Graphomotor Skills: Why Some Kids Hate To Write

By Glenda Thorne, Ph.D. DESCRIPTION OF GRAPHOMOTOR SKILLS

Handwriting is complex perceptual-motor skill that is dependent upon the maturation and integration of a number of cognitive, perceptual and motor skills, and is developed through instruction (Hamstra-Bletz and Blote, 1993; Maeland, 1992). While a plethora of information exists in lay and professional literature about many of the common problems experienced by school age children, difficulty with handwriting is often overlooked and poorly understood. Students with graphomotor problems are frequently called "lazy", "unmotivated" and/or "oppositional" because they are reluctant to produce written work. Many times, these are the children who dislike school the most. Because they are sometimes able to write legibly if they write slowly enough, they are accused of writing neatly "when they want to". This statement has moral implications and is untrue; for children with graphomotor problems, neat handwriting at a reasonable pace is often not a choice.

When required to write, children with written production problems frequently engage in numerous avoidance behaviors. They have to go to the bathroom; they need to sharpen their pencils; they need a Kleenex from their backpack. Sometimes they just sit and stare. Even disrupting the class and getting in trouble may be less painful for them than writing. Work that could be completed in one hour takes three hours because they put off the dreadful task of writing.

The following paragraphs will attempt to elucidate the various components of handwriting and the characteristics which students display when there are breakdowns in these components. Components of graphomotor or handwriting skills include visual-perceptual skills, orthographic coding, motor planning and execution, kinesthetic feedback and visual-motor coordination.

Visual-Perceptual Skills. Visual-perceptual skills enable children to visually discriminate among graphic forms and to judge their correctness. Thus, visual-perceptual skills involve the ability or capacity to accurately interpret or give meaning to what is seen. Generally a number of specific skills fall into this category including visual discrimination, or the ability to distinguish one visual pattern from another, and visual closure, or the ability to perceive a whole pattern when shown only parts of that pattern. Adequate visual-perceptual skills are a necessary but not sufficient condition for legible written output.

Orthographic Coding. A second factor important to the production of legible handwriting is orthographic coding. Berninger and her colleagues (Berninger, Yates, Cartwright, Rutberg, Remy and Abbott, 1992) define orthographic coding as the "ability to represent a printed word in memory and then to access the whole word pattern, a single letter, or letter cluster in that representation" (pg. 260). Thus, orthographic coding refers to the ability to both store in memory and retrieve from memory letters and word patterns. The relationship between poor handwriting and orthographic coding deficits has been empirically established (Berninger et. al., 1992).

Motor Planning and Execution. A third component of handwriting is praxis or the ability to plan and execute motor actions or behavior. Fitts and Posner (1967) describe motor skill acquisition as proceeding through three stages. The first phase is called the cognitive or early phase. In this phase, the learner establishes an understanding of the task and a cognitive map of the movements required to accomplish the task. In the second phase, the associated or intermediate phase, the movement patterns become more coordinated in time and space. During this phase, proprioceptive feedback (the feedback that the brain receives from the muscles and nerves) becomes increasingly important and the importance of visual feedback decreases. The final phase, the autonomous phase, is characterized by the development of larger functional units that are translated into a motor program which then occurs with minimal conscious attention.

Luria (1966) notes that a motor action begins with an idea about the purpose of an action and the possible ways in which this action may be performed. The ideas are stored as motor engrams. Thus, in order to carry out a motor behavior, we must have both the idea or image for what must be accomplished (i.e., the plan) and the ability to match our motor output to that plan. Therefore, both adequate motor planning and execution are necessary for handwriting.

Levine (1987) includes in the definition of dyspraxia difficulty with assigning the various muscles or muscle groups to their roles in the writing task. This definition focuses on the execution or output aspect of dyspraxia. According to Levine, in order to hold a pencil effectively and produce legible handwriting at an acceptable rate, the fingers must hold the writing utensil in such a way that some fingers are responsible for stabilizing the pencil or pen and others are responsible for mobilizing it. In a normal tripod grasp, the index finger is responsible for stabilizing the writing instrument and the thumb and middle finger are responsible for the mobility of the instrument during writing.

Kinesthetic Feedback. Yet another component of motor control for legible handwriting produced at an acceptable rate is feedback of the sensorimotor system, especially kinesthetic feedback, during the performance of motor actions. Luria (1966) points out that for effective motor action, there must be afferent impulses from the body to the brain that inform the brain about the location and movement of the body. The body then makes adjustments based on these impulses to alter its movement pattern until the desired pattern is achieved. Thus, it is kinesthetic feedback that facilitates a good match between the motor plan and motor execution. In writing, the writer has a kinesthetic plan in mind and compares this plan to the kinesthetic feedback and then either corrects, persists or terminates the graphomotor pattern (Levine, 1987).

Visual-Motor Coordination. Visual-motor coordination is the ability to match motor output with visual input. Although it is the nonvisual or kinesthetic feedback that is crucial for handwriting, visual feedback is also important. Visual feedback provides gross monitoring of writing rather than the fine-tuned monitoring provided by nonvisual feedback. It is this gross monitoring that prevents us from writing on the desk, crossing over lines (Levine, 1987) and staying within the margins.

