

# Completely Illiterate Adults Can Learn to Decode in 3 Months

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The purpose of this case series was to explore whether adults who did not have the opportunity to acquire reading skills during childhood were able to do so rapidly if trained with an adequate literacy programme. After 14 weeks of training with a new, optimised, literacy course based on cognitive research, 6 out of 8 participants were able to read words they had never encountered.

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The purpose of this case series was to explore whether adults who did not have the opportunity to acquire reading skills during childhood were able to do so rapidly if trained with an adequate literacy programme. After 14 weeks of training with a new, optimised, literacy course based on cognitive research, 6 out of 8 participants were able to read words they had never encountered. They also showed enhanced phonemic sensitivity and phonological memory. Thus, there is no major plasticity

impediment preventing the rapid eradication of illiteracy in adults.

- According to the most recent worldwide data for 2005–2014, 15% of people aged at least 15 years lacked any reading and writing skills (UNESCO, 2016).
- This high rate is mainly explained by the lack of adequate learning opportunities.
- Due to socioeconomic or cultural reasons, many people do not attend school during childhood, or they only go for some months or years on an irregular basis.
- Literacy and schooling are considered human rights, thanks to the growing recognition that adult illiteracy often condemns the individual to poverty, poor health, and social exclusion (not only the adults but also their children).
- Although reading can clearly be taught to adults, only a few learners become fluent readers at the end of a literacy course.
- The available evidence does not support the assumption that there is a sensitive period for reading development during childhood or even until at least middle adulthood.
- The scarcity of information in the majority of adult literacy studies concerning instruction methods, time devoted to instruction, and the level of ability before and after instruction, makes it difficult to assess the effects of literacy programmes rigorously.



## **Present study**

The authors of the present study elaborated a new literacy

course aimed at optimising reading acquisition and applied it to a small group of completely illiterate women, while fully controlling the instruction provided and repeatedly measuring its effects.

### **The literacy course principles**

Literacy for illiterate adults (LIA) is based on the phonics approach, with four overarching principles:

1. To develop comprehension of the alphabetic principle; namely, that letters (alone or in combination [graphemes]) stand for phonemes;
2. To teach the orthographic code; namely, the correspondences between graphemes and phonemes (GPCs) in a progressive way from the simplest to the most complex, capitalising on current knowledge about the possible stumbling blocks in reading acquisition;
3. To teach lower- and upper-case letters in parallel; and
4. To combine reading and handwriting activities systematically.

### **The literacy course outline**

- The phonics approach is reported to elicit the best results among both children and adults.
- Reading an alphabetic script is contingent on understanding the alphabetic principle, while phonemic awareness develops hand in hand with the acquisition of this principle as illustrated by the fact that it is virtually absent in illiterate adults.
- LIA combines opportunities for insight and learning of GPCs of increasing level of difficulty, which is the best way to teach word decoding.
- Initially, student attention is directed to the phonological length of word pairs displaying an incongruent relation to the size of the referents as well as to the number of syllables included in these

words, and their associated articulatory gestures.

- Next, LIA relates the notion to the length of written words, illustrating that phonologically longer words need (in principle) more letters to be written than phonologically shorter words.
- After exercising this approximate correspondence, each syllable is isolated in turn, illustrating the left-right directionality of reading/writing (a notion that illiterate adults also lack).
- Still in the first lesson, phonemic awareness and the understanding of the alphabetic principle are then promoted by insisting simultaneously on sounds, articulatory gestures, and letters.
- The understanding of the alphabetic principle is then tested using new consonant–vowel (CV) combinations.
- To decode implies to master the language’s orthographic code.
- The order of GPCs teaching in LIA obeys five principles:
  - Phoneme accessibility: from the easiest to the most difficult
  - Degree of consistency: from higher to lower
  - Grapheme complexity: from simpler to more complex
  - Visual difficulty of letter recognition: from letter pairs of higher to lower visual discriminability
  - Phonological structure: from simpler to more complex syllabic environment
- The course is subdivided into 17 modules of increasing complexity; each module is taught in 2 or 3 lessons for a total of 41 lessons and corresponds to the introduction of 1 (or more) GPCs, concepts, or orthographic rules.
- For instance, the first two modules (five lessons) focus exclusively on the acquisition of the alphabetic principle and therefore only present simple letters.
- Inconsistent GPCs are introduced in Module 3 together with unstressed vowels and a new structure.
- Some simple contextual and positional rules are

introduced in Modules 4–6, together with simple digraphs.

