

Spelling and Writing

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In a nutshell

- Learning to read, write, and spell reinforce each other and must be included systematically and explicitly in any literacy program.
- Growing into a writer begins when a child observes that spoken language can be divided into words, words can be divided into syllables, and syllables into single phonemes which are represented by their own letter signs.
- The skill of writing is often viewed via three subskills: handwriting, spelling, and composition. Handwriting requires body control and fine motor skills, specifically fine motor control and coordination.

Spelling is based on linguistic skills, especially phonological processing, while composition depends on the skill of writing different kinds of texts.

- Handwriting and typing are different skills to learn and use.

Learning to spell and write

Writing is about transforming spoken language to the written form and transmitting messages. Growing into a writer begins when a child observes that spoken language can be divided into words, words can be divided into syllables, and syllables into single phonemes which are represented by their own letter signs. Connecting phonemes to syllables, syllables to words, and words to sentences and text forms the grounds of writing on which later writing skills are based.

The skill of writing is often viewed via three subskills: handwriting, spelling, and composition¹Berninger, V. W., Nielsen, K. H., Abbott, R. D., Wijsman, E. & Raskind, W. (2008). Writing problems in developmental dyslexia: Under-recognized and under-treated. *Journal of School Psychology*, 46, 1–21.. As a motor accomplishment, handwriting requires body control and fine motor skills, specifically fine motor control and coordination. Spelling, on the other hand, is based on linguistic skills, especially phonological processing. Writing can best be described as a process in which motor, cognitive, and linguistic skills and functions on several different hierarchical levels are needed simultaneously. Composition is based not only on handwriting fluency and spelling, but also a child's vocabulary, working memory, reading skill, and executive functions.

Lower levels are represented by the motor production of

letters (drawing letter shapes), syllables, and single words; higher levels are represented by orthographic (spelling), syntactic (sentence structure), and semantic (meaning) subprocesses. As skills develop, composition may mean very complicated and long-term problem-solving processes. A child needs to manage the rules of written language and solve what kind of meanings the text will include. In addition, they need to make the text a logical, coherent, and understandable unity. Thus, it is not surprising that spelling and writing can be difficult for many children, although for different reasons.

Many different perspectives have been applied to understand writing difficulty, for example studying spelling mistakes, or the motor control and brain mechanisms demanded by writing. However, there is less research on writing skill development and the specific problem related to it (dysgraphia) than on reading skill development (dyslexia). It is important to consider the subskills of writing to be able to recognise the causes of writing-related problems and identify where support should be directed and what kind of exercises help children most.

Writing subskills and their development

Handwriting as a motor function

There is a connection between cognitions and motor function in writing process. Our cognitions are embodied and placed in our concrete environment²Shapiro, L. (ed.) (2014). The Routledge handbook of embodied cognition. London: Routledge.. Then, environment is part of our cognitions; that is, our actions create our own personal environment, which modifies our perceptions and cognitions. This may sound complicated, but we

can simplify the idea by noting that the action-environment-perception-cycle forms a sort of brain mechanism on which our cognitions are based. The neuron networks of the brain change as these cycles are repeated, and our earlier active actions modify our perceptions in new situations. It is essential to understand that these new perceptual motor systems are born only when we are active actors. This means that a child cannot learn to write letters only by watching how someone else writes them; instead, own active motor functioning – in this case, practising drawing letter shapes – is needed, which, interestingly, also produces clearer changes in brain functions than, for example, drawing on ready-made model letters³Vinci-Booher, S., James, T. W. & James, K. H. (2016). Visual-motor functional connectivity in preschool children emerges after handwriting experience. Trends in Neuroscience and Education, 5, 107–120..

Multi-sensory teaching of letter shapes was found by Slingerland ⁴Slingerland, B. (2008). The Slingerland multisensory approach: A practical guide for teaching reading, writing, and spelling. Bellevue, WA: Slingerland Institute for Literacy. to benefit all beginner writers greatly, but in particular children who have difficulties drawing and remembering letter shapes. In multi-sensory teaching, the child's attention is directed to the visual hints of the letter by looking at the letter's shape, to the auditory hints by listening to the letter's name and sound, and to kinaesthetic hints by following the letter shape with a finger⁵Wolf, B., Abbott, R. D. & Berninger, V. W. (2017). Effective beginning handwriting instruction: multimodal consistent format for 2 years, and linked to spelling and composing. Reading & Writing, 30, 299–317.. At the same time, attention is directed to the motor functions of using the hand to write the letter and grip the pencil, as well as how the sound which corresponds to the letter is produced in the mouth. It is interesting that, in the practice phase, it is

not relevant how accurate the letters that the child draws are; instead, for the purpose of learning, if a child actively produces versions of letter shapes that differ slightly from each other, they are rehearsing the motor function of drawing the letter and embedding it into their long-term memory⁶James, K. (2017). The importance of handwriting experience on the development of the literate brain. *Current Directions in Psychological Science*, 26, 502–508.. The more fluent the handwriting becomes, the less conscious the motor management and visual reinforcing needed⁷Wolf, B., Abbott, R. D. & Berninger, V. W. (2017). Effective beginning handwriting instruction: multimodal consistent format for 2 years, and linked to spelling and composing. *Reading & Writing*, 30, 299–317..

