

# Pre-literacy skills

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## Vocabulary

In a nutshell

- Pre-literacy skills include e.g., print awareness, vocabulary, phonological awareness, letter knowledge and letter-sound connections.
- Listening comprehension and motor and visuo-motor skills are also important pre-literacy skills. Listening comprehension contributes to reading comprehension and visuo-motor skills are important in handwriting.
- A good vocabulary base can support a desire to use the language for a variety of purposes such as listening, speaking, reading, and writing. Vocabulary is essential for reading comprehension.
- The process of reading relies on the recognition of letters and their combination to form words, which in turn have meaning for the reader.
- Teachers need to be sure that they are using the correct letter names and sounds so that they are good role models of language use while teaching reading. This is important, as we may have learners in our class who are not native speakers of the language.
- Rapid automatized naming (RAN) means the ability to *fluently find the accurate name* for familiar items – letters, colours, or objects, for example. Naming speed predicts reading fluency (reading speed). Children who struggle with reading might have problems in rapid naming.

*There are two main types of vocabulary, both of which are important for learners to acquire. Oral vocabulary is used in everyday language. These are words found in stories and used in informal conversations throughout the school day and at home. Having a vast oral vocabulary will aid comprehension while reading written texts. Academic vocabulary or academic language, in contrast, are words and language that learners and teachers use for formal instructional purposes or in more formal speaking, reading, and writing.*

Children start producing words by their first birthday. By the age of sixteen-to-eighteen months, children usually have a vocabulary size of fifty words. Studies suggest that around that time children go through a “vocabulary spurt,” acquiring new words very fast. Vocabulary development continues so that by the age of six children have about 10 000 words. It is estimated that children without disabilities increase their reading vocabularies by thousands of words each year. We also know that from the earliest stages of language learning, children vary widely in their vocabulary size and rate of development<sup>1</sup>Hoff, E., & Shatz, M. Eds. (2007). Blackwell handbook of language development. USA: Blackwell Publishing Ltd..

Rapid development of vocabulary is based on good learning and memory capacities. We know that children can learn a new word association with an object after a few exposures to the word and can remember the word for a long period of time. This phenomenon is called fast mapping. Even thirteen-month-old children are capable of fast mapping, and three-year-olds are just as good as adults in remembering such mappings.

Vocabulary size at the start of kindergarten is one of the most powerful predictors of a child’s ability to learn to read and succeed in school.

### **Word learning and communication**

It is known that a communicatively optimal context for word learning is when the adult and the child are jointly focused on the same object or event and the adult repeatedly utters the new word associated with the object or event. For example, a mother is showing a ball to her child, both mother and child are looking at the ball, and the mother says, “Look at this, this is a ball, a ball, this is a red ball,” etc<sup>2</sup>Rowe, M.L. (2012). A longitudinal investigation of the role of quantity and quality of child-directed speech in vocabulary

development. *Child Development*, 83, 1762-1774..

### **What about non-optimal contexts?**

The problem is that not all situations in which a child is learning new words are communicatively optimal<sup>3</sup>Hoff, E., & Shatz, M. Eds. (2007). *Blackwell handbook of language development*. USA: Blackwell Publishing Ltd..

- It is often the case that when the child hears the word (e.g., ball), the intended referent or object is not visually available.
- The second problem is that, although the situation is communicatively optimal, there still would not be enough information in the input to allow a definite understanding of the word. This is because any word can have an infinite number of meanings. For example, if a child hears “bottle of milk,” the word *bottle* can refer to different kinds of bottles with different sizes and colours – all of which are bottles.
- In typical communicative interactions, input does not give enough information concerning the possible meanings of the word. The child has to do a lot of inductive work to figure out what it is that they are supposed to imitate in the adult’s speech (e.g., ball).

## **Research briefs**

[The Home Literacy Environment Is a Correlate, but Perhaps Not a Cause, of Variations in Children’s Language and Literacy Development](#)

[Book Reading and Vocabulary Development: A Systematic Review](#)

[The Role of the Home Environment in Phonological Awareness and Reading and Writing Ability in Tanzanian Primary School](#)

## Children

[Early Childhood Reading Sessions Support Reading Skills](#)

[Reading Outcomes of Children with Delayed Early Vocabulary: A Follow-up from Age 2–16](#)

[Vocabulary Learning in Primary School Children: Working Memory and Long-Term Memory Components](#)

[The Impact of Vocabulary Instruction on Passage-Level Comprehension of School-Age Children: A Meta-Analysis](#)

[A Systematic Review of the Research on Vocabulary Instruction That Impacts Text Comprehension](#)

[A Longitudinal Investigation of the Role of Quantity and Quality of Child-Directed Speech in Vocabulary Development](#)

## **Practical tips**

[Training in Reading Comprehension](#)

## **Additional reading/Pre-literacy skills**

[Preparatory Reading Skills and Perceptual Development](#)

### **What are the mechanisms of word learning?**

*Input.* Longitudinal studies suggest that it is indeed the properties of maternal speech that most strongly predict a child's vocabulary size. Some researchers say that the sheer amount of talk matters, while others find that specific types of speech (e.g., use of sophisticated vocabulary, number of words or utterances, and diversity of input) play an important role. It could be that diversity of vocabulary input plays more of a role in vocabulary growth when children get older, and sheer quantity plays a more important role when children

are in the more initial stages of vocabulary development.

*Syntax.* The child's knowledge of syntax (the arrangement of words and phrases to create well-formed sentences in a language) is another language-specific mechanism that helps the child to figure out the meanings of the words and whether the word is a count noun, proper noun, adjective, verb. etc.

*Lexical constraints.* Children are equipped with lexical constraints that help to limit the possible meanings of words. These constraints include whole word bias (words that refer to whole objects, not parts or features), a taxonomic bias (words that refer to kinds of things, not individuals), and mutual exclusivity bias (every object can have only one name).

*Attention and learning mechanism.* Learning the meanings of words can be understood based on general cognitive mechanisms that are not specific to word learning – associative learning and attentional mechanisms, for example.

*Conceptual biases.* Children have knowledge about the kinds of things that exist in the world, and this knowledge helps a child to narrow down hypotheses about the possible meanings of new words they encounter (e.g., distinctions between objects and actions, between animate and inanimate beings, and even between within-domain categories like cats and dogs).

*Pragmatics.* According to the social-pragmatic account, when children hear a new word, they are primarily interested in figuring out what is in the speaker's mind. By being sensitive to communicative context, cues about the speaker's behaviours, and the speaker's state of knowledge and dispositions, children can substantially narrow down the speaker's plausible referential intents and consequently the possible meanings of the word<sup>4</sup>Hoff, E., & Shatz, M. Eds. (2007). Blackwell handbook of language development. USA: Blackwell Publishing Ltd..

**To summarize**

Children rely on multiple mechanisms in the word learning process and weight these mechanisms differently; the weights actually change as children develop. Early in the development, perceptual salience may be more heavily weighted than intentional cues. We may even think that word learning principles emerge as a result of word learning rather than being present from the outset. Once developed, these lexical principles enhance and expand children's word learning.

### **Teaching vocabulary**

*Vocabulary is key to communication.* The ultimate goal of learning vocabulary is to be able to communicate in a given language. A good vocabulary base can support a desire to use the language for a variety of purposes such as listening, speaking, reading, and writing.

There are two main types of vocabulary, both of which are important for learners to acquire. *Oral vocabulary* is used in everyday language. These are words found in stories and used in informal conversations throughout the school day and at home. Having a vast oral vocabulary will aid comprehension while reading written texts. *Academic vocabulary* or *academic language*, in contrast, are words and language that learners and teachers use for formal instructional purposes or in more formal speaking, reading, and writing.

### **The importance of teaching vocabulary**

*Vocabulary is key to communication.* The ultimate goal of learning vocabulary is to be able to communicate in a given language. A good vocabulary base can support a desire to use the language for a variety of purposes such as listening, speaking, reading, and writing.

*Development of other skills.* Learners who have strong vocabulary will be able to develop other language skills. When vocabulary skills are developed, learners build up their language proficiency as a whole. A rich vocabulary can support

improved listening, speaking, reading, and writing skills.

*The more words you know, the more you learn.* Knowledge of vocabulary leads to an increase in comprehension. Improved comprehension will lead to a greater capacity for acquiring more vocabulary and learning other concepts in other subjects in the curriculum.

### **Vocabulary in prekindergarten and kindergarten classrooms**

Early vocabulary acquisition consistently predicts children's later reading achievement. Thus, finding ways to promote the vocabulary development of young children is important. Young children learn words from interactions with adults. Direct instruction of vocabulary words can be an effective method to support children's word learning, and combining different vocabulary instruction practices is more effective than using one practice alone<sup>5</sup>Fletcher, J.M., Lyon, G.R., Fuchs, L.S., & Barnes, M.A. Eds. (2019). Learning disabilities. From identification to intervention. Second edition. New York: The Guilford Press. <sup>6</sup>Wasik, B.A., Hindman, A.H., & Snell, E. (2016). Book reading and vocabulary development: a systematic review. *Early Childhood Research Quarterly*, 37, 39-57..

Some children do not have the opportunity to learn all the words they need to understand lessons in school. Therefore, it is reasonable to teach at least some of them in early childhood education classrooms. Research shows that differences in the ways teachers read books to children are related to differences in children's receptive vocabulary.

Teachers' analytical talk boosts vocabulary acquisition, as in book reading situations:

- Low-frequency words are used and often repeated several times.
- Word meanings are clarified through definitions and



examples.

- Visual and kinaesthetic clues are used to clarify the meanings of the words.
- Words are presented in the context of sentences.
- The meaning of the story is discussed.
- The deep processing of words is encouraged by the interactive nature of the discussions (e.g., asking descriptive questions, giving positive feedback).

## **General principles and practices to develop vocabulary in school**

### *Creating language- and word-rich environments*

These are environments in which children have opportunities to read, hear, use, and talk about new vocabulary. These environments contain books, dictionaries, puzzles and word-games, and other reading materials, both narrative and expository, on a variety of topics appropriate for a variety of reading levels.

Reading aloud texts that contain rich vocabulary and the time the teacher spends discussing with children the words encountered in these selections are important for vocabulary development.

These situations promote both incidental and intentional word learning and motivate children to develop new word knowledge on their own. Incidental word learning, through listening or reading, is important to children's general vocabulary development<sup>7</sup>Blachowicz, C.L.Z., Fisher, P.J.L., & Cole, D. (2006). Vocabulary: questions from the classroom- Reading Research Quarterly, 41, 524-539..

