

The write stuff achieves the right stuff

Make sure your children are learning to write; and then, make sure they continue to write, **Dr Ragnar Purje**

It is thinking, action and complex movement that develops and enhances the brain and body (the *hólos*). ‘We do not have bodies; we are our bodies’ (Claxton, 2015, p. 3).

Writing is not only an extraordinarily complex fine motor skill, it also involves gross motor skills. These neurological and neuromuscular biological relationships are essential for developing and enhancing a rich, complex brain and a sophisticated mind and body (*hólos*). Tapping a keyboard or swiping a screen – especially by children – is not complex. Because of this axiomatic truth, deep, rich and intricately sophisticated neurological and neuromuscular biological developmental relationships are not formed in the same way that is achieved through the act of writing.

The *hólos* is a term which unifies the brain and the body, with one word. *Hólos* derives from the Greek: *όλος* – *όλος*. The English word holistic is derived from *hólos*. Holistic and *hólos* offer the same classification. Holistic and *hólos* incorporate the concept of holism. It is the efficient action and skill of writing which provides the right stuff for optimum *hólos* development for children.

Children need to write to rewire the brain with complexity

Children need to write. The act of writing involves the fine motor skills of the hand, the fingers, the face and eyes; writing also involves the gross motor skills of the arm, shoulders and torso (Ritchey, 2006; St. John, 2013; Seung-Hee, & Meisels, 2006). Referring to Ericsson (2008), St. John (2013, p. 17), identified research which suggests that fine and gross motor deficits has the potential to influence poor student ‘achievements during the first three years of school.’

Fine motor skills and cognitive abilities

Fine motor skills are defined as being ‘the coordination of groups of small muscles to complete a task or to participate in an activity’ (St. John, 2013, p. 16). Fine motor skills are found in three areas: the face, which includes the eyes, ears, the tongue and the mouth, the hands, and the feet (St. John, 2013; Seung-Hee, & Meisels, 2006).

Imperatively, fine motor skill development is directly connected to cognitive abilities as well as to reading, writing, literacy development, numeracy development and associated intellectual comprehension advancements. Fine motor skill coordination and its associated abilities is also a predictor of school readiness and associated successful school based learning engagement as well as successful social engagement (St. John, 2013; Seung-Hee, & Meisels, 2006; Grissmer, *et al.*, 2010).

Writing is complex and for this reason it is enriching and essential

Writing is an activity that requires a wide range of rich and complex interconnected neurological and neuromuscular relationships that include the following: 1) The condition of kin-aesthesia. This is where a person is aware of where their limbs are in space by means of sensory organs (proprioceptors) in the muscles and joints. 2) The situation where the individual has biological support that provides stable joints in the wrists, hands and fingers. 3) The requirement where there is the ability of fine motor hand control that provides the individual with the means to successfully hold a writing implement with bio-mechanical efficiency. 4) The requirement of where the individual has the visual and cognitive ability to identify and track the letters and words that are being written. 5) The requirement of where the individual has the ability to successfully recognise when the midline of the body has been crossed. 6) The requirement for the individual to have successful coordination of both sides of the body (Christensen, 2004; St. John, 2013; Seung-Hee, & Meisels, 2006).

The principle of skill efficiency is the same in all human movement disciplines

Learning how to hold a pencil correctly is no different, in terms of principle, of learning how to hold a tennis racquet, a cricket bat, how to kick a football, or how to throw a basketball correctly. These sports skills, and the ability of learning how to hold a writing implement, in terms of principle, is exactly the same. All require demonstrations, immediate mirrored action by the learner, with accompanying ongoing support, which is then followed by ongoing repetitive practice.

Without this taking place, neurons do not fire and neurological connections do not grow, connect or amplify. As Coyle (2009) points out, in terms of learning any skill, ‘[r]epetition is invaluable and irreplaceable’ when one is wanting to learn and advance any skill.

Associated with this, the one who is practising the skill, must be taught how to do the activity in the first place. Skill efficiency does not ‘just happen.’ The skill, irrespective of what the skill is, must be demonstrated, with accompanying oral explanations, which is immediately actioned by the learner and then constantly practiced and refined.

Handwriting is no different to any other skill, the same principles apply; demonstration, explanation, immediate action by the learner, with ongoing practice.

The tripod grip is the ideal biomechanical pencil grasp for writing efficiency

Citing research undertaken by Bonney (1992), Case-Smith (2001), and Chu (1997), St. John (2013, p. 19), points out that before any successful coordinated and efficient writing can take place, the child 'must be able to hold and manipulate a writing tool. This process is facilitated by a proper pencil grasp.' The tripod grip is, in biomechanical and skill acquisition terms, the most efficient grip to hold any writing implement. The 'tripod grip is the ideal grasp where the thumb and pointer finger grasp the pencil with an open web space, while the pencil rests on the middle finger' (St. John, 2013, p. 19).