PROBLEMS WITH GRAPHOMOTOR SKILLS

Deficits in Visual-Perceptual Skills. Children with visual-perceptual problems may have a history of reading problems because of difficulty with letter and word recognition. In addition, if a child cannot accurately visually discriminate the letter b from the letter d, he/she will be unable to reliably reproduce these letters upon demand. If students have problems with visual closure, they may have difficulty with accurate letter formation and handwriting legibility may be poor. For example, they may print the letter o with a space in the top, but perceive the letter as closed. When deficits in visual-perceptual skills are suspected, they can be readily identified by informal or standardized tests.

Deficits in Orthographic Coding. Students who have trouble with orthographic coding will often forget how to form certain letters in the middle of a writing task. They frequently retrace letters or exhibit false starts or hesitancies as they write. Observations of their written output may show that they have formed the same letter several different ways. When asked, these students can usually report if they have difficulty remembering what letters look like. Children who cannot reliably make use of visual recall to form letters and words often prefer to print rather than write in cursive because print involves only twenty-six different visual letter patterns, whereas letters written in cursive have a seemingly endless number of visual patterns. Their spelling errors may be phonetic in nature (Levine, 1987, 1994).

Deficits in Motor Planning and Execution. Poor motor planning and execution is referred to as dyspraxia. Deuel and Doar (1992) define dyspraxia as the "inability to learn or perform serial voluntary movements with the proficiency expected for age and/or verbal intelligence" (pg. 100). Helmer and Myklebust (1965) discuss the role that memory for motor sequences play in correctly forming letters when writing. Luria (1966) described two forms of dyspraxia. The first form involves difficulty in creating an image of a required motor movement. The second involves a breakdown in the central nervous system mechanism that is responsible for putting the plan into action. Thus, the child has the blueprint for the action/behavior, but has difficulty implementing it motorically (Levine, 1987).

Ayres (1972, 1975, 1985) suggested that the problem in developmental dyspraxia is in the neural activity that takes place prior to motor execution. According to Ayres, dyspraxia is generally viewed as an output problem because the motor component is more observable than the sensory component. However, in her view, dyspraxia is an inability to integrate sensory and motor information, rather than merely motor production.

Children who suffer from fine motor dyspraxia show poor motor coordination. At times, they assign too many muscles to stabilizing the pencil or pen and too few muscles to mobilizing it. At other times, they assign too many muscles to mobilizing the writing utensil and too few muscles to stabilizing it. Thus, their pencil grips are often inefficient. They may develop a hooked grip in which they stretch out the tendons in the back of the arm so that the fingers move very little if at all during writing. With this grip, they are using the larger muscles of the wrist and forearm which may be easier to control than the smaller muscles in the fingers. They often perform poorly with other fine motor tasks that involve coordinated motor movements such as tying shoes or holding a fork correctly (Levine, 1987).

Another pencil grip which suggests fine motor dyspraxia is one in which the child holds the pencil very tightly and near the point when writing. Further, students with dyspraxia often change pencil grips and prefer writing in cursive rather than print. They do not like to write and complain that their hand hurts when they write. Writing for them is a labor-intensive task. Fine motor dyspraxia is frequently associated with speech production problems because these children often have difficulty assigning the muscles in the mouth to specific speech sounds (Levine, 1987, 1994).

Impaired Kinesthetic Feedback. Children with impaired kinesthetic feedback often develop a fist-like grip of the writing instrument. With this grip, they extend their thumb over the index and middle finger, limiting the mobility of the fingers. They may also press very hard on the paper with the writing utensil in an attempt to compensate for the lack of kinesthetic feedback. Further, they may look closely at the pencil or pen when writing thus attempting to guide the hand using visual feedback which is a much slower process. This is why children with impaired kinesthetic feedback may produce legible handwriting at a greatly reduced pace. As they progress in school, however, the demands placed on written output are too great and legibility deteriorates. These are the children who are often accused of writing neatly "when they want to". They also often prefer to use mechanical pencils and "scratchy" pens because these provide more friction on the paper when writing. They complain that their hand hurts when writing and they do not like to write. Performance in other fine motor skills may be adequate or good because many fine motor skills do not place such reliance on kinesthetic feedback.

Research has shown that tasks which were designed to improve kinesthetic sensitivity improved handwriting performance more than a task that involved only practice in handwriting (Harris and Livesay, 1991).

Deficits in Visual-Motor Coordination. Children with visual-motor incoordination function much differently than those with impaired kinesthetic feedback because of the different demands of certain motor tasks. Poor visual-motor integration may lead to problems with fine motor tasks that rely heavily on visual feedback. These include threading a needle, drawing, painting, craftwork, building things with blocks, repairing things, playing games such as Nintendo and using a mouse on a computer.

Complete references are available at: http://www.cdl.org/resource-library/articles/graphomotor.php?type=subject&id=45.

About the Author

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