### *Intentional teaching of selected vocabulary*

Research shows that there is no single mode of instruction that is uniformly effective for vocabulary development. It

requires a repertoire of teaching activities and instructional strategies coupled with the teacher's ability to choose appropriately from within this repertoire. But there are certain characteristics of effective instruction that are applicable across teaching contexts:

- Learners are actively involved in the generation of word meanings rather than being passive receptors of information. This includes the integration of their prior knowledge with new information as well as building semantically related categories of words and concepts. Research suggests that having children make semantic connections among words (e.g., a concept definition map) and verbalizing or explaining those connections supports their learning of the meanings of the target words.
- Instruction provides both definitional and contextual information about the target words as well as multiple exposures and opportunities to use them. Instruction that combines definitional information with other active processing, such as adding contextual information, writing, or the manipulation of words, is consistently more effective than definitional instruction alone.

### *Developing word learning strategies*

Children need to develop independent strategies for dealing with the new words they will meet in schools, at work, and in other areas of life. In dialogic book reading, the most often used strategies are:

- defining words
- questioning as a means to promote discussion on vocabulary and comprehension
- retelling

- rereading
- using props to illustrate word meanings
- providing extension activities that promote exploration and discussion of vocabulary

Adult-child interaction during reading is crucial for vocabulary learning to occur. Word learning is enhanced when adults ask questions and engage children in discussions about target vocabulary words relative to the simple recasting of the meaning of the words.

### **Vocabulary interventions and learning disabilities**

Systematic reviews of vocabulary interventions for children with learning disabilities have found evidence of effectiveness for several types of vocabulary interventions<sup>8</sup>Fletcher, J.M., Lyon, G.R., Fuchs, L.S., & Barnes, M.A. Eds. (2019). Learning disabilities. From identification to intervention. Second edition. New York: The Guilford Press.<sup>9</sup>Wasik, B.A., Hindman, A.H., & Snell, E. (2016). Book reading and vocabulary development: a systematic review. Early Childhood Research Quarterly, 37, 39-57.:

- keyword/mnemonic strategies (e.g., the use of a “keyword” that sounds similar to the new word, accompanied by images of the of the meaning of the new word)
- cognitive strategy instruction using semantic feature analysis, semantic/syntactic feature analysis, and semantic mapping (words are categorized according to overlapping and differentiating semantic features)
- explicit instruction, in which word meaning is explicitly provided and the teacher checks for understanding, promotes children’s use of the new words and fosters more independent learning

It is promising that the intervention effects on children with learning disabilities seem to be larger than on those without learning disabilities.

## **To summarize**

### **Guidelines for teaching vocabulary**

There are several factors to consider when designing vocabulary instruction:

- the amount of vocabulary learners need to acquire (the number of new words in a school year)
- the level of vocabulary the learner possesses

All people learn word meanings in stages. The stage at which people understand a word will determine if or how well they can recognize or use that word. The depth of understanding moves through four stages:

1. The person does not know the word.
2. The person has not seen or heard the word.
3. The person knows something about the word and can relate it to a situation or provide a synonym.
4. The person knows the word and can explain and use it.

*Indirect vocabulary learning* refers to learning vocabulary through oral experience by listening to someone read or talk. Teachers reading aloud stories to help learners gain new oral vocabulary is an example.

*Direct vocabulary learning* refers to vocabulary being taught explicitly to learners through specific vocabulary activities. Direct vocabulary teaching before reading a story is an ideal way to support reading comprehension. Activities for learning vocabulary can range from using clues in a text and the teacher demonstrating or showing visuals of the word to

learners using dictionaries and teachers and learners writing sentences or acting out a word or phrase along with word games and puzzles.

## **Principles of teaching vocabulary**

There are several key principles for teaching vocabulary:

- Develop experiential background.
- Relate vocabulary to prior knowledge.
- Build relationships among words.
- Develop depth of meaning.
- Present several exposures.
- Create an interest in words.
- Teach learners how to learn new words by, for example, using dictionaries and context clues, and analysing word parts or morphemes.

Teachers should remember to go through the following steps when teaching vocabulary:

- Say and display the word.
- Ask learners if they are familiar with the word.
- Ask learners if they know the meaning of the word.
- Explain the meaning of the word (by showing the item, using a gesture, or using a synonym or familiar word).
- Use the word in a sentence that shows its meaning.
- Ask learners to make sentences with each word.
- Give formative feedback.

# Phonological awareness

## What makes a child a good reader?

To become a good reader, a child needs to know letters and corresponding letter-sounds and blend them into syllables and words. They also need to retrieve these linguistic items from their memory, a process known as rapid automatized naming (RAN) and keep them in their short-term memory. In addition, phonological awareness is a skill that is also needed.

**Phonological awareness** is a set of skills that support initial reading. In short, it can be described as a child's sensitivity to a language at a phonological (sound) level and the ability to discriminate and manipulate sounds in a spoken language. Phonological awareness includes identifying and manipulating units of oral language-parts, such as words, syllables, and sounds (phonemes), as well as onsets and rimes in English. Children with good phonological awareness are able to (for example) identify and make oral rhymes, clap out the number of syllables in a word, or recognise words with the same initial sounds (for example, the **s** sound in **some** and **sit**).

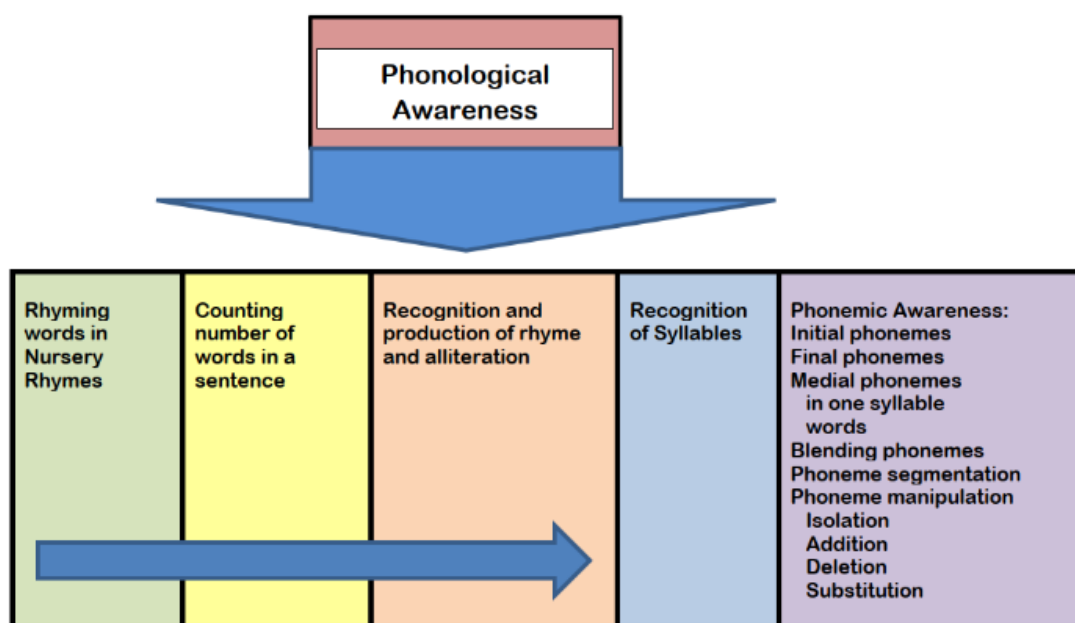
**Phoneme awareness** is the most advanced skill within phonological awareness. This means that a person is aware of the individual phonemes (sounds) in spoken words.

## How is phonological awareness related to reading?

Phonemes (sounds) are the smallest units in spoken language. Phonemes can be combined to form syllables and words. For example, the word 'sat' has three phonemes: /s/ /a/ /t/. Another example is the word 'duck' that also has three phonemes (sound units): /d/ /u/ /ck/. Can you think of an English word that has 5 letters, but only three phonemes? Phonemic awareness is important because it is the foundation for word recognition skills. When a person relates letter-

sounds to letters, they are able to form written words. This skill is especially useful in transparent orthographies like Bantu languages, Finnish or Spanish, where the correspondence of letters and letter-sounds is very high and stable. English is not transparent because the spelling of most words is very different from the way they are pronounced (e.g. eye /ai/). Phonemic awareness is one of the best predictors of how well children will learn to read and spell.

As a basic rule, the sequence of teaching phonological awareness skills usually moves from larger to smaller units of sound. This begins with the skills of listening and being attentive to syllables, letter-sounds, words and sentences, and ending with manipulating or substituting phonemes within words. Phonological awareness includes the following skills more or less in order of difficulty:



# Research briefs

[Reading and Phonological Awareness in Africa](#)

[Bidirectional Relations Between Phonological Awareness and Letter Knowledge in Preschool Revisited: A Growth Curve Analysis of the Relation Between Two Code-Related Skills](#)

[Phonological awareness and reading](#)

[Early Predictors of Phonological and Morphological Awareness and the Link with Reading: Evidence from Children with Different Patterns of Early Deficit](#)

## Practical tips

[Training in Sound Identification](#)

### The areas of phonological awareness

#### Rhyming words in nursery rhymes

- recognising when words rhyme: e.g., Do ‘cat’ and ‘chair’ rhyme?
- coming up with a word that rhymes: e.g., What rhymes with ‘cat’?
- Afrikaans: “huis” en “muis” rym met mekaar, maar “kat” en “muis” rym nie
- Oshikwanyamandonga: Ombete na Ombele?; puta na tuka?
- Kiswahili: paka na ruka; goti na koti. Lakini “paka” na “goti” sauti za silabi za mwisho hazifanani

### 2. Counting the number of words in a sentence

This is an exercise that increases phonemic awareness.



## Counting Words in Sentences using Counters

### 3. Recognition and production of rhyme and alliteration

[Caterpillar word family](#) is a good way to display rhyming words.

Afrikaans: bak, sak, rak, mak, pak; tak; hak

lek, hek, bek, nek, dek, wek, rek

pot, rot, sot, bot, lot

**More (Afrikaans, Oshiwambo, Otjiherero, etc examples)**

### 4. Recognition of syllables

Syllable awareness means that learners are able to divide words into syllables, a skill that assists in speeding up the decoding process, boosting reading fluency and supporting spelling. Clapping out the number of syllables in a word helps in getting learners recognise the different syllables in a word. In groups, let learners try to come up with the word that has the most syllables. Write these words on the board and learners may be surprised that the word with the most syllables is not necessarily the longest word.

### 5. Phonemes:

#### ***Initial phonemes***

Learners are required to identify the first sound that they hear in a word.

Activities include:

1. Saying a word and asking them to identify the initial

sound, e.g. What is the first sound that you hear in the word 'dog'? (d)

2. Showing a picture from which, they first identify the object in the picture and then identify the initial sound.
3. Matching pictures with the same initial sound: Learners have to sort through pictures and pair the pictures together with the same initial sound, e.g. ball and baby; sun and sweet (Eng.); bal en baba; son en sambreel (Afr); Onyama/Ombwa; ekaka/etama (Oshindonga).