The research indicates it is important for children to immediately learn how to use the tripod grip correctly (Bonney, 1992; Case-Smith, 2001; Chu, 1997; St. John, 2013; Seung-Hee, & Meisels, 2006).

Like any other skill in any other discipline, the skill (whatever it may be) needs to be demonstrated, observed, explained, and then immediately actioned by the student and then practiced. The tripod grip is no different. Because the tripod grip is the most biomechanically efficient and effective grip, it is this, the tripod grip, which has the highest potential to lead to the

presentation of efficient, accurate and legible handwriting to take place (St. John, 2013; Seung-Hee, & Meisels, 2006).

Associated with this St John (2013, p. 20) points out that if a student is having difficulty in being able to successfully grasp a writing implement with the tripod grip, this difficulty 'often foretells writing difficulty, so time and effort should be taken to ensure proper tripod pencil grasp' takes place. An important question to ask here is why do parents, caregivers, significant others or teachers need to concern themselves with the biomechanically efficient pencil grip, i.e., the tripod grip?

According to St. John (2013) citing Bonney (1992), Chu (1997), and Case-Smith (2001) an improper or inefficient biomechanical pencil grip can often lead to and contribute to inefficient writing mechanics with associated improper and uneconomical letter shaping.

This inefficient mechanical writing action with associated improper and uneconomical letter shaping can then make handwriting not only more difficult to execute, these biomechanical and biological inefficiencies can also drastically affect the smoothness, economic efficiency and the legibility of the handwriting that is taking place.

As with tennis, squash, cricket, football, basketball, and etc.,



'handwriting is a multisensory process that involves the integration of the visual, motor, sensory, and perceptual systems of the body' (St. John, 2013, p. 20), all of which need to combine to help bring about biomechanically efficient legible writing; and which needs the direction, with supportive demonstrations (with accompanying explanations) of an insightful coach.

It is important to note that writing is multi-faceted in terms of what it is and what it provides. Handwriting is an amalgamation of physically creating symbols, i.e., writing letter forms (which is referred to as orthographic codes). Writing also involves knowing the names of letters (which is referred to as phonological codes). Self-evidently, handwriting also involves being able to efficiently shape all letters, which is known as the grapho-motor codes of the letter writing process (Medwell, Strand, & Wray, 2007).

This coordination of letter writing, associated knowledge and fine motor skill application is known as orthographic-integration (Christensen, 2004). The research in this field has demonstrated that there is a profound and significant relationship between orthographic-integration and a student's ability to produce a well-composed text that has been written with biomechanical efficiency, which is legible and which also has intellectual narrative merit, in relation to the developmental age of the writer (Medwell, Strand, & Wray, 2007; St. John, 2013; Seung-Hee, & Meisels, 2006).

Efficient writing, automaticity, cognition, speech and intellectual advancements

In terms of skill development, extensive, accurate and deliberate conscious practice, irrespective of the discipline, is what eventually leads to efficient automaticity. For automaticity and associated efficiency to take place, the key words are repetition and practice. There is not one skill, in any discipline, which one cares to mention, that will progress unless constant, regular and repeated practice takes place.

Ongoing and continuous accurate practice is the only behaviour that leads to

smooth and efficient action, with associated subsequent automaticity taking place (Bonney, 1992; Christensen, 2004; Coyle, 2009; Medwell & Wray, 2008; St. John, 2013; Seung-Hee, & Measles, 2006). Coyle (2009, p. 44) extends this requirement of practice even further: 'it's time to rewrite the maxim that practice makes perfect. The truth is, practice makes myelin, and myelin makes perfect.'

According to St. John (2013) referring to research undertaken by Christensen, 2004). St. John (2013, p. 19) noted that it is the deliberate and conscious action of constant regular practice and repetition, which eventually provides the means by which proficient and accurate accomplishment 'of a task without the need for direct attention to the task' to take place.

Further to this, St. John (2013) citing Gray (2004, p. 39) found that there was 'an association between deficits in automaticity and difficulties in reading itself; as well as in difficulties in reading for comprehension, in reading for fluency, in writing with biomechanical efficiency and legibility, as well as in the areas of numeracy, spelling, and memory. Added to this, the research in this area of biomechanical writing efficiency and cognition, as alluded to above, found that the skill of automaticity not only also has an impact on handwriting efficiency and fluency, it also has a profound impact on content quality, i.e. legible writing that presents intellectual narratives, that is aligned with the age and developmental stage of the writer (Bonney, 1992; Chu, 1997; Case-Smith, 2001; Medwell & Wray, 2008; St. John, 2013; Seung-Hee, & Meisels, 2006).