- New graphemes and syllabic structures are added progressively; however, plosives and mirrored letters do not appear before Modules 11 and 12, respectively.
- The 17<sup>th</sup> and final module is devoted to highly inconsistent letter(s).
- The third overarching principle of LIA (that lower- and upper-case letters are taught in parallel) was motivated by the fact that mastering the alphabet requires the acquisition of abstract letter units to consider as identical symbols that may be physically quite different.
- The last overarching principle (that reading and handwriting are taught and exercised jointly throughout the course) was not meant to allow written production to develop substantially in the very short instruction that was used. However, training handwriting may benefit reading acquisition.

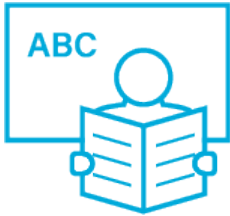
### **Assessing the effectiveness of LIA**

- LIA was applied to 8 illiterate women for 3 lessons (of 2 h each) per week over 14 weeks.
- Each lesson (except the first) began with revision.
- Students also received homework.
- Participants were tested before, during, and after the course.
- Tests included students' letter and complex grapheme knowledge, their ability to match letters across case, their reading and meta-phonological abilities, and phonological memory.



## Findings

- All participants learned to recognise single letters.
- Performance was lower on complex graphemes with two participants still struggling after the course, although progress was significant.
- Matching physically different letters was initially easier for letters that are similar across case than for dissimilar ones; however, this difference decreased over time.
- Post-intervention, progress in reading was robust except for one participant who did not learn to read at all. Among the others, there were strong individual differences in overall reading scores after the intervention, ranging from 43% to 88% for words presented in the classroom, and from 21% to 85% for new words.
- Individual progress was sounder for upper- compared to lower-case items, and for old compared to new words.
- Still, performance on both new and old words was far from perfect after the intervention as most students still struggled with items including a nasal digraph.
- Performance significantly improved for two of the three meta-phonological tests (namely, phonemic sensitivity and syllable deletion); however, not for the more difficult phoneme deletion test (except for one participant).



## **Conclusions and implications**

- Overall, the LIA course yielded a significant improvement in almost all the evaluated abilities.
- Throughout the learning period, there was a steady increase in the knowledge of simple letters and to a lesser (but still significant) extent of complex graphemes.
- At any test session, performance improved only for the studied GPCs. For these, progress was rapid and was maintained at further testing sessions.
- The students (entirely illiterate at the beginning) clearly learned to decode, an indispensable condition to becoming autonomous readers.
- Many new words were read perfectly post-intervention, which shows that students developed a genuine decoding ability rather than resorting to whole-word pattern recognition.
- Nevertheless, as expected, words that had been presented in the classroom were read slightly better than new words, although the difference post-intervention was not significant.
- Reading new pseudowords remained slightly more difficult than reading new words, and clearly more difficult than reading words that had been presented in the classroom.
- Scores in meta-phonological tasks increased through successive test sessions.
- Performance on syllable deletion and phonemic sensitivity began to improve even before learning to read, which is consistent with the idea that those abilities may benefit from such learning whilst not depending on it.

- Large individual differences were observed in participant learning curves, with individual performance remaining near 0 or increasing by 60% or even more than 90%, in particular for knowledge of complex graphemes and word reading.
- Only one student failed to learn to read at all; she was the oldest (64 years old) and least motivated of the participants.
- The present results clearly show that a total of 82 h training delivered throughout 3 months is insufficient to progress beyond slow and effortful decoding.
- This is particularly relevant considering adult literacy courses are often quite limited in instruction time.
- Longer and more intensive training is most likely required to become a fluent reader.

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# Adult Literacy Benefits? New Opportunities for Research into Sustainable Development

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This article briefly reviews progress in adult literacy, touches on existing perspectives on literacy, and illustrates



four recent sources of information useful in the revitalised agenda offered by the United Nations (UN) Sustainable Development Goals (SDGs). By integrating literacy into the SDGs, literacy researchers can reveal the channels through which literacy can contribute to social welfare and transformation.