### ***Final phonemes***

Learners are required to identify the last sound that they hear in a word.

Activities include:

1. Saying a word and asking them to identify the final sound, e.g. What is the last sound that you hear in the word 'dog'? (g)
2. Showing a picture from which, they first identify the object in the picture and then identify the final sound.
3. Matching pictures with the same final sound (more difficult than identifying the initial sound): Learners have to sort through pictures and pair the pictures together with the same final sound, e.g., ball and doll; sun and fan (Eng.); bal en vel;
4. Afrikaans: son en maansambreel – different final phoneme?
5. Oshidonga: Onyama na Ombwa; Omboloto na Omulilo
6. Are these final sounds the same? e.g., mat and mad -NO (Eng); hard en Afrikaans: hard en hart-JA

Oshindonga: Ombiga na Oshiyaha – EEWA

### ***Medial phonemes***

Compared to identification of initial and final phonemes, medial phonemes are the hardest to master. This is most effectively achieved by starting to teach this skill with three-letter words. Start with the identification of the initial and final sound, so that learners can initially recognise the middle sound through elimination; for example: In the word 'mat', what sound do you hear at the beginning of the word (*m*), what sound do you hear at the end of the word (*t*), and what sound do you hear in the middle of the word (*a*). Once learners can easily discriminate the middle sound (after identifying the initial and final sounds) they are likely to be able to identify the middle phoneme without prompting.

### ***Identification of all the phonemes in words***

1. Name all the sounds that you can hear in the word 'begs' and 'fish'.
2. Can you identify the number of syllables and the number of sounds in a word; for example, 'thought' has one syllable and three sounds/phonemes; 'water' has two syllables and four phonemes/sounds. This activity can be completed as a game for older learners where groups compete with each other. The words become more difficult as the game progresses.

### ***Blending phonemes***

- blending syllables: for example, I am going to say parts of a word. Tell me what the word is Lin-da (Eng); Om-bu-ta (Oshindonga); tuis-ny-wer-heid (Afrikaans). These are examples that are increasingly more difficult as the number of syllables increases.
- blending sounds: for example, put these sounds together to make a word: 's/i/t' what word do you get?
- Afrikaans: b/a/k, m/i/s, v/e/g
- Oshindonga: o/h/i; a/m/e; i/t/a

- Kiswahili: k/u/l/a; c/h/e/z/a

### ***Phoneme segmentation***

- segmenting syllables: for example, Clap for each syllable you hear in the word 'kindergarten'.
- segmentation of sounds: for example, tell me what sound is at the beginning of the word 'pat' or Tell me each sound you hear in the word 'cat'.

### ***Phoneme manipulation***

- deletion of syllables: for example, Say the word 'strawberry.' Now say it without saying 'straw.' (berry)
- deletion of sounds: for example, Say 'chair.' Now say it without the 'ch.' (air)
- addition of sounds: for example, Say 'cook not.' Now say it with an 'e' at the end. (cook note)
- manipulation of sounds: for example, Change the 's' in 'sad' to a 'b' and say the new word. (bad)

### ***Phoneme isolation***

This phonemic awareness skill requires learners to isolate a single sound within a word.

Example:

1. The learner is presented with a number of pictures (spade, dig, dog, bone, boy, girl, etc). Say the name of each picture. Find and mark where you hear the /g/ sound in each picture below. (dog, dig, girl)
2. Identifying initial, ending and middle sounds also falls under phoneme isolation

### ***Phoneme addition***

This phonemic awareness skill enables the learner to add a phoneme/sound to a word that will change that word; for example, Add 's' to the end of the word 'top'. The word is now 'tops'.

Add 't' to the end of 'car'. The word is now 'cart'.

Add 's' to the beginning of the word 'top'. The word is now 'stop'.

### ***Phoneme deletion***

This phonemic awareness skill enables the learner to delete a phoneme/sound from a word that will change that word.

For example, Delete the /t/ sound from the following words:

'trap', 'stand', 'train', 'cart'.

### ***Phoneme substitution***

This phonemic awareness skill enables the learner to substitute or delete a phoneme/sound from a word that will change that word.

Say 'cat'. Now change the first sound in 'cat' to /s/. Now the word is 'sat'.

Say 'sat'. Now change the middle sound in 'sat' to /e/. Now the word is 'set'.

### ***Phoneme reversal***

This advanced phonemic awareness skill enables the learner to reverse the first and last phoneme/sounds in a word to form a new word.

Say 'top'. Now put the first sound last and the last sound first. Now the word is 'pot'.

When **assessing and training** phonological awareness, it is

important for the teacher or therapist to know what kind of skills the learners already have and what kind of skills require further practice. Furthermore, we know from several meta-analyses that when teaching children to read, phonological awareness is important, but it is more effective when combining phonological and letter training.

**The following tasks** are useful for both assessment and training. Examples are in English, but you can see the tasks in local languages **here**.

See the attached Phonological Awareness Assessment in English, Afrikaans and Oshikwanyama. MIIKA I SENT THESE TESTS IN THESE LANGUAGES, BUT IF YOU DO NOT FIND THEM I CAN SEND THEM AGAIN

### **Training phonological awareness**

- Start training from easy tasks like rhyming. Tasks with syllables are usually also easier than tasks with phonemes.
- Train both segmenting and blending skills to get better results.
- Practice every day! A child with problems in learning to read and write needs a lot of practice.
- Parent-based literacy activities make training more effective. Training should be motivating so that the child will continue training as long as needed. **More...**
- Training is more effective when sounds with corresponding letters are present.
- GraphoGame [see more](#)
- Training with peers **see more**

A great by-product of teaching phonemic awareness is the opportunity to increase the vocabulary of learners—an important aspect of reading comprehension

### **Letter-sound correspondences**

Stated simply, reading is a complex cognitive process in which we decode symbols (letters) in order to acquire meaning. In other words, we need to decode the written symbols to comprehend what we are reading. We have seen from phonological awareness that these symbols (letters) have sounds that correspond to them.

The main reason for teaching phonological awareness directly and explicitly to learners is because research has shown that phonological awareness supports reading and writing acquisition (as referenced above). Knowledge of phonological awareness skills and letter-sound correspondences are the basic building blocks of literacy learning.

### ***What are letter-sound correspondences?***

To read a word, the learner must recognise the letters in the word and associate each letter with its sound. Blending sounds into syllables and words is the basic skill in reading. To write a word, the learner must break the word into its component sounds and know the letters that represent these sounds.

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## Letter knowledge

### *Why is letter knowledge important?*

The process of reading relies on the recognition of letters and their combination to form words, which in turn have meaning for the reader. As such, it is of utmost importance that learners have knowledge of the letters that form their alphabet. This letter knowledge entails knowing the names of the letters and the sounds they make. (Please consult the Language Studio where you can listen to letter names and sounds of various alphabets of African languages; [Language studio](#))

When children know the names, sounds and shapes of letters as well as the different letter cases (upper and lower), they recognise each letter within words quickly, which makes word decoding more automatic. The more automatic word decoding is, the more fluent the child can read. Better fluency, in turn, aids reading comprehension.

### *How do we know about the value of letter knowledge?*

Letter knowledge is found to be a strong predictor of learning to read. In fact, numerous studies show that of the emergent literacy skills that children develop before they enter formal schooling (such as oral language, alphabet knowledge and phonological awareness), alphabet knowledge is the strongest



longitudinal predictor of later reading in transparent languages<sup>10</sup>Drouin, M., Horner, S. L., & Sondergeld, T. A. (2012). Alphabet knowledge in preschool: A Rasch model analysis. *Early Childhood Research Quarterly*, 27(3), 543–554. doi:10.1016/j.ecresq.2011.12.008. Studies have also shown that letter knowledge—particularly letter naming skill—among pre-primary school children predicts reading progress in subsequent grades<sup>11</sup>Furnes, B., & Samuelsson, S. (2011). Phonological awareness and rapid automatized naming predicting early development in reading and spelling: Results from a cross-linguistic longitudinal study. *Learning and Individual Differences*, 21(1), 85–95. doi:10.1016/j.lindif.2010.10.005.

For pre-primary children, upper case letters are easier to learn than lower case letters, while the easiest task is letter recognition followed by letter naming and thereafter letter sounds<sup>12</sup>Drouin, M., Horner, S. L., & Sondergeld, T. A. (2012). Alphabet knowledge in preschool: A Rasch model analysis. *Early Childhood Research Quarterly*, 27(3), 543–554. doi:10.1016/j.ecresq.2011.12.008. However, these tasks overlap somewhat. Therefore, teachers can assess and teach letter knowledge using combined letter tasks, rather than separating them.

***Does the language in which the child learns these alphabet skills matter?***

Apparently it does! According to McGuinness<sup>13</sup>McGuinness, D. (2005). *Language Development and Learning to Read: The Scientific Study of How Language Development Affects Reading Skill*. Massachusetts: MIT Press. and Lyytinen, Erskine, et al.<sup>14</sup>Lyytinen, H., Erskine, J., Kujala, J., Ojanen, E., & Richardson, U. (2009). In search of a science-based application: A learning tool for reading acquisition. *Scandinavian Journal of Psychology*, 50(6), 668–675. doi:10.1111/j.1467-9450.2009.00791.xreading skills among

children vary from country to country. In countries where the language spoken is transparent (i.e., there is a strong regularity between letter and phoneme), the 'burden' of decoding is less. Such languages are also described as 'regular'. Thus, children who speak these languages learn to decode accurately quicker. For example, Finnish is a very transparent language, which 'leads to a relatively low learning burden', resulting in 'more than a third of children who learn to read without formal instruction before school entry'<sup>15</sup>Verhoeven, L., Perfetti, C., & Pugh, K. (2019). Developmental dyslexia across languages and writing systems. In *Developmental Dyslexia across Languages and Writing Systems*. <https://doi.org/10.1017/9781108553377>. Reading success in transparent languages is deemed to be reading fluency and reading comprehension, rather than mere reading accuracy, which children seem to attain more organically and is more easily taught.

The good news is that in Africa, most indigenous languages are transparent/regular! This means there is a strong correlation between the letter names and their sounds. Thus, our children should be able to read fairly easily in their mother tongues. The bad news is that we have complicated our lives with many parents and schools having opted for English, the most opaque/irregular language, as the medium of instruction in Grade 1. This complicates both the learning of letters (for learners) and the teaching of the importance of letter knowledge (for teachers).

### ***How well do we as teachers know our letter names and sounds?***

As teachers, we need to be sure that we are using the correct letter names and sounds so that we are good role models of language use while teaching reading. This is important, as we may have learners in our class who are not native speakers of the language. *(Please consult the Language Studio, where you can listen to letter names and sounds of various alphabets of*

## *African languages.*

It is also important that we involve the parents of our learners in assisting their children to learn the correct letter names and sounds. The study carried out by Manolitsis et al.<sup>16</sup> Manolitsis, G., Georgiou, G., Stephenson, K., & Parrila, R. (2009). Beginning to read across languages varying in orthographic consistency: Comparing the effects of non-cognitive and cognitive predictors. *Learning and Instruction*, 19(6), 466–480. doi:10.1016/j.learninstruc.2008.07.003 on Greek- and English-speaking children demonstrated that direct teaching of letter sounds and names at home resulted in better letter knowledge.