Handwriting is an essential hólós foundational skill

Referring to research undertaken by Bart, Hajami and Bar-Haim, (2007), and Seung-Hee and Meiseis (2006) St. John (2013, p. 17) points out that fine motor skills is also an 'important foundational skill and can positively impact a student's progress in school. Researchers have found a relation between well-developed fine motor skills and better school achievement, as well as a relation to positive social behaviors.'

The question is, why does this occur? Cognitive development (as a result of self-motivated effortful focussed thinking) and skill based automaticity (which arises as a result of regular deliberate practice) leads to neurons firing and wiring. These consistent and related actions of thinking and physical practice also leads to the situation where brain derived neurotrophic factor (BDNF) is released.

The neurological relationships that create automaticity

Brain derived neurotrophic factor has the capacity to attach itself to synapse receptors. As a consequence of this BDNF and synaptic receptor binding, this results in the synapse being able to trigger a seamless cascading flow of ions that leads to an increase in the transmission voltage at the synapse. This process helps to strengthen the connections 'between the neurons' (Arden, 2010, p. 11), which brings with it physiological capacity that these neurons will now tend to fire together more and more efficiently as the work and practice takes place.

When we perform an activity, any activity, this neurological and neuromuscular brain and body (hólós) interaction requires specific neurons to fire together. In this case, all of this is associated with the the act of writing. This external (action of writing) and internal (thinking about how one is writing) interaction, as noted, leads to the release of BDNF. The release of BDNF 'consolidates the connections between these activated neurons and helps them to wire together so they fire together more and more reliably as the practise continues. The activated neurons are now beginning to align into neuronal assemblies.

According to Doidge (2015), referring to Susan Greenfield and Gerald Edelman, the point of these neuronal assemblies is to bring about a combined amplification of the power that each neuron brings to the neuronal assembly, which is then distributed to all of the other neuronal assemblies that are distributed throughout the brain. An important point to note here is that these neuronal assemblies are not fixed or stable. 'These networks are constantly reforming themselves into new neuronal assemblies' (Suzuki, 2015, p. 105). This constant neurological

reforming adds to the brain's plasticity and functioning potential. This can include but not be limited to learning, the development of new skills, or enhancing memory potential and knowledge.

Self-motivated focussed attention leads to the firing of the nucleus basalis

The next important occurrence during this critical period of where writing development is taking place is where this action of writing not only leads to the release of BDNF. This release of BDNF also 'turns on the nucleus basalis' (Doidge, 2010, p. 80).

The nucleus basalis is that part of the limbic system of the brain which not only 'allows us to focus attention', this release of BDNF also counterbalances the nucleus basalis to keep firing 'throughout the entire critical period' (Doidge, 2010, p. 80). This not only allows ongoing attention to remain active and therefore prominent, but the ongoing release of BDNF also influences the following beneficial mind imperatives: memory function, the ability to learn, and the ability to remember. BDNF release also influences what is referred to as 'cognitive behaviour,' which is all about the ability of the mind and the body (the hólós) to seamlessly engage in sophisticated and complex thinking and action (Iughetti, Casarosa, Predieri, Patianna, & Luisi, 2011, p. 205). When all of this has taken place, we now have the automaticity of a highly skilled writer taking place. Because of this automaticity, as noted above, this now efficient and biomechanically highly skilled writer is now able to focus on what is being written, rather than focussing on how to write.

It is the thinking and the action of handwriting that provides the right stuff

What all of this suggests is that the importance of learning how to write efficiently cannot be overstated. Handwriting, with the application of the biomechanically efficient tripod grip, is not only a fine motor skill; biomechanically efficient handwriting also provides the means by which

deeper, richer and more advanced cognitive and intellectual efficiencies begin to take place.

Writing also involves not only activating the brain's motor systems, it also involves activating the prefrontal cortex. The prefrontal cortex is referred to as the brain's executive thinking centre. What is required here is to achieve the most efficient level of coordination between the brain's motor systems and the prefrontal cortex. And as the research indicates, it is the biomechanically efficient tripod hand-

It is the biomechanically efficient tripod handwriting grip which also has a significant influence on the presentation of refined utterances and the ability to engage in fluent sophisticated comprehensive writing and speech

writing grip which also has a significant influence on language development, the presentation of refined utterances and the ability to engage in fluent sophisticated comprehensive writing and speech, with associated constructive social behaviours. All of which is beneficial for hólós development and associated academic and social advancements to take place.

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