

# Eye tracking and reading



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Did you know that the Lexplore assessment is done in just 5 minutes?

Really? Amazing!  
I can't wait to read more about this.

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# Research summary

Lexplore was founded in 2017 following a research project which began in 2007 and was conducted at the Marianne Bernadotte Centre, part of the Karolinska Institute in Stockholm. The research project was undertaken by two scientists: Gustaf Öqvist Seimyr and Mattias Nilsson Benfatto. They are also the founders of the company Lexplore. Lexplore's method of assessing reading is based upon the original data from the Kronoberg project. You can read more about the project in our Research Guide.

## What is eye tracking?

Eye tracking is a sensor technology that can detect a person's presence and follow what they are looking at in real-time. The technology converts eye movements into a data stream that contains information such as pupil position, the gaze vector for each eye, and gaze point.

Eye tracking has become an increasingly popular research method for studying the relationship between different behaviours and underlying cognitive processes, especially because it is relatively simple and entirely objective.

Our knowledge of eye movements and the insight they offer into reading is continually being developed as research continues. There are now close to 5000 published studies in this area. A search for "reading" and "eye movements" in the reference database 'Web of Science' generates approximately 3000 titles. There is, therefore, an established and well-documented correlation between the reading process and its various expressions in different eye movement patterns.

Lexplore's new technology can offer surprising insights into reading, helping pinpoint specific difficulties or problem areas in a matter of minutes using eye movement correlations. With immediate, objective and in-depth results, teachers can then make quick, evidence-based decisions to tailor support.

The logo for Lexplore, featuring the word "Lexplore" in a stylized, teal-colored font with a handwritten or brush-stroke appearance.

# Eye movements and reading

When reading - like you are now - you're probably not thinking about the complex cognitive processes which enable you to turn the words typed on a page into meaningful content. Reading fluently is the result of a complicated interplay between many linguistic and cognitive processes, which together enable children to decode text and comprehend written content. Learning these processes can be extremely difficult; children must first understand that words are composed of individual sounds – phonemes.

Children who are good readers have strong phonemic awareness, vocabularies and grammatical skills. They also understand and can easily apply alphabetic principles. There are no boundaries between the many different cognitive and linguistic processes involved in reading; all these processes form part of a much larger communication network and occur simultaneously.

As an adult, these processes often occur subconsciously, meaning reading can often be confused as something which comes naturally for human beings. In reality, it involves many complicated processes which children must master.

**Our eye movements really do tell a lot about our reading skills!**

**I'm curious how this can be measured! I have to keep on reading...**

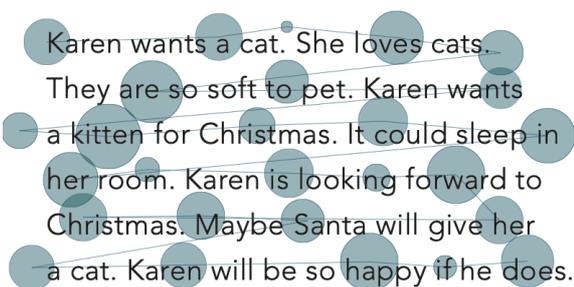
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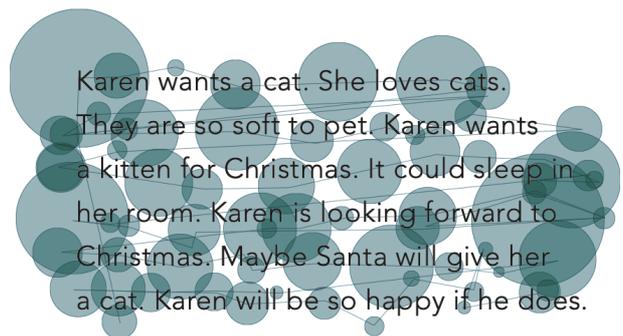
# Measuring the eye movements

To measure how effectively the many involved processes work together, we use the latest eye tracking technology. By measuring where, when and how the eyes move in relation to the words you read, we can gain a unique insight which immediately reflects the complex cognitive and linguistic interplay occurring. This insight is entirely spontaneous and reflects natural reading without the influence of any external factors. To ensure that we also measure beyond the technical side of reading, we also include comprehension questions to assess whether pupils have understood the content they have read.

Below you can see the visual representation of the reading process, showing the eye movements of a strong reader (left) and a weaker reader (right).



Karen wants a cat. She loves cats.  
They are so soft to pet. Karen wants  
a kitten for Christmas. It could sleep in  
her room. Karen is looking forward to  
Christmas. Maybe Santa will give her  
a cat. Karen will be so happy if he does.