This requires that teachers, parents and learners know the correct pronunciation of letter names and sounds. Check out our video clips, language studio and documents to guide you in using the correct pronunciation.

Share this video clip or language studio with parents so that they can also have a better understanding of how to help their children with letter knowledge.

*Afrikaans: (The Afrikaans letter names and sounds should be included in the Language Studio)*

Here are a few video clips and documents for Afrikaans:

*Alphabet letter names and sounds:*

Click on the recording of Afrikaans letter names (without C, Q and X, which do not exist in the Afrikaans alphabet—only in borrowed words).

Recording of Afrikaans Consonants:

*Afrikaanse klanke volledig (kort/lank/dubbel/trippel klanke):*

How to pronounce letter sounds and names using the International Phonetic Alphabet (IPA): XXXX

*Cinyanja:*

*Kiswahili:*

## **How to teach letters and letter-sounds**

### ***What sequence should be used to teach letter-sound correspondence?***

Letter-sound correspondences should be taught one at a time. As soon as the learner acquires one letter sound correspondence, introduce a new one.

For **Afrikaans**, the order in which letter-sound correspondences are taught is as follows: s, m, v, r, y, e, b, n, w, k, d, g, a, f, i, h, j, o, l, p, t, u, (z in borrowed words), (c, q, x does not form part of the Afrikaans alphabet).

For **Oshiwambo** languages (Oshindonga and Oshikwanyama), the order in which letter-sound correspondences are taught is as follows: t, a, e, m, o, l, i, u, n, p, k, h, v, d, f, s, w, y, g, b, x, z

For **Kiswahili**, the order in which letter-sound correspondences are taught is as follows: a, ba, cha, da, e, fa, ga, ha, i, ja, ka, la, ma, na, o, pa, ra, sa, ta, u, va, wa, ya, za, (q and x do not form part of the Kiswahili alphabet)

For **English**, the order in which letter-sound correspondences are taught is as follows: a, m, t, p, o, n, c, d, u, s, g, h, i, f, b, l, e, r, w, k, x, v, y, z, j, q

These sequences are designed to help learners start reading as soon as possible, as they provide the opportunity to form words from the first few letters.

### ***Why these sequences?***

1. Letters that occur frequently in simple words (such as a, m, t in English) are taught first.

2. Letters that look similar and have similar sounds (b and d) are separated in the instructional sequence to avoid confusion.
3. Short vowels are taught before long vowels.
4. Lower case letters are usually taught first in the African context since these occur more frequently than upper case letters. In the Finnish context, upper case letters are taught first, as they are regarded as being easier for learners to write.

### ***How well do your learners know their letters?***

It is important to understand which level your learners have attained in terms of letter knowledge (knowledge of the name and sound of a letter). The following is a quick assessment test that you can complete with your learners. This will help you understand each individual learner and provide you with some awareness of how the class is faring as a whole. Any specific letters that appear to be a problem for a number of learners will also be easily detected through this simple assessment.

### ***How can we assist learners who are struggling with their letter knowledge?***

Here are two examples of possible interventions. One is a computer-assisted game that provides lots of practice in learning letter sounds (and word formation). The other presents the practices and experiences of a teacher and how she goes about getting her learners to learn their letters. Do you have other practices that work for your learners? Please share with us!

Videos:

[Teaching and learning letters in kiswahili](#)

[Letter-sound correspondence \(Finland\)](#)

The results of studies in languages with regular orthographies show that learning letter sounds is a good tool for dynamic assessment, especially using computer-assisted training<sup>17</sup>Lyytinen, H., Ronimus, M., Alanko, A., Poikkeus, A., & Taanila, M. (2007). Early identification of dyslexia and the use of computer game-based practice to support reading acquisition. *Nordic Psychology*, 59(2), 109–126.. This type of assessment is in line with that proposed by Vygotsky in his mediated learning experience approach (MLE), whereby a pre-test is first carried out to assess a learner's knowledge of letter sounds. Thereafter, a strategy is used (in the study by Lyytinen, et al.<sup>18</sup>Lyytinen, H., Ronimus, M., Alanko, A., Poikkeus, A., & Taanila, M. (2007). Early identification of dyslexia and the use of computer game-based practice to support reading acquisition. *Nordic Psychology*, 59(2), 109–126., this is computer-assisted training through Graphogame) to improve the letter-sound knowledge. A post-test determines at what level the learner is currently operating. The process is repeated until the required knowledge level is attained. While playing GraphoGame, each child's letter and word knowledge is assessed and then continues to progress at their own speed and ability. The Graphogame generates data that can display the learner's success or difficulty with each letter. This data can provide valuable insight to the teacher about an individual learner's difficulty, as well as insight into class-wide difficulties that can lead to successful, purposeful intervention.

## **Research briefs**

[Letter Knowledge Predicts Grade 4 Reading Fluency and Reading Comprehension](#)

## Practical tips

[Training in Letter Sounds Relationships](#)

## Read more

Digital [learning game](#) that provides training in basic reading skills.

## Videos

[Afrikaans alphabet letter names and sounds](#)

[Letter-sound correspondence](#)

# Naming speed – Rapid automatised naming

Rapid automatized naming (RAN) means the ability to *fluently find the accurate name* for familiar items – letters, colours, or objects, for example. And this is exactly the way we can measure RAN: by asking children to name serially presented items as fast and accurately as they can. By measuring the time and accuracy, we obtain an estimate of their RAN skills. It sounds simple, doesn't it?

## Case example

Thomas is a nine-year-old boy who has difficulties in reading and, to a lesser extent, in math. In first grade, Thomas seemed to hear phonemes accurately, but his automatization of letter names was slower than that of his classmates. Now he is reading quite accurately, but his reading is still laborious

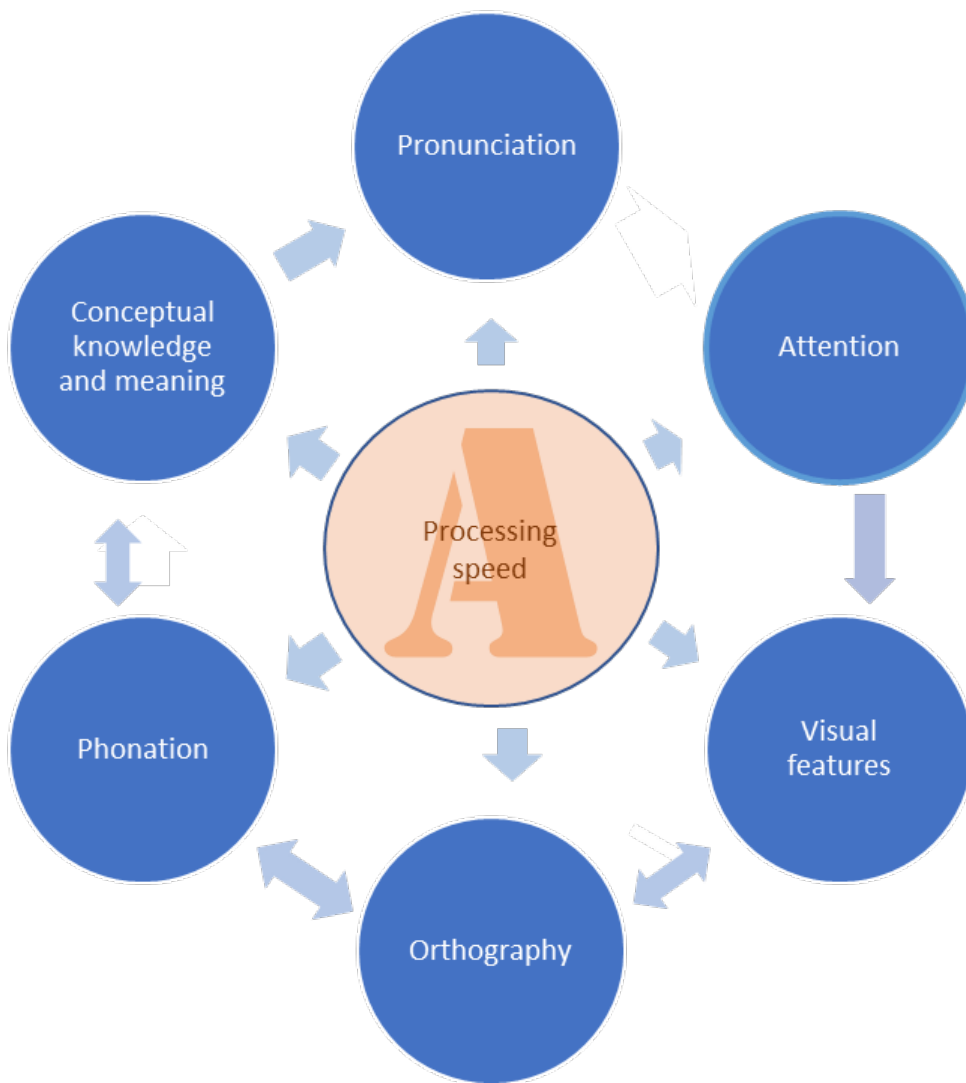
as he reads so slowly. He often has to read a sentence twice to be able to understand its content. He also has difficulties in the fast retrieval of mathematical facts, like ten-pairs and the answers to multiplication tasks. Sometimes Thomas seems to forget the words he surely knows, and he may replace them with other, usually less accurate words or wait for some of his friends to help him complete the sentence.

Even though there are many explanations for reading difficulties, one of the key skills behind fluent reading (especially in transparent orthographies) is rapid automatized naming (RAN). But what is RAN?

### **What is RAN or naming speed?**

Behind its superficial simplicity RAN is a *multicomponential skill*, and the naming process involves integrating many different sub-processes (see Diagram 1). For example, when you name the letter *A*, you first have to focus your attention on the letter and recognise its visual features – three different lines. Next, you have to integrate these separate visual features as an orthographical unit you have learnt from your ABC book. After that, you'll have to find the proper phonological representation of the letter (/ə, eɪ/). At the same time, you associate the meaning and conceptual knowledge with the visual and phonological representation: *My dear sister's name begins with A. A is the first letter in alphabet.* In the last phase of the naming process, you will use your motor skills and say aloud the name of the letter you see. In order to be smooth and fluent, many of the subprocesses of naming involve *processing speed*. In short, processing speed refers to the individual pace of receiving, understanding, and responding to information or a cognitive task.