**Author: David Post**

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This article briefly reviews progress in adult literacy, touches on existing perspectives on literacy, and illustrates four recent sources of information useful in the revitalised agenda offered by the United Nations (UN) Sustainable Development Goals (SDGs). Data from the Programme for the International Assessment of Adult competencies (PIAAC) study conducted by the Organisation for Economic Co-operation and Development (OECD), the World Values Survey (WVS), and the World Bank's Skills Toward Employment and Productivity (STEP) study are now available to researchers who wish to link educational change with attitudinal and behavioural change. Another important resource are the emerging data on mobile learning. By integrating literacy into the SDGs, literacy researchers can reveal the channels through which literacy can contribute to social welfare and transformation.

- While literacy rates increased sharply during the 1960s and 1970s, progress toward the elimination of adult illiteracy proved elusive over the years since the World Conference on Education for All (EFA) in Jomtien (1990) and the World Education Forum in Dakar (2000).
- As the 2015 EFA Global Monitoring Report demonstrates, only a few countries with comparable data have succeeded in reducing adult illiteracy by 50% since 2000.
- Literacy seems to be diminishing within the world agenda

for change.

- Even using 1990 as a reference point (rather than 2000), estimates by the UNESCO Institute for Statistics (UIS) show there has been a far smaller reduction in adult illiteracy than was hoped in low-income countries with comparable indicators of adult literacy.
- According to a UNESCO survey (2015, 2016), more women across cohorts over time could correctly read a sentence; however, this appears to be simply because more girls are finishing primary school as opposed to more adults learning to read.
- In most countries, literacy within a birth cohort stagnated or even declined over time.
- The stalled progress of literacy programmes has been accompanied by two newer conceptual developments: one stressing the varied contextual meaning and purposes of literacy, and the other viewing all educational change through the lens of human rights rather than as factor of economic production.

### **Some benefits of literacy**

- Literacy benefits not only the individuals, but also their families and children.
- Maternal literacy is the channel through which mothers improve their children's health outcomes.
- More literate mothers tend to adopt a pedagogical stance with their children, talking to them more frequently during their school years.
- Literacy offer the capability to change.
- Where there is capability, the individual can do what they want to do (whether at home, in the workplace, in a social or political context, or as support for further learning).

### **Sustainable Development Goals**

- UN SDGs integrate literacy into broader global progress than was the case with previous goals.
- Although adult literacy receives little special attention within SDG 4 (*'Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all'*), target 4.6 aims for a substantial proportion of adults to achieve literacy and numeracy (UN 2015).
- Target 4.7 focuses on the social consequences of education and on education as prerequisite for progress towards other goals.

### **Cross-national surveys available for a revitalised literacy agenda**

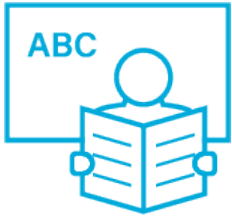
- From 2010 to 2014, a consortium of social researchers designed and conducted the sixth wave of the World Values Survey (WVS 2014).
- Survey respondents who self-reported as literate were much more likely to claim they were in good or excellent health, compared with those who said they were illiterate.
- In addition, literate individuals who interact in literate environments typically place trust in a wider circle of people than people who report themselves to be illiterate.
- Beyond trusting one's own neighbourhood, respondents who were literate were more often trusting of people of different religions and nationalities.
- Those who identified as literate were more likely to prioritise the environment over economic growth.
- By contrast, respondents who did not identify as literate were much more likely to favour economic growth over environmental protection.
- The PIAAC Round 1 survey was conducted from 2008 to 2013 in 24 countries.
- Like the patterns that emerged from the WVS, the PIAAC

survey shows that individual literacy levels are associated with possible social consequences such as political efficacy and civic engagement.

- Greater literacy skill levels have independent positive effects on such outcomes, such as adult willingness to engage in the political process, political efficacy, trust, and good health.
- A third, newly available source of information for cross-national investigations into the benefits of literacy is the STEP study (World Bank 2014).
- Respondents' reports of the amount of text they read were related to their increased openness to new experiences.