In handwriting, a good pencil grip does not disturb fluent text production. Right from the beginning, it is good to teach the thumb–index finger–middle finger grip, where three fingers hold the pencil. A pencil grip tends to be permanent, and changing it later is difficult. It is important to direct attention to handedness, early pencil grip, ergonomic writing pose, and relaxed writing. Left-handed persons typically bend their hand, a movement related to the writer's attempt to see the writing; however, this pose may cause tension in the hand. For a left-handed person, the grip should be far enough from the tip of the pencil, as it is common that the thumb gets in the way and hinders them from seeing the writing.

It takes several years of active practising to develop handwriting which is automatic, fast, and requiring little active attention. As the writing skill develops, the writing speed increases, halts decrease, and writing becomes more fluent and automatic, which makes it possible for attention to be directed from motor accomplishment to word meanings, the formation of sentences, and the structure of a text.

In their early writing attempts, children do not use much

tactile or visual feedback to correct their accomplishment; rather, they produce movements by programming them even before they begin. In the next developmental phase, visual feedback is emphasised, but as the skill develops, the child learns to combine both feedbacks optimally, and the relevance of visual feedback decreases. At the same time, the child's typical handwriting develops, and the variation in how they write a specific letter decreases. On the other hand, problems of motor development can clearly complicate the development of writing skills and prohibit the automatization of handwriting.

What happens in the brain when writing?

A considerable amount is already known about how different areas of brain are activated in skilled adult writers. Attention has been directed in particular to the so-called Exner's area, which has been seen as the centre of motor images related to writing. This area is located in the middle gyrus of the left hemisphere, which is in the front side of motor area, just above Broca's area. The area seems to activate in linguistic tasks only when such tasks relate to writing as a motor function. Moreover, the superior parietal cortex in the left hemisphere has its own role in writing, and some researchers have stated that the motor programmes required for writing are stored in this area. In addition, the superior parietal cortex is important in handling the kinaesthetic feedback from the hand.

In addition to these areas of the cortex in the cerebrum, the back part of the cerebellum in the right hemisphere seems to consistently activate when a person is writing. Thus, the areas of the superior parietal cortex and cerebellum described above form the central brain structure in regard to writing. In addition to these motor areas, the fusiform gyrus in the left hemisphere, located in the temporal and occipital lobes, is important for writing; however, its function is related specifically to perceiving letters and words and the accuracy

of writing, rather than on motor-producing it⁸ Palmis, S., Danna, J., Velay, J.-L. & Longcamp, M. (2017). Motor control of handwriting in the developing brain: a review. *Cognitive Neuropsychology*, 34, 187–204..

Differences between handwriting and typing

Handwriting and typing are very different. Fluent handwriting is directed by a visuomotor process. Typing does not require the control of letter-shape drawing; thus, it does not include this subfunction. However, in typing, a person must first remember where the letter is located on the keyboard (for example, keyboard, touchpad, pointing pen) and then produce certain movement models which, over time, become faster and automatic. Furthermore, the sensory-motor experiences of handwriting and typing (touch, pose feeling, motoric and visual perceptions) are different, and typing on a touchpad produces different sensory feedback to a pencil moving on paper.

There is no research-based consensus that typing with digital equipment is more efficient or useful than writing with pen and paper. On the contrary, many experimental and brain-function studies even show evidence of the usefulness of handwriting⁹ Vinci-Booher, S., James, T. W. & James, K. H. (2016). Visual-motor functional connectivity in preschool children emerges after handwriting experience. *Trends in Neuroscience and Education*, 5, 107–120.. When learners are learning to read and spell, handwriting seems to further their recognition of letters, so they are better able to read and spell words than if they were learning to type. Studies of children's recognition of single letters have found that handwritten letters are remembered better than typed letters¹⁰ James, K. H. & Engelhardt, L. (2012). The effects of handwriting experience on functional brain development in pre-literate children. *Trends in Neuroscience and Education*, 1,

32–42.¹¹Longcamp, M., Zerbato-Poudou, M.-T. & Velay, J.-L. (2005). The influence of writing practice on letter recognition in preschool children: A comparison between handwriting and typing. *Acta Psychologica*, 119, 67–79.. It is thought that in the learning process, the letter shapes are saved to the long-term memory as motor programmes. In handwriting, these programmes consist of the way the different lines of letters are produced (e.g., shapes and directions, upward, downward, curved). When writing a letter, the motor programme is taken from the long-term memory, and the more detailed features of its production, such as muscle movements, directions, and size of letters, are handled in the working memory¹²Palmis, S., Danna, J., Velay, J.-L. & Longcamp, M. (2017). Motor control of handwriting in the developing brain: a review. *Cognitive Neuropsychology*, 34, 187–204.. Thus, it has been suggested that handwriting letters activates engrams in the brain which support the learning and remembering of letters. When typing, the motor functions are easier, and the sensory and motor experiences not as complex, as in handwriting; thus, they leave weaker engrams.