## Research briefs

[What Mechanism Underlies the Rapid Automated Naming – Reading Relation?](#)

[Rapid Automatised Naming \(RAN\) and Reading Fluency: Implications for Understanding and Treatment of Reading Disabilities](#)

[Naming Speed and Reading: From Prediction to Instruction](#)

For a more detailed description of the naming process, see<sup>19</sup> Wolf, M., Bowers, P. G., & Biddle, K. (2000). Naming-speed processes, and reading: A conceptual review. *Journal of*

Learning Disabilities, 33, 387– 407.. In addition to the cognitive skills referred to above, RAN seems to be related to short-term memory<sup>20</sup>McCallum, R. S., Bell, S. M., Wood, M. S., Below, J. L., Choate, S. M., & McCane, S. J. (2006). What is the role of working memory in reading relative to the big three processing variables (orthography, phonology, and rapid naming)?. *Journal of Psychoeducational Assessment*, 24(3), 243-259., motoric and linguistic fluency, and, possibly, executive functions<sup>21</sup>Närhi, V., Ahonen, T., Aro, M., Leppäsaari, T., Korhonen, T. T., Tolvanen, A., & Lyytinen, H. (2005). Rapid serial naming: Relations between different stimuli and neuropsychological factors. *Brain and Language*, 92, 45–57.. For alternative explanations of RAN and why it is connected with reading, see the research and reviews on the topic<sup>22</sup>Georgiou, G. K., & Parrila, R. (2020). What mechanism underlies the RAN–reading relation? *Journal of Experimental Child Psychology*. Advance online publication. doi:10.1016/j.jecp.2020.104840<sup>23</sup>Kirby, J. R., Georgiou, G. K., Martinussen, R., & Parrila, R. (2010). Naming speed and reading: From prediction to instruction. *Reading Research Quarterly*, 45, 341–362.<sup>24</sup>Norton, E. S., & Wolf, M. (2012). Rapid automatized naming (RAN) and reading fluency: Implications for understanding and treatment of reading disabilities. *Annual Review of Psychology*, 63, 427–452.<sup>25</sup>Papadopoulos, T. C., Spanoudis, G. C., & Georgiou, G. K. (2016). How is RAN related to reading fluency? A comprehensive examination of the prominent theoretical accounts. *Frontiers in Psychology*, 7. doi:10.3389/fpsyg.2016.01217. To sum up, RAN is easy to measure but hard to define in a simple way as it requires many subprocesses to succeed.

### **Where do we need naming speed?**

If you read the story of Thomas, you'll find that naming speed

has an effect on:

- how easy it is for a child to recall the names of the items, concepts, or people in his everyday life. This ease affects conversations between the child and his peers.
- how fast the child learns letter names and letter-sound connections.
- how fluently he learns to read.
- how much effort is needed for learning basic mathematical facts like ten-pairs and multiplication tables.
- how many repetitions are needed to learn a new word or concept.

**How do you know that a child in your class may have problems in naming?**

- The child seems to forget names he has already learnt.
- The child replaces a word with other ones that are not as exact as the target.
  - He uses “empty words” or very general words like *that thing*.
  - He points to concrete items and says, “Can I have that there?” instead of using the target word.
  - He replaces words with phonologically similar words (e.g., *guacamole* with *Guatemala*), visually similar concepts (e.g. *refrigerator* with *washing machine*), or other words from the same semantic category (e.g. *chair* with *table*).
  - He uses his own invented words or longer expressions (e.g. *wheel shoes* for *roller skates* or *the place where I put my shirts* for *wardrobe*).
- The child appears to be quiet and shy and doesn't take part in vivid conversations.

- Learning the letters is laborious even though the phonological skills are intact.
- The child learns to read accurately, but the reading is slow and laborious.
- The child has difficulties with basic mathematical skills or linguistic skills that require automatization (e.g., the names of the days or months).

The number of symptoms depends on the severity of the naming deficit. It is rather usual that a child may have a naming-speed deficit but not more general problems in word finding. How much the naming deficit impairs learning depends also on the presence of comorbid problems and on the compensation skills the child has.

It is also important to recognise that these characteristics may also be due to other problems. For example, mathematical problems may be related to visuospatial learning disabilities, and the child can replace words if he has gaps in vocabulary. However, if many of the symptoms co-occur, it is worthwhile to test the naming skills to find out if the child has a naming deficit.

### **How can I assess rapid automatized naming?**

Since the 1970s, when the first on RAN<sup>26</sup> Denckla, M., & Rudel, R. (1974). Rapid “automatized” naming of pictured objects, colors, letters and numbers by normal children. *Cortex*, 10, 186-202.<sup>27</sup> Denckla, M., & Rude, R. (1976). Rapid “automatized naming (RAN): Dyslexia differentiated from other learning disabilities. *Neuropsychologia*, 14, 471-479. were published, naming speed has been assessed roughly the same way everywhere. The child asked to name familiar, serially presented items as quickly and as accurately as possible. The most common terms to be named are letters, digits, colours, and objects. The latter two can be used even before school age.

As the items are easy to name, the number of errors is usually very small. (If not, the errors should be analysed qualitatively as they may indicate word-finding problems.) Therefore, the naming speed is usually used as an outcome measure.

The assessment tools for rapid automatized naming of objects and letters are available for Kenya, Namibia, Tanzania, and Zambia<sup>28</sup>Ketonen, R., Salmi, P., & Krimark, P. (Eds.). (2015). Kenya: Literacy assessment tools for Grades 1-3. Grapho Learning training programme. Jyväskylä, Finland: Niilo Mäki Foundation.<sup>29</sup>Ketonen, R., Salmi, P., & Krimark, P. (Eds.). (2015). Namibia: Literacy assessment tools for Grades 1-3 and special education. Grapho Learning training programme (2012-2014). Jyväskylä, Finland: Niilo Mäki Foundation.<sup>30</sup>Ketonen, R., Salmi, P., & Krimark, P. (Eds.). (2015). Tanzania: Literacy assessment tools for Grades 1-3 and special education. Grapho Learning training programme (2012-2014). Jyväskylä, Finland: Niilo Mäki Foundation.<sup>31</sup>Heikkilä, R. (2015). Rapid automatized naming and reading fluency in children with learning difficulties. Jyväskylä studies in education, psychology and social research 523. These tools also have indicative reference material for school-aged children to enable the evaluation of possible naming-speed deficits.

### **The effects of naming-speed difficulties on the development of reading fluency . . .**

Research has found naming speed to be associated with reading accuracy, reading fluency, reading comprehension, and also spelling. However, the research evidence thus far has shown the strongest support for a connection between RAN and reading fluency or reading speed, as findings on the connections with other aspects of reading or spelling have been more or less conflicting<sup>32</sup>Kirby, J. R., Georgiou, G. K., Martinussen, R., &

Parrila, R. (2010). Naming speed and reading: From prediction to instruction. *Reading Research Quarterly*, 45, 341–362.<sup>33</sup> Norton, E. S., & Wolf, M. (2012). Rapid automatized naming (RAN) and reading fluency: Implications for understanding and treatment of reading disabilities. *Annual Review of Psychology*, 63, 427–452..

Thus, the most prominent consequence of naming-speed deficit is problems in reading fluency. The child with naming-speed deficit usually learns to read accurately but needs far more repetition than others to gain sufficient reading speed. To increase reading speed, the child might try to compensate by the error-prone strategy of guessing. The other disadvantage of slow reading fluency is the increased effort that reading development requires, which may decrease the motivation towards reading and result in avoidance of reading tasks – which, of course, is detrimental for the development of reading. Therefore, boosting motivation for reading is a crucial part of supporting children with naming-speed deficits and poor reading fluency.

### **. . . and the effects on reading comprehension**

In addition to the effect of laborious reading on reading motivation, an even more important consequence of poor reading fluency is its correlation with reading comprehension. If basic reading makes heavy demands on cognitive resources, there are fewer resources left for comprehension. This is the case especially if the child has problems with short-term-memory (e.g., when the child finishes a long sentence and may have forgotten the beginning of the sentence because a) it took so long and b) it took so much effort to make sense of the individual words.)

### **How to help children with naming-speed deficits?**

The bad news first: Even though RAN is easy to measure, it is hard to improve. No quick tricks are available. The good news is that it is not always necessary to improve naming fluency in order to improve reading fluency. That is, usually it is more useful to improve reading fluency than to try to improve naming speed. With both skills, repetition and quantity of practice are the keys for improvement. For this reason, one of the most important things the teacher can do is to focus on motivating children by trying to find ways to make reading an appealing hobby for the child.

If the child has broader naming deficits that hamper everyday communication and written production (deficits in word-finding accuracy and productive speech), it is worthwhile (and often effective) to:

- build up associations between words and their semantic categories (e.g., classifying toys and pictures into different classes, playing My ship is loaded with . . . , a game with different categories like animals, food, clothes, etc.).
- give the child phonological or semantic prompts that help him to find the word (e.g., the beginning of the word, a semantic hint).
- encourage the child to tell more with specific question prompts.
- play story games with pictures or story cubes.

With younger children, it is important to recognise naming problems and reading difficulties and to pay attention to supporting reading fluency development. In addition, it is important to support the learning and understanding of key concepts in theoretical school subjects: underline them, explain them, and highlight the context of the concepts. Ensure enough time for repetition and review. Teaching effective reading comprehension strategies helps the whole

class, not only the child with naming difficulties.

With older children, it is also important to support their metacognitive skills so that they learn to recognise the situations where naming skills are needed and then use appropriate strategies for finding the words. It is also very important to find a way to compensate naming problems so that the children will be able to make their message understood. These compensating skills may include drawing pictures or showing them from their phone to support their story.

In addition to the references mentioned earlier, this summary is based on the clinical experience and research of neuropsychologist Riikka Heikkilä and speech and language therapist Paula Salmi<sup>34</sup>. Heikkilä, R. (2015). Rapid automatized naming and reading fluency in children with learning difficulties. *Jyväskylä studies in education, psychology and social research* 523.<sup>35</sup> Salmi, P. (2008). Nimeäminen ja lukemisvaikeus: Kehityksen ja kuntoutuksen näkökulma [Naming and dyslexia: Developmental and training perspectives]. *Jyväskylä Studies in Education, Psychology and Social Research*, 345..

## Working memory

*Working memory is needed in many classroom activities that involve, for example, reading, science, and mathematics. With working memory, we can hold in mind and mentally manipulate different kinds of information for short periods of time.*

### Case example

Jonathan is an eight-year-old boy struggling in reading and math. He has difficulties in following the teacher's



instructions, such as “Please leave your book on your desk, take your pencil and rubber, and come sit here in the front of the class.” He also often loses his place in complex tasks and skips important information.

There could be different kinds of explanations for his behaviour and difficulties, but one possible explanation is that he has problems with working memory (WM). But what kind of memory is WM?

