower)
- WISC PI (Elithorn Mazes)
- Booklet Category Test for Children

Writing and spelling skills

- Wechsler Individual Achievement Test - 2nd Edition
- Woodcock-Johnson III
- Test of Written Language - 3rd Edition (TOWL-3)
- Test of Written Spelling - 4th Edition
- Test of Early Written Language - 2nd Edition (TEWL-2)
- Test of Written Expression (TOWE)
- OWLS Written Expression Scale
- Informal Writing Assessment

Phonological awareness tests

- Comprehensive Test of Phonological Processing (C-TOPP)
- Process Assessment of the Learner (Phonemes & Pseudo-word Decoding)
- Woodcock-Johnson III (Word Attack)
- Phonological Awareness Test
- NEPSY (Phonological Processing)
- Test of Word Reading Efficiency (TOWRE)

Retrieval fluency measures

- Woodcock-Johnson III (Retrieval Fluency & Rapid Picture Naming)
- NEPSY (Verbal Fluency & Speeded Coding)
- Process Assessment of the Learner (Expressive Coding & Sentence Sense)
- Controlled Oral Word Association Test (COWAT)

Family history

- Neuropsychology of Writing Disorders: Dignosis and Intervention Steven G. Feifer, Ed.S & Philip A. De Fina, Ph.D School Neuropsych Press, LLC. 2000. ISBN: 0970333714 To order: 1-240-236-1210 snpress@frederickmd.com School Neuropsych Press P.O. Box 413 Middletown, Maryland 21769

Neuropsychology of Dysgraphia Steven G. Feifer, Ed.S, NCSP Philip A. Defina, Ph.D., ABPdN November 2002

http://www.ldonline.org/article/6203

APPENDIX C

Links to various Direct Handwriting Instruction Methods and Information:

- Handwriting Without Tears: http://www.hwtears.com/
- Lindamood-Bell Learning Processes: http://www.lblp.com/programs/index.html
- Slingerland Institute for Literacy: http://www.slingerland.org/
- Orton-Gillingham Institute for Multi-sensory Education: http://orton-gillingham.com/index.asp
- Various Pencil Grips:

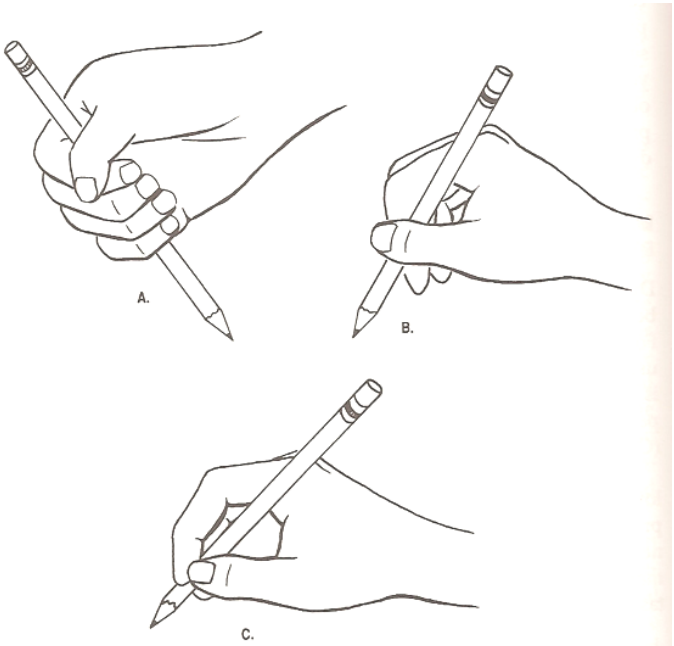
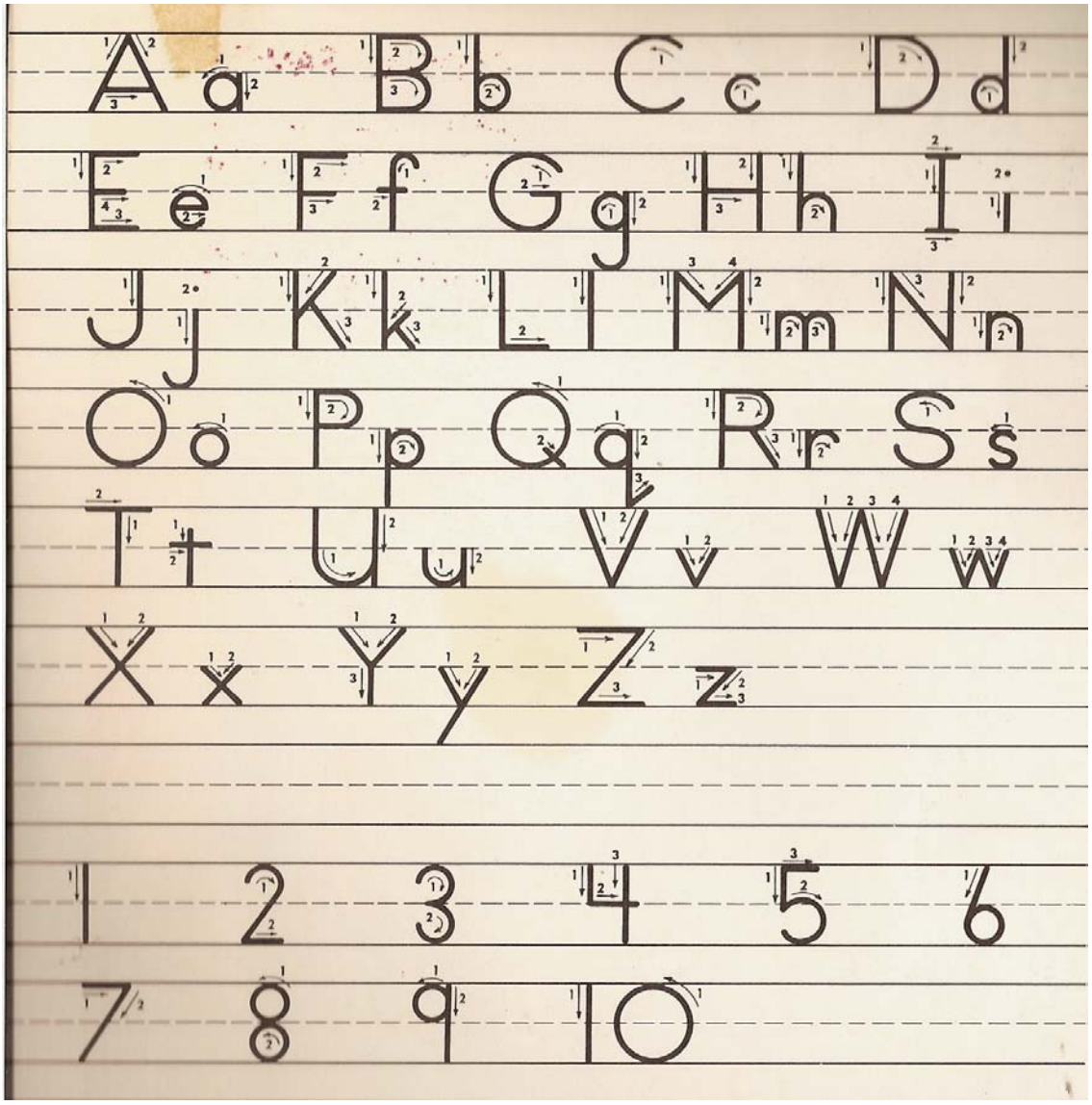