### **Mobile reading and M-learning**

- Researchers can now use the experience of mobile reading to investigate consequences relevant to the SDGs.
- For example, mobile phone activities and learning exercises, when added to an adult education programme in Niger, improved outcomes for reading and numeracy significantly more than among students in programmes without mobile phone exercises.
- Mobile phones have the potential to alter the *amount* of reading and the *type* of reading that takes place.
- Mobile phone-related reading is less likely to be national and more likely to be global in terms of origin of material.
- According to a UNESCO survey (2014), most respondents reported enjoying reading even more after they started reading on their mobile phones, regardless of their initial attitudes toward reading.



## **Directions for future research on the SDGs and the benefits of literacy**

- Researchers should welcome the new vision on the consequences of literacy implicit in the SDGs.
- The SDGs can refocus research attention on the consequences of education, including the consequences of literacy.
- It is important to uncover ways in which adult literacy benefits both individuals and their societies.
- The Dakar Framework for Action argued that ‘the vital role literacy plays in lifelong learning, sustainable livelihoods, good health, active citizenship, and the improved quality for individuals, communities and societies must be more widely recognised’ (WEF 2000).

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# **Neo-literate Adult Dyslexia and Literacy Policies: A Neurocognitive Research Review of a Curious Unexplored Phenomenon**



There are approximately 750 million illiterate adults globally who could (in principle) learn fluent reading. However, adult literacy programmes have thus far performed poorly. The author posits the hypothesis that all people become dyslexic toward new alphabets at the approximate age of 19 years, and the ability to read new alphabets fluently decreases with age.

**Author: Helen Abadzi**

Source: Abadzi, H. (2019). Neo-literate adult dyslexia and literacy policies: A neurocognitive research review of a curious unexplored phenomenon. *Current and Critical Issues in Curriculum, Learning and Assessment, in progress-reflection nro 29*, IBE/2019/WP/CD/29.

There are approximately 750 million illiterate adults worldwide who could (in principle) learn fluent reading. However, adult literacy programmes have thus far performed poorly. In this paper, the influence of some neurocognitive factors on poor adult reading performance is explored. Automatic readers of a script detect letters and words effortlessly and involuntarily. Adults learning a new script detect letters slowly, may make mistakes, understand little, soon abandon the task, and may also forget what they have learned. When a neo-literate person (a person who does not yet know how to read the alphabet) glances at a text, they may only see a jumble of letters and may only process some of the features. They must activate reading consciously and sound out each letter. Their difficulties are perceptual, and interviews suggest that perceptual distortions may continue for decades. This phenomenon termed 'neo-literate adult dyslexia' (NAD) has received little attention to date. The problem occurs in the

brain, and may originate at the early stages of development of the parietal cortex at the dorsal reading path, which constricts short-term visual memory. Parts of the visual cortex (the striate cortex V1, and perhaps the extra-striate cortex V4) may also be involved. Deficits affect the ventral path that provides parallel processing and direct print-to-meaning reading. Some neuronal groups may have a sensitive period that affects the capacity to collect frequency data and to integrate the appropriate features of letters and words. Then, adults do not learn to perceive letter shapes and words as easily as most children do. These difficulties for adults are not linguistic. Dysfluent readers simply cannot decipher the symbols within a sufficient time to acquire the meaning of texts (or they do so after considerable conscious visual effort). Some adults may become better readers than others. However, there seems to be a correlation between learning a script at increasingly later ages and worse reading outcomes, although no data exists to map this trajectory. To explore this curious phenomenon, this review brings together a range of insights from of neurocognitive research, notably studies on a) perceptual learning, b) neurocognitive studies aimed at dyslexic children, c) studies of adult suffering from brain damage that causes alexia, and d) performance of adult literacy programmes. The author posits the hypothesis that all people may become dyslexic toward new alphabets from the approximate age of 19 years, and that ability to read new alphabets fluently decreases with age.

## **Background**

- Global adult literacy has increased from 56% in the 1950s to 86% in 2015.
- However, while this growth reflects the impact of children's schooling, it disguises the existence of some 745 million adult illiterates worldwide (mostly women) who have never been to school, and others who may have dropped out of school before learning to read fluently.