### **What is memory?**

In everyday life, we can say that we have good or bad memory. By saying so, we suggest that we have one kind of memory when in reality we have different kinds of memory (or memory mechanisms or systems) that may work well or be somehow compromised<sup>36</sup>Henry, L. (2012). The development of working memory in children. Sage..

### **Structure of the memory system**

Most often we divide our memory systems into two main parts: short-term memory (STM) and long-term memory.

Let’s first focus on STM.

### **The mechanisms of STM**

STM includes two mechanisms: short-term memory and WM.

- The concept of WM evolved from the concept of STM, but in the literature these concepts are sometimes used synonymously.
- Alan Baddeley uses STM to refer to the simple temporary storage of information in contrast to WM, which implies the combination of storage and manipulation. In this definition, WM is the mental workspace. For example, we use STM in repeating number series when the teacher says 6-5-3, and the child repeats 6-5-3; but we use WM when

the teacher says 6-5-3 and child repeats 3-5-6 backwards.

- Baddeley<sup>37</sup>Baddeley, A. (2007). Working memory, thought, and action. Oxford Univ. Press<sup>38</sup>Baddeley, A. (2012). Working memory: Theories, models, and controversies. Annual Review of Psychology, 63, 1-29. started developing his model about 50 years ago, and it has gone through many revisions. It is perhaps the most elegant, research-based way to understand this part of the memory system.

Readers who are interested in learning what kind of structure and components are inside WM will find information [here](#). Information regarding the kind of psychological methods you can use in assessing WM can be found [here](#).

### **When are we using WM?**

WM is needed in many classroom activities that involve, for example, reading, science, and mathematics. In WM, we can hold in mind and mentally manipulate different kinds of information for short periods of time, for example when:

- we have to remember a PIN, password, or telephone number.
- we try to remember spoken instructions to reach a specific location.
- we remember difficult, new foreign language names.
- we remember the right numbers and how we should manipulate these numbers in different arithmetic and calculation tasks.
- we try to estimate how much the items in our shopping basket will cost in total.

### **Limits of WM**

The capacity of our WM is limited, and distractions (such as something unexpected happening in our environment or unrelated thoughts popping into mind) may disturb it. WM may also fail if a task is too demanding and requires very difficult mental processing or we try to keep too much information in mind.

There are also individual differences in WM capacity. We know, for example, that the difference in WM capacity among children of the same age can be very large. According to Gathercole and Alloway<sup>39</sup>Gathercole, S.E., & Alloway, T.P. (2006). Practitioner review: Short-term and working memory impairments in neurodevelopmental disorders: diagnosis and remedial support. *Journal of Child Psychology, Psychiatry, and Allied disciplines*, 47,1, 4-15., in a class of 30 children aged 7 to 8 years, we would expect at least 3 of them to have the WM capacities of an average 4-year-old child, while 3 others would be expected to have the WM capacities of an average 11-year-old child, which is close to an adult level.

Read more about the WM in deaf children [here](#).

### **How to identify WM problems**

A child in your class may have WM problems if he or she exhibits the following characteristics:

- The child has difficulties in repeating sentences.
- When you give instructions, the child may forget some parts.
- The child may have difficulties keeping his or her place (e.g., in writing).
- The child may forget the content of messages and instructions.
- The child may lose his or her place in complicated tasks.
- The child may have problems in learning basic reading and math skills, with particular difficulty in reading

comprehension.

However, it is not easy to know whether the basic problem is short attention span or whether there is a problem with the child's WM.

### **The importance of monitoring**

By observing the children in your class, you may recognize when a particular child's WM is overloaded. For example, if sentences to be repeated are too long and complicated, the child may forget important information. Strategies to help the child include repeating instructions, especially when you notice that all children are not listening carefully, and breaking tasks into smaller steps.

### **Understanding demands on WM**

Difficult and new, complicated tasks increase WM loads, and children may need more help for these tasks than for easy tasks.

- If a task involves a lot of verbal material and long instructions to keep in mind, it may be difficult for the child who has WM problems (e.g., verbal arithmetic tasks or instructions with multiple steps: *First do this, then this, and after that this and that.*)
- Situations in which the child has to change focus as, for example, from the white board to the paper when copying sentences may be very demanding.

### **Reducing WM loads**

There are many strategies you can use to reduce WM loads:

- Shorten sentences in your instructions or in writing tasks.

- For activities involving sentences, reduce syntactic complexity and/or increase the familiarity of the vocabulary.
- Try to combine new material with familiar so that it is easy for children to remember.
- Try to use short, simple sentences.
- Use pictures or comics, which may help children remember multistep instructions.
- Use computer games, which may have positive effects on WM as many such games require WM.
- In arithmetic lessons, you can use number lines or different kinds of concrete materials like blocks and sticks, cards, etc., that may reduce memory load.
- Rehearsing aloud or silently is a very good way to help children keep verbal material in WM.
- Find ways for children to mark their progress in complex tasks.

It is important to show and teach children how these aids can be used. Ensure that they have plenty of practice in the use of the aids prior to using them in more complex task settings.

These tips are based on Gathercole and Alloway<sup>40</sup>Gathercole, S.E., & Alloway, T.P. (2006). Practitioner review: Short-term and working memory impairments in neurodevelopmental disorders: diagnosis and remedial support. *Journal of Child Psychology, Psychiatry, and Allied disciplines*, 47,1, 4-15.<sup>41</sup>Gathercole, S. E., & Alloway, T.P. (2007). *Understanding working memory. A classroom Guide*. London: Harcourt Assessment..

### **Direct WM training – Does it help?**

- Because WM is so important in learning, there are many studies that have researched WM enhancement by direct training, most often with computer-aided methods.

- The initial studies were quite optimistic that these methods can boost WM and in this way also improve learning and school performance<sup>42</sup>Klingberg, T. (2010). Training and plasticity of working memory. Trends in Cognitive Sciences,14, 317-324.
- However, the benefits of that training rarely transfer to other activities that also depend on WM
- There are also studies showing promising results for non-computerized interventions. According to the review by Rowe, the most effective tasks are executive-loaded, i.e., they tap into attentional resources under executive control (e.g., listening recall, odd one out, backward digit recall, verbal and visuospatial dual tasks, and word list updating). The studies suggest that indirect WM tasks, cognitively demanding physical activity, fantastical play, and inhibition training benefit executive-loaded WM.
- More research is needed to make final conclusions, but the latest research<sup>43</sup>Gathercole, S. E., & Alloway, T.P. (2007). Understanding working memory. A classroom Guide. London: Harcourt Assessment. suggests that training-induced transfer occurs only when we have learnt a new complex cognitive skill in the course of training and that skill can be applied to a novel task.

## Linguistic memory

*Linguistic memory is our ability to store and recognize common linguistic patterns, word parts (or morphemes), and high-frequency words. It leads to greater word recognition and reading fluency.*

### Memory

Memory is the process in which information is encoded, stored,

and retrieved. In the first stage, *encoding* (or registration, receiving, and processing received information) allows information to reach our senses and changes it so that we can put it into the encoding process. *Storage* (the creation of a permanent record of the encoded information) is the second memory process, and it entails retaining information over periods of time. The third process is *retrieval* (to call back the retrieved information from storage in order to use it). We must locate the information and return it to consciousness.

## **Levels of memory**

*Sensory memory* involves the storage of sensory events, those events that are perceived by any of the five senses in real time and automatically. It holds sensory information less than one second. Short-term memory and working memory are described in detail [here](#). *Sensory memory*, *short-term memory*, and *working memory* have strictly limited capacity and duration, which means that information is not retained there indefinitely. *Long-term memory* can store much more information for a potentially unlimited duration during our life, and its capacity is immeasurably large.

## **Linguistic memory**

Linguistic memory is our ability to store and recognize common linguistic patterns, word parts (or morphemes), and high-frequency words. It leads to greater word recognition and reading fluency. Research shows that children with reading disabilities need forty-plus exposures to a word before it is stored as a recognizable "whole word," whereas normally developing readers only need ten-to-fourteen exposures. Children with reading disorders such as dyslexia also have trouble noticing and recognizing the distinct parts of words and the underlying linguistic and phonological patterns in words. They need explicit instruction to acquire these patterns and to match them to words with similar patterns already stored in memory.

In memory research, the concept of verbal memory is also quite often used. It is a rather broad concept that refers to memory for verbally presented information. There are a variety of tasks for measuring verbal memory capability, including learning word lists, story recall (or logical memory), and learning sequences of paired words.

### **The role of memory in learning a language**

There are two kinds of languages that many peoples learn during their lifetime. The first language (L1) is our mother tongue, the language we first hear and acquire after birth. The second language (L2) is the language we learn after we have mastered our first language. An important point is that we acquire rather than learn the first language, whereas we learn rather than acquire the second language. When we learn the second language, linguistic memory plays a very important role. Memory is also a factor that can be used to predict the performance of a child learning a foreign language. Verbal working memory and short-term memory have important roles in vocabulary acquisition, language production, and language comprehension, as well as in learning to read.

## **Research briefs**

[Working Memory, Long-Term Memory, and Language Processing: Issues and Future Direction](#)

[Interventions Targeting Working Memory in 4-11 Year Olds within Their Everyday Contexts: A Systematic Review](#)

[Training Working Memory of Children with and without Dyslexia](#)

## **Additional reading**

[Working Memory in Deaf People](#)



## Practical tips

[Training in Short-term Memory](#)

## Read more

[Understanding Working Memory Assessment of Working Memory](#)

# Listening comprehension

*Listening skills and academic success or knowledge are closely connected since listening is an important medium for children to process and acquire information. Listening skills are the primary means by which information is transferred from teachers to children, and they play a key role in literacy success and the development of numerous other language skills, such as reading comprehension and writing skills.*

## Listening skills

Listening is one of the four language skills, along with speaking, reading, and writing. Good listening skills are of critical importance in daily, relational, and educational life. Primary school children spend approximately 50–75 percent of each school day listening to teachers, classmates or audio-supported media. Consequently, proficient listening is an essential language skill for primary school children for various reasons<sup>44</sup>Bourdeaud'hui, H., Aesaert, K., Van Keer, H., & van Braak, J. (2018). Identifying student and classroom characteristics related to primary school students' listening skills: A systematic review. *Educational Research Review*, 89-99.:

1. Listening skills and academic success or knowledge are closely connected since listening is an important medium for children to process and acquire information. Listening skills are the primary means by which information is transferred from teachers to children. If children listen effectively, they are able to follow a line of reasoning, monitor their understanding, and actively connect new information to their prior knowledge.
2. Listening skills play a key role in literacy success and the development of numerous other language skills, such as reading comprehension and writing skills.
3. Children also need listening skills to understand practical oral instructions from the teacher, such as for homework assignments.
4. Listening skills are fundamental for the development of social and relational skills in the school context (e.g., during group discussions, literary conversations).