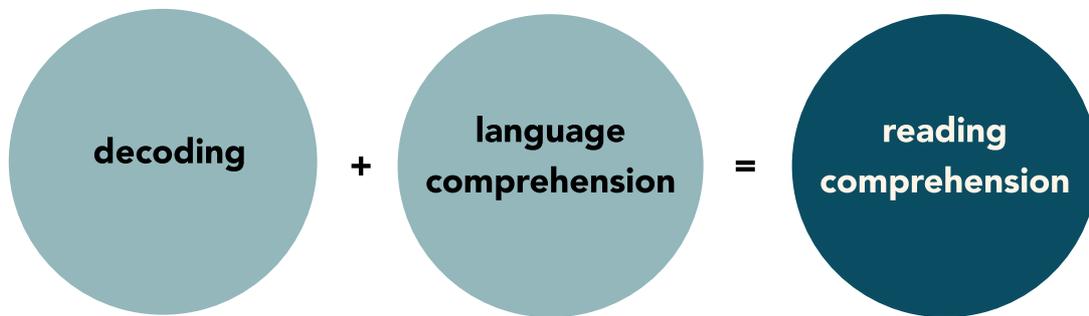


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## Key



# The definitions of reading



## The Simple View of Reading

Decoding + language comprehension = reading comprehension.

According to "The Simple View of Reading" (Gough & Tunmer, 1986), the goal of reading is comprehension, and this is defined as a product of decoding and language knowledge. Decoding refers to the process of converting letters, phonemes and graphemes into words and content which can be understood, whilst language knowledge refers to the processes involved with understanding words and being able to determine their context in written material. Although this model of reading may seem simple, it has been shown in several studies to hold a strong empirical base (Kirby & Savage, 2008). Differences in decoding skills and language knowledge can also contribute to variations in children's comprehension skills; especially when children are still learning to read (Tilstra et al., 2009).

The Lexplore practice and teacher guides are based on the simple view of reading.

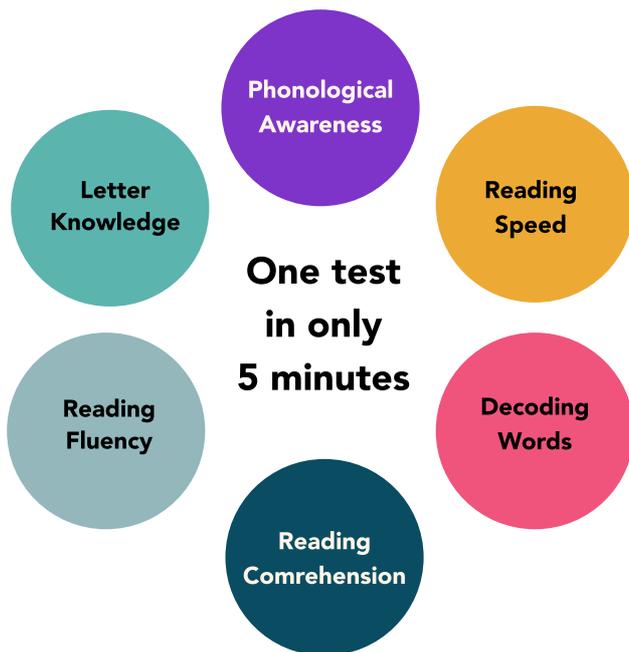
I hear you say the simple view, but I'm sure it's more complex...

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# Insights from Lexplore

The relationship between comprehension and children's foundational decoding and language skills enables us to use eye movement analysis to study how the many different processes involved with reading work together for a child to read with proficiency, fluency, and comprehend content. Our assessment is only 5 minutes long and give you information about:



There are several studies which demonstrate the importance of including reading speed in the calculation of reading attainment (Deno et al., 1982; Fuchs et al., 1988; Silverman et al., 2013). Reading speed not only demonstrates how effectively the underlying processes involved with reading work, but also how they interact. By using the insights eye movements can offer, Lexplore's method is able to look beyond reading as simply a product of comprehension, or a measure of speed, and instead as a very fine and complex interplay between many different processes. These processes are often difficult to assess using traditional, one-dimensional paper-based tests.

By including simple comprehension questions, the Lexplore assessment is able to provide a truly unique insight into the many different components which make a strong reader. Teachers can then use results to tailor support quickly to the needs of every child in the classroom.

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# Reading for growth

Reading with fluency means that pupils can effectively use their skills of decoding and language knowledge to move effectively and proficiently through a text. Reading with fluency can also be the result of a child developing strong sight-reading skills. As children move into secondary education, more emphasis is placed upon comprehension, especially when it comes to assessment. Many subjects become much more content heavy. Literacy issues need to be spotted at the earliest opportunity so children can receive the support they need to succeed in the classroom.

Definitions of reading from PISA and PIRLS also stress the importance of children's comprehension skills and ability to reflect on the content they have read (The National Agency for Education, 2017). Once children can reflect on texts, they can read to achieve, develop their knowledge and participate in society.



## **UN Sustainable Development Goals and Lexplore**

To ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, is the UN Sustainable Development Goal #4. The importance of literacy for succeeding in school and in life are well known. Lexplore aims to be a part of advancing access to literacy and with that making the world a better place, one reader at a time.

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