- Developing functional, usable, literacy for adults is the United Nations' Sustainable Development Goal 4 (target 4.6).
- The goal is to ensure that all youth, and a substantial proportion of adults, achieve literacy and numeracy by 2030.
- Many illiterate people are older, but a generation of illiterate school leavers is in the making.
- Schools in poor countries often use languages and teaching methods that require parental support and/or offer few books for reading practice.
- Some academics and donor staff found the concept of dyslexia for normal adults implausible or unbelievable.
- They tended to attribute the issue of illiteracy to social disadvantage, and the difficulties of educated adults to poor command of language or low personal motivation.

### **The neo-literate adult dyslexia hypothesis**

- This article posits that all people potentially become dyslexic toward new alphabets at approximately 19 years of age, and this difficulty increases with age.
- The difficulties are not linguistic.
- Language competence seems to have little relationship with the visuospatial tasks described in this document.
- Dysfluent readers cannot decipher symbols in sufficient time to ascertain the meaning of texts (or do so after considerably conscious visual effort).
- When beginning learners try to learn a language while trying to decipher a script, the process is clearly difficult and time consuming.
- An extensive research review attempts to integrate studies on a) perceptual learning, b) neurocognitive studies aimed at dyslexic children, and c) studies of adults suffering from brain damage that causes alexia.



## Observations by an 'illiterate' reading specialist

- Since 1992, the author has interviewed and given informal reading tests to dozens of educated people who (as adults) learned various languages (such as Hindi, Arabic, Japanese, and Russian) with scripts different from those studied as children.
- The author did not encounter anyone who had learned a script beyond the age of 19 who claimed completely effortless reading.
- Interviews and tests were also given to two individuals who learned Hebrew reading as children and who read fluently despite a lack of language knowledge.
- Interviews and personal experiences suggest that acquisition speed decreases in mid-adolescence.
- Capacity for fluent and effortless reading seems to wane significantly by 19 years.
- Most people interviewed over time read slowly (approximately 10–20 words per min).
- These individuals cannot read involuntarily as automatic readers do.
- They must activate conscious pronunciation of the letters in their heads.
- Slow and effortful decoding fills working memory with letters and limits comprehension.
- The prevalence of illiterate reading specialists is noteworthy.
- Unless these specialists were native readers, nearly all remained illiterate in terms of the written (rather than spoken) word.
- Perennially slow and inaccurate reading (neo-literate) people may read too slowly for regular speech; hence, a delay results and the prediction of the word may be completely inaccurate.
- Illiterate adults seem to forget sound–letter correspondences within a few weeks when reading due to difficulty remembering letter shapes and sound

correspondences in the long term.

- Letter neighbourhoods and locations matter along with independent letter identification, and only a few letters can be read 'in real time' before making a mistake due to systematic neglect of certain letters.
- Regarding feature integration difficulties and ambiguities, incorrect priming from meaning results in features that should correctly identify a word being neglected. This error may not be noticed until a sentence is incomprehensible and requires a second attempt.
- Some letters may be recognised faster than others, while letters with many features similar to others that require comparison are detected more slowly than letters that share few features.
- Reliance on unusual letter shapes means that unusual characteristics at a certain location can facilitate distinction.
- In general, people read longer words more slowly resulting in exaggerated word length effect.
- Increased practice in one script may speed up others.
- There may be an occasional and inconsistent activation of the print-to-meaning pathway.
- Perennially slower identification of letters representative of non-native sounds may occur.
- Difficulties in calligraphic reading is present.
- Awkward handwriting occurs.

### **The basic neuroscience of reading**

- Many neuro-imaging studies have explored the brain regions involved with reading in both dyslexic and non-dyslexic children and adults.
- Findings show that specialised brain regions work together to form a reading network.
- As children learn how to read, the brain rewires itself so that one area working on visual matters and another

working on auditory matters work together as a cohesive unit.