### **Listening comprehension**

The role of oral language in literacy development is very important. Oral language includes lexis (words), sentences, and discourse-level skills. The meaning of vocabulary has received much attention in theoretical models and empirical studies of reading. In contrast, our understanding of listening comprehension has been limited. Listening comprehension is defined as one's ability to comprehend spoken language at the discourse level – including conversations, stories (i.e., narratives), and informational texts – and involves the processes of extracting and constructing meaning. Listening comprehension has important meaning both for literacy acquisition and reading comprehension. We can conclude that the ability to listen and comprehend multiple utterances in spoken language is one of the necessary

component skills in reading and writing development, and oral language comprehension is also one of the essential and necessary foundational skills for reading comprehension.

### **Listening comprehension, reading, and writing**

One widely supported model of reading comprehension, the simple view of reading (**see RP xx**), specifies that linguistic comprehension is an essential skill in addition to decoding (or word-reading proficiency). Oral language skills such as vocabulary and listening comprehension are critical to reading comprehension, and their importance increases as children develop reading skills.

Oral language skills, including listening comprehension, are also important for writing development. Although oral language skills are not explicitly specified in the developmental models of writing, writing requires the generation of ideas, which then need to be translated into oral language at lexical, sentence, and discourse levels. According to the simple view of writing, transcription and ideation (the generation and translation of ideas) are two necessary skills for writing.

Theoretical models of reading comprehension and writing as well as empirical evidence indicate the importance of oral language skills, including listening comprehension, in reading and writing development. One question that naturally arises, then, is what it takes to develop listening comprehension<sup>45</sup>Torppa, M., Georgiou, G.K. Lerkkanen, M-K., Niemi, P., Poikkeus, A-M., & Nurmi, J-E. (2016). Examining the simple view of reading in a transparent orthography: a longitudinal study from kindergarten to grade 3. *Merrill-Palmer-Quarterly*, 2, 179-206..

### **Listening comprehension sub-skills**

Based on correlational and intervention research, the most

important sub-skills of listening comprehension are<sup>46</sup>Kim Y.S.G., Pilcher H. (2016). What Is Listening Comprehension and What Does It Take to Improve Listening Comprehension? In: Schiff R., Joshi R. (eds) Interventions in Learning Disabilities. Literacy Studies (Perspectives from Cognitive Neurosciences, Linguistics, Psychology and Education), vol 13. Springer, Cham.<sup>47</sup>Kim, Y-S., & Phillips, B. (2014). Cognitive Correlates of Listening Comprehension. Reading Research Quarterly, 3, 269-281.<sup>48</sup>Kim, Y.-S.G. (2016). Direct and mediated effects of language and cognitive skills on comprehension of oral narrative texts (listening comprehension) for children. Journal of Experimental Child Psychology, 141, 101-120.:

- *Memory* (working memory and long-term memory)
- *Inference-making* (An inference is an idea or conclusion drawn from evidence and reasoning. An inference is an educated guess.)
- *Comprehension monitoring* (teaching children to monitor their understanding of the text, even if it means rereading or asking questions about the text in order to fully understand the meaning of the text). Comprehension monitoring is the ability to evaluate one's own comprehension of a text. For instance, when children listen to the following short story, individual differences are found in their ability to detect an inconsistency in the story: *Johnny loves to play outside. It is nice and warm today. When Johnny asked his mother if he could go out and play, his mother said it was too cold to play outside.* Studies have shown that many children, particularly struggling readers, fail to understand what they read and are not aware of their failure.
- *Knowledge* such as background or world knowledge
- *Linguistic knowledge* (vocabulary, syntactic knowledge)
- *Theory of mind* (the ability to infer others' mental

states and predict behaviour, e.g., *What is the girl in this story thinking or how is she feeling?*)

Many studies indicate that these language and cognitive skills are related to children's listening comprehension. The same processes are also related to reading comprehension in all languages.

### **How to teach listening comprehension**

Listening comprehension is not a simple skill that children acquire easily. Instead, it requires acquisition and coordinated application of multiple language and cognitive skills. Improving listening comprehension requires explicit and systematic instruction beyond vocabulary. Explicit instructional attention to vocabulary, syntactic and grammatical structure, inferences, characters' thoughts and emotions, and comprehension monitoring is needed.

The good news is that these skills, like skills related to vocabulary, are malleable. Studies have shown that grammatical knowledge, comprehension monitoring, inference-making, and theory of mind can be improved with intervention<sup>49</sup>Bourdeaud'hui, H., Aesaert, K., Van Keer, H., & van Braak, J. (2018). Identifying student and classroom characteristics related to primary school students' listening skills: A systematic review. *Educational Research Review*, 89-99.<sup>50</sup>Connor, C.M., Phillips, B.M., Kaschak, M. et al. (2014). Comprehension Tools for Teachers: Reading for Understanding from Prekindergarten Through Fourth Grade. *Educational Psychology Review*, 3, 379-401..

- One challenge in listening comprehension instruction is how to teach these multiple language and cognitive skills in a limited and overloaded school day and in classrooms with too many pupils. The theoretical models

and the practical constraints of school days indicate that an *integrated approach*, incorporating these multiple skills into single lessons rather than targeting each skill in separate lessons, is best. For instance, good vocabulary instruction includes information about the syntactic features of target words and their uses in sentences.

- Reading comprehension lessons can easily incorporate language and cognitive skills, and book reading can incorporate and target multiple language and cognitive skills systematically and explicitly.
- Teaching a verb would involve not only teaching the meaning of the verb but also whether the verb requires an object and how it is inflected in the text
- Implicit or inferential questions requiring children to infer information either from an earlier part of the story or from their background knowledge can be asked systematically. For example, after reading the text *It was hot and humid. Bugs were buzzing around. How annoying, thought Rachel,* the teacher may stop and ask questions such as: *What season do you think it is in the story? How do we know?*
- Theory of mind can be also incorporated into book reading as characters' and authors' thoughts, emotions, and reasoning are an important part of texts. The storyteller can tell stories and explicitly highlight the main story line and characters' thoughts and mental states.
- Comprehension monitoring can also be easily taught during book reading. At an appropriate point in a story, the teacher can stop and ask children whether the story makes sense, and if not, why it does not. At other times, the teacher can stop during reading and ask a silly question that is inconsistent with the story content up to that point. For instance, in the example story above, the teacher can state, *"Hmm . . . it must be winter in the story since it is hot and humid. Does*

*this make sense?"* and wait for children's responses.

As is clear from previous research, creating a language-rich environment is critical for children's language development, including listening comprehension. Therefore, targeting multiple language and cognitive skills should not be limited to planned lessons per se. Instead, language instruction should be embedded throughout the school day, exploiting teachable moments. For instance:

- When a child shares what he or she did on the weekend, the teacher may find another way of expressing a sentence to improve syntactic knowledge.
- The teacher may ask seemingly silly questions that are inconsistent with the child's story, and remind the children that stories have to make sense to the comprehender.

In a similar vein, listening comprehension instruction should not be limited to the classroom. Ideally, these instructional approaches and strategies are shared with parents and caregivers so that they are implemented and extended in the child's home and community.

### **Raising standards for understanding**

A critical aspect of teaching these multiple language and cognitive skills is raising standards of search after meaning (coherence). Higher-order cognitive skills (e.g., inference-making) are effortful and strategic processes and thus may not be employed, even if the child has the ability, unless the child has a need or a desire for establishing a global search after meaning. Thus, an important part of higher-order cognitive skill instruction is raising standards of coherence – raising awareness that the stories or sentences children hear should make sense to them, that it is important to understand a character's or author's goals, thoughts, and

emotions, and that stories do not tell us everything and, therefore, comprehenders should fill in information.

Being aware of these ideas will require instruction for many children as children do not spontaneously monitor their comprehension of oral texts.

### **It takes time to learn listening comprehension**

Improving listening comprehension takes a prolonged time and, thus, instruction should be long-term across multiple years. As multiple language and cognitive skills contribute to listening comprehension, the development and coordination of these skills is not likely to occur in a short time span. Component skills of listening comprehension, such as vocabulary acquisition, are expansive and continue to grow throughout the life, and so too do listening comprehension skills. This continual growth is in contrast to a confined or constrained skill or mastery skill such as acquiring the alphabet, which has a limited number of units to be learned and can be taught to mastery in a relatively short time<sup>51</sup>Bourdeaud'hui, H., Aesaert, K., Van Keer, H., & van Braak, J. (2018). Identifying student and classroom characteristics related to primary school students' listening skills: A systematic review. *Educational Research Review*, 89-99.<sup>52</sup>Connor, C.M., Phillips, B.M., Kaschak, M. et al. (2014). *Comprehension Tools for Teachers: Reading for Understanding from Prekindergarten Through Fourth Grade*. *Educational Psychology Review*, 3, 379-401..

There are several teaching practices that could be integrated into listening courses<sup>53</sup>Bourdeaud'hui, H., Aesaert, K., Van Keer, H., & van Braak, J. (2018). Identifying student and classroom characteristics related to primary school students' listening skills: A systematic review. *Educational Research Review*, 89-99.:



- First, children remember more facts from auditory texts when they receive instruction in the specific structure of the text type (i.e., narrative or expository strategy instruction).
- Second, listening skills can be improved by applying visual techniques during listening training, such as telling stories supported by illustration or asking children to paint a picture of the main features in their mind.
- Third, listening strategy instruction positively affects listening skills. For example, teaching children different listening strategies such as listening for a purpose or predicting what could happen will improve their listening skills.
- Finally, listening skills can be improved by integrating listening activities into the entire curriculum and combining listening activities with speaking, reading, or writing activities.

When teachers give children the opportunity to practice listening throughout the day, instead of teaching listening skills in isolation, children will become better listeners. There is also evidence for the importance of adequate listening conditions in classrooms. Different studies have shown that poor acoustics and background noise cause attention loss and exacerbate listening difficulties, while systems that improve the learning environment, such as the use of an effective sound system, positively influence children's listening skills. In this respect, the findings are in line with other research that indicates the significance of classroom design and classroom equipment on children's learning outcomes. Therefore, reducing class sizes and/or investing in sound systems that improve the sound environment of the classroom will positively influence children's listening performance, especially in classrooms with a high percentage of special needs children<sup>54</sup>Lepola, J., Lynch, J.,

Kiuru, N., Laakkonen, E., & Niemi, P. (2012). Early Oral Language Comprehension, Task Orientation, and Foundational Reading Skills as Predictors of Grade 3 Reading Comprehension. *Reading Research Quarterly*, 4, 373-390.<sup>55</sup>

Torppa, M., Georgiou, G.K., Lerkkanen, M-K., Niemi, P., Poikkeus, A-M., & Nurmi, J-E. (2016). Examining the simple view of reading in a transparent orthography: a longitudinal study from kindergarten to grade 3. *Merrill-Palmer-Quarterly*, 2, 179-206..