It is useful to note that reading difficulty can complicate spelling, and visuomotor difficulties can complicate handwriting. In this kind of situation, writing can be made easier by using a computer keyboard and text handling programme which has a spellcheck function or speech synthesis-supported spellcheck function. Nevertheless, it is not advisable to miss out on handwriting practice as the skill only develops after several repeats and with regular practice.

Additional reading

[Writing as a motor function and its brain mechanisms](#)

Practical tips

[Training in Writing Letters](#)

Spelling words

Spelling entails an understanding of how the sounds (phonemes) of heard words are changed to graphical signs, that is, letters or letter combinations (graphemes). In orthographically shallow languages, such as Finnish and Bantu, almost all phonemes have a corresponding letter sign, which makes it faster to learn to read and spell the words. When children learn to decode by using letter-phoneme correspondence, they simultaneously learn to recognise the word's phoneme structure, which they can utilise using phoneme-letter correspondence while spelling the word.

Most of the same factors that affect the development of reading skills affect the development of spelling skills, and the development of these skills is strongly and reciprocally supportive¹³Lerkkanen, M.-K., Rasku-Puttonen, H., Aunola, K. & Nurmi, J.-E. (2004). The developmental dynamics of literacy skills during the first grade. *Educational Psychology*, 24, 793–810.. Because a novice writer needs to carefully analyse the phoneme structure of a word, they need to know the phoneme-letter correspondence. For this reason, it is understandable that the best predictor of spelling skill is phonological awareness¹⁴Landerl, K. & Wimmer, H. (2008). Development of word reading fluency and spelling in a consistent orthography: An 8-year follow-up. *Journal of Educational Psychology*, 100, 150–161.. In addition to phoneme-letter correspondence, letter knowledge, and phonological processing skills, it has been noted that a child's

vocabulary, working memory, and rapid serial naming are related to their word-spelling skill¹⁵ Milburn, T. F., Hipfner-Boucher, K. & Weitzman, E. (2017). Cognitive, linguistic and print-related predictors of preschool children's word spelling and name writing. *Journal of Early Childhood Literacy*, 17, 111-136.. It has also been found that visuomotor skills, letter knowledge, and phonological skills predict spelling development during the first school year, and thereafter, reading skill development is the best predictor of spelling skill progress in a transparent language¹⁶ Lerkkanen, M.-K., Rasku-Puttonen, H., Aunola, K. & Nurmi, J.-E. (2004). The developmental dynamics of literacy skills during the first grade. *Educational Psychology*, 24, 793–810..

Practical tips

[Training in Spelling](#)

Text composition

Text composition – that is, the skill of writing different kinds of texts – means transforming ideas into text, choosing words, creating content, and knowing text styles. In addition to handwriting or typing fluency and spelling skill, working memory and self-regulation skills are related to text composition¹⁷ Berninger, V. W. & Winn, W. D. (2006). Implications of advancements in brain research and technology for writing development, writing instruction, and educational evolution. In C. A. MacArthur, S. Graham & J. Fitzgerald (ed.). *Handbook of writing research* (s. 96–114). NY: Guilford Press.. In this context, self-regulation means the skill of

observing and regulating one's own actions and the ability to plan, set goals, evaluate, and correct text, as well as the commitment to finish the text. Text planning, making, evaluating, and correcting, on the other hand, presuppose a good working memory. To evaluate and correct one's own text, good reading skills are also needed.

Overall, text composition is a demanding and often long-term process, which starts from planning the writing, goes on to producing the text, and ends in reading, evaluating, and correcting it. These subprocesses of writing are produced over and over again until the text is finished. *Planning* refers to both the writing process and the planning of the text content. When planning, the writer sets a goal, considers their own actions, and decides how to proceed to accomplish the goal. Text usually also has some purpose and an intended audience. *Text producing* proceeds from producing single words, clauses, and sentences to writing bigger wholes. In this way, ideas and meanings in the mind are transformed into text. At the same time, the writer needs to follow spelling rules. *Text evaluation* means that one is already able to read and modify the text under production during the writing process. Writers need to be able to read the written text and understand what has been written. This requires a child to have sufficiently accurate reading skills to be able to evaluate the spelling, structure, and understandability of a text while reading it.

For a child who has reading difficulty, it is difficult to read and evaluate their own text. Reading strategies are different when reading own- versus other-written text. Other person-written text is read to understand the content, but before reading one's own text, it is necessary to decide what is to be evaluated: handwriting style, spelling, sentence structure, cohesion of sentences, paragraphs or whole text, style of writing, correctness of the content, or sufficiency of content and knowledge.

This process of text producing requires time for learners to

write and carry out multiple repeats to learn the required functions and become used to text production. Hence, developing into a skilled writer requires, in addition to motivation to practise producing different kind of texts, good executive functioning and self-regulation of the process.

References

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Practical tips

[Training in Writing Sentences and Text Producing](#)