- From the eye receptors, a signal traverses the superior colliculi and pulvinar nuclei to the occipital lobe (the striate cortex [V1] area), then travels through paths that recognise shapes toward the parietal lobe, which connects letters to sounds to find meaning in the medial temporal lobe.
- As visual information exits the occipital lobe, it follows two main pathways (or streams).
- The ventral stream (also known as the 'what pathway') is involved with object and visual identification and recognition.
- The dorsal stream ('where pathway' or 'how') helps process the object's spatial location relative to the viewer and with speech repetition.
- The dorsal pathway stretches from the primary visual cortex (V1) in the occipital lobe forward into the parietal lobe. It is interconnected with the parallel ventral stream, which runs downward from the V1 into the temporal lobe.
- The ventral pathway identifies complex multipart objects. Words are encoded through a posterior-to-anterior hierarchy of neurons tuned to increasingly larger and more complex word fragments, such as visual features, single letters, bigrams, quadrigrams, and possibly whole words.
- Data from children support the proposed distinction between the phonologically mediated dorsal pathway and the direct print-to-meaning ventral pathway.
- As children become better readers, reliance shifts from the dorsal to the ventral pathway.
- Visual working memory is critical for many tasks in the parietal lobe.
- This type of memory permits the maintenance of object identities and their locations across brief delays, such as those accompanying eye movements.

- The parietal lobe may have a general role in remembering various types of visual information, mainly motor spatial attention and spatial memory.
- Beside the cortical structures involved in reading other areas also play a role.
- The pulvinar of the thalamus sends signals about sudden, unpredicted, motion in the environment to the cortex.
- Neuroimaging studies show early involvement of the thalamus in reading tasks before signals enter the cortex.

### **The role of implicit memory in reading**

- Long-term memory is divided into two systems: a) explicit or declarative conscious recollections of events and facts, and b) implicit memory; instructions on how to do things.
- Explicit memory includes personal recollections (episodic memory) and conscious knowledge of facts (semantic memory).
- Implicit memory includes memory of procedures (procedural memory), priming, conditioned responses, and habituation to the environment; social learning and adaptive imitation also form parts of procedural memory.
- Implicit memory reconfigures functional networks of the brain early on, creating focal points at the cerebellum, the basal ganglia, and related subcortical structures.
- One important feature of implicit memory is task specification, which suggests that training for one script does not transfer to another.
- Letters and words taught to adults seem not to transfer completely into implicit memory; rather, they remain in semantic memory, which is vulnerable to forgetting.

### **Statistical learning of visual stimuli**

- Statistical learning is a fundamental brain mechanism that extracts and represents regularities within our

environment.

- It results in faster and more accurate responses to high conditional probability events compared to those of low conditional probability ones.
- Neurons in the later parts in the parvocellular ventral visual stream are tuned to increasingly complex combinations of visual features; they are related to the extraction of regularities from the visual environment (often without awareness) and they can identify which image features tend to appear together.
- For dyslexic people, the impairment limits their ability to identify which visual features tend to go together. Thus, neurons in the ventral visual stream usually shaped by such learning will not effectively support visual word and object recognition.
- There is a positive link between reading ability and statistical learning in the general population.
- Neo-literate adults experience difficulties related to statistical learning and possibly prediction of speed.

### **Perceptual learning: letters as objects, then words as faces**

- Perceptual learning is a sustainable, long-term performance improvement of a perceptual task following training or visual experience.
- Perceptual learning effects are best understood as a change in the ability of higher-level integration or association areas to assimilate sensory information in the service of certain decisions.
- Perceptual learning seems to have an evolutionary value for animals and mainly occurs without effort in the implicit memory system.
- People typically think of reading in terms of language; however, reading is a perceptual process.
- In nearly all writing systems, visual stimuli must be coupled with associated sounds.
- Perceptual learning competently links visual symbols and

sounds, particularly when they demonstrate one-to-one correspondence.

- Fluent reading requires unambiguous deciphering of a text in milliseconds.
- A temporal window in early life exists, which is a critical period during which the visual system is highly plastic; it is subject to a major rewiring that leads to the acquisition of important visual abilities.
- However, it is possible for an adult to acquire a new skill after the critical period.

### **Feature integration in perceptual learning**

- Spatial attention seems to bind visual object features that co-occur at the same location and integrate them into a coherent object representation.
- When multiple objects are simultaneously present in a scene, the visual system must correctly integrate the features associated with each object and separate them.
- The processes underlying feature integration create a *gestalt* phenomenon: circles that are almost closed are seen as completed, and interrupted lines are seen as whole; bottom-up processing evolves into holistic processing as different parts are joined into a whole.
- Aging brings about changes in the ability to concentrate on one item while ignoring others.
- Age also seems to restrict