## Research briefs

[Identifying Student and Classroom Characteristics Related to Primary School Students' Listening Skills: A Systematic Review](#)

[Language Outcomes of Contextualized and Decontextualized Language Intervention: Results of an Early Efficacy Study](#)

[Early Oral Language Comprehension, Task Orientation, and Foundational Reading Skills as Predictors of Grade 3 Reading Comprehension](#)

## Motor and Visuomotor skills

*Children need many different motor skills when they start formal schooling. Motor skills are often divided into fine motor and gross motor skills. Motor skills are closely related to many cognitive skills.*

Children need many different motor skills when they start formal schooling (e.g., self-care skills, walking and running, use of a pencil, and the manipulation of objects).

Motor skills refer to underlying internal processes

responsible for moving the body or parts of the body in space.

Motor skills include (1) movements themselves and (2) cognitive processes that give rise to the movements.

Different names may be found in the literature for motor-related skills, including perceptual-motor, sensorimotor, and psychomotor skills. All these terms are implicated when we are moving our body and our sensory perception and movement systems are working together<sup>56</sup>Magill, R. & Anderson, D. (2014). Motor learning and control. Singapore: McGraw Hill..

### **Fine and gross motor skills**

Motor skills are often divided into two types of skills:

*Fine motor skills* involve coordinating small muscle movements. Drawing, writing, speaking, manipulating small objects, or playing instruments are typical fine motor skills.

*Gross motor skills* involve the body's large muscles, the orientation and movement of the trunk and limbs, and postures pertaining to balance, such as walking, running, hopping, and playing games and sport.

### **Motor skills and school performance**

*Fine motor skills* are, in longitudinal studies, associated with academic skills like reading and math. Some studies show that fine motor skills predict stronger early math development than reading development<sup>57</sup>Kim, H., Duran, C.A.K., Cameron, C.E., & Grissmer, D. (2018). Developmental relations among motor and cognitive processes and mathematics skills. *Child Development*, 89, 476-494.<sup>58</sup>Pitchford NJ, Papini C, Outhwaite LA and Gulliford A (2016) Fine Motor Skills Predict Maths Ability Better than They Predict Reading Ability in the Early Primary School Years. *Frontiers in Psychology* 7:783..

*Gross motor skills* are important for social competencies and

physical wellbeing and make engagement in learning and social activities, like games and sports, easier in school.

The exact mechanism that links motor skills to school performance is still unclear<sup>59</sup>Claire E. Cameron,<sup>1</sup> Elizabeth A. Cottone,<sup>2</sup> William M. Murrah,<sup>2</sup> and David W. Grissmer (2016). How Are Motor Skills Linked to Children's School Performance and Academic Achievement? *Child Development Perspective*, 10, 2, 93-98..

### **Cognitive processes and motor skills**

There are different kinds of assessment methods and tools to assess motor skills or competencies. In these assessments, three processes are important:

1. *Motor coordination* means that the child must coordinate body movements in directed actions, as for self-care (dressing themselves, tying their shoes), paper-pencil tasks, or manipulating objects (using building blocks).
- *Executive functions* are needed for focusing and shifting attention, manipulating information in working memory, and inhibiting maladaptive responses to meet adaptive goals.
  - *Visuospatial skills* are for perceiving spatial relationships (e.g., in front, behind, beside) and visualizing objects using cognitive representations in two or three dimensions.

### **Motor coordination**

Many of these skills are learned and practiced at the preschool age.

Many motor tasks include numerous steps or phases that require motor planning and spatial sequencing and the use of different tools (e.g., pens, pencils, scissors, keyboards). For children who start school with these skills well developed, it is easier to be at school and concentrate on learning new skills than it is for those who struggle with these basic motor skills.

Based on research, we know that 5–10 percent of children have problems in learning new motor skills and that they are clumsier and slower in their movements than other children in the class. We now know that these children may have a neurodevelopmental disorder called developmental coordination disorder (DCD)<sup>69</sup> Missiuna, C., Rivard, L., & Polloc, N. (2012). Children with Developmental Coordination Disorder: At home, at school, and in the community (Booklet). Mac Master University and CanChild (www pages)..

### **Executive functions**

In motor tasks, children need to maintain attention on the task, as when they are copying letters or figures. Executive functions are more important when the child is practicing a new task and is very young. After practicing and learning the task, it is not new anymore and can be executed with fewer cognitive resources such as planning and attention focusing.

At the beginning of school, many motor tasks are new to the child and require a lot of executive functions and control before these skills are automatized.

We can say that a skill is automatized when the child can do it together with another task (e.g., the dual task of writing letters and words while listening to what the teacher is saying).

### **Visuospatial and visuomotor skills**

Many visuospatial skills develop quite early, before a child

starts school, and visual processing and manual control develop hand in hand.

The most typical method to assess these skills is design copying (such as the test of visuomotor integration). Copying geometric figures is based on and correlated to both perceptual skills (e.g., the ability to judge line-length, rotate visual stimuli, mentally reproduce a figure in free space) and motor skills (e.g., hand-eye coordination, the use of a pencil, the perception of the direction of movement).

Visuomotor tasks requiring the alignment of movements with perceptual input are quite complex because they require crossmodal integration of different processes (visual, motor) across different networks in the brain. It is thought that because of this complexity, visuomotor integration predicts academic achievement both in reading and maths.

### **Motor coordination, executive skills, and visuomotor skills in learning**

In learning motor coordination, executive functions and visuospatial processes are all needed in the classroom, and they work in combination with other processes (e.g., language, memory) to form a successful basis for learning in school.

Research findings show that visuomotor and executive function skills (especially inhibitory control) can compensate each other in classroom learning. Children with either strong visuomotor integration or strong inhibitory control skills learned as much in print knowledge as children who were strong in both. This compensatory pattern also emerged in phonological awareness and teacher-related classroom behaviour<sup>61</sup>Cameron, C.E., Brock, L., Hatfield, B.E., Cottone, E.A., Rubinstein, E., LoCasale-Crouch, J., Grissmer, D.W. (2015). Visuomotor Integration and Inhibitory Control Compensate For Each Other in School Readiness, *Developmental Psychology*, 51, 1529-1543..

## **How to help the child in the classroom**

In the classroom, children meet many new demands on their emerging abilities to control and regulate their emotions and behaviours, including their body movements. Significant individual differences in these abilities are very easy to see in every classroom.

Children with good fine and gross motor skills have more time to spend on other tasks, and they will experience less frustration and fewer negative emotions in the classroom.

Accordingly, children with strong attention, self-control, and working memory may engage more readily with new tasks that require increasingly complex motor skills and experience.

Fine motor skills and emerging literacy skills (reading and writing) are distinctly related. Design copying is related positively with name writing, written expression, and math.

### **Seven important keys for teaching fundamental motor and visuomotor skills**

There are seven important keys for teaching fundamental motor and visuomotor skills: <sup>62</sup>Landy, J.M., & Burrige, K.R. (1999). Fine motor skills & handwriting activities for young children. Teaching, remediation and assessment. USA: The center for applied research in education

*Show enthusiasm, care, and interest.* Without these qualities, teachers won't be as effective as they could be.

*Use visual demonstration with instruction whenever possible.* Teachers may even need to physically move the child through some of the actions.

*Give praise, encouragement, and feedback.* These strategies are essential parts of the learning process. Good feedback – information about what the child has done, to aid his or her

improvement – is essential. For example: “I watched the way you held the ball correctly in your fingers,” or “That was great effort; this time let’s put your other foot forward.”

*Create a positive, fun learning environment.* Sometimes teachers get preoccupied with telling the child what he or she is doing wrong or what he or she has not done instead of focusing on what the child should be doing. And has been doing well. A positive comment indicates approval to a child; the child can then develop trust and a willingness to keep trying.

*Keep information simple and easy to follow.* Teaching by small-step progression is ideal. Progress may be a lot slower than expected, and so patience definitely becomes a virtue.

*Keep the practice sessions short but frequent.* By keeping the sessions shorter, you can ensure that physical and mental fatigue do not become factors and that the child’s interest level is sustained.

*Avoid showing frustration – be patient.* If you feel frustrated, imagine how the child must feel. Frustration on your part is easily picked up by the child and compounds difficulties. Try saying, “I think this is a good place to stop for today. Let’s continue tomorrow.”

### **Some specific tips and suggestions for motor skill teaching**

*Ensure that the child is positioned properly for desk work.* His or her feet should be flat on the floor, and the height of the desk should allow the child’s shoulders to be relaxed with forearms comfortably supported on the desk.

*Set realistic short-term goals.* This will ensure that both the child and educator continue to be motivated.

*Provide the child with extra time to complete fine motor activities, such as math, printing, writing a story, practical science tasks, and artwork.* If speed is necessary, be willing



to accept a less accurate product.

*Help with tasks that require fine motor skills.* If lessons include using scissors, folding paper, or any other task that might cause a child with motor difficulties to struggle, provide plenty of assistance and try to introduce the child to the activity beforehand so that he or she has a chance to practice and get familiar with the physical manipulations required.

*Emphasize directions in step-by-step form.* Going over task directions and requirements several times is crucial. Try to write task instructions in short sentences and use checklists for assignments with multiple parts. Demonstrating a task and reading directions out loud, in addition to providing a printed version, is helpful for all children as it clarifies the task and ensures that everyone is on the same page.

*When copying is not the emphasis, provide the child with prepared worksheets that will allow him or her to focus on the task.* Examples include prepared math sheets, pages with pre-printed questions, or fill-in-the-blank exercises for reading comprehension. For study purposes, photocopy notes written by another child.

*Have children use pencil grips* if they seem to help improve pencil grasp or to reduce pencil pressure on the page.

*Use paper that matches the child's handwriting difficulties.* For example, use 1) widely spaced lines for a child who writes with very large lettering; 2) raised, lined paper for a child who has trouble writing within the lines; 3) graph paper for a child whose writing is too large or improperly spaced; 4) graph paper with large squares for a child who has trouble keeping numbers aligned in mathematics.

*Focus on the purpose of the lesson.* If a creative story is the goal, then accept messy handwriting, uneven spacing, and multiple erasures. If the goal is to have the child learn to

set up a math problem correctly, then allow time to do it even if the math problem does not get solved.

Provide additional time for tests and exams that require a lot of written output.

## References

### Research briefs

[Learning Letters with the Whole Body: Visuomotor Versus Visual Teaching in Kindergarten](#)

[Effect of Fine Motor Skills Training on Arithmetical Ability in Children](#)

[Playing Action Video Games Improves Visuomotor Control](#)

### Read more

[DCD Booklet](#)<sup>63</sup> © C. Missiuna, L. Rivard & N. Pollock, 2011; CanChild Centre for Childhood Disability Research, McMaster University

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