Plate 7-13. Various grips seen in developing children including (A) a fisted grip, often seen early. At about 2–3 years. A semi-fisted grip (B), and a mature grip (C) in which the fingers move independently of the hand and wrist

- Diagram of numbered strokes for letter and number formations.



APPENDIX D

Links and Accommodations:

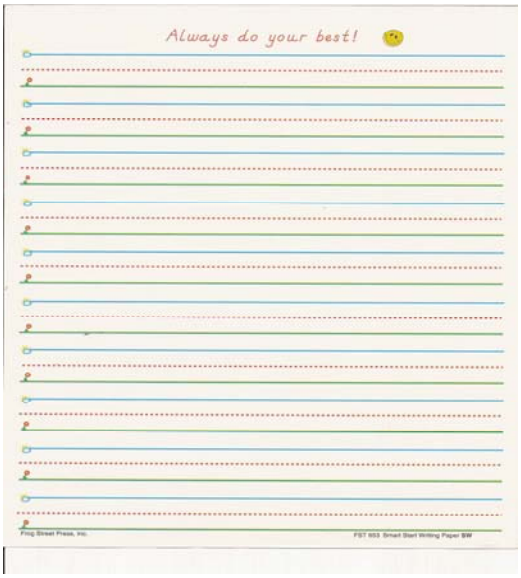
- **Dixon Ticonderoga's Triconderoga® Pencil: http://www.dixonusa.com/index.cfm**

- **Slant Board**

http://www.therapyshoppe.com/index.php

K & L Resources, Inc., 703-455-1503

- **Smart Start Writing Paper®**



http://edushop.edu4kids.com/catalog/default.php

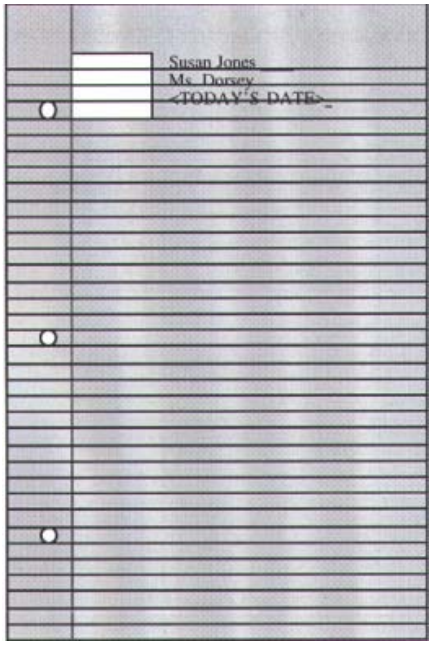
http://www.therapyshoppe.com/index.php

Kaleidoscope-The Parent Teacher Store: http://www.kaleidoscope-pts.com/

- **Right Line Tactile paper®**

http://www.therapyshoppe.com/product.php?cat=1&id=6

- **Sample Template for Pre-prepared paper**



http://www.resourceroom.net/readspell/dysgraphia.asp

- **Links to free downloadable graph papers**

http://donnayoung.org/math/papers.htm#graph

http://www.pdfpad.com/graphpaper/

- **Inspiration™ and Kidspiration™ Software** and information available at http://www.inspiration.com/
- **MathPad™ Software** and information available at http://pubpages.unh.edu/~mwidholm/MathPad/
- **Write: OutLoud™** available at http://www.donjohnston.com/catalog/writoutd.htm.
- **Franklin Electronic Speller® and Dictionary** http://www.franklin.com/.
- **Writer** http://www.writerlearning.com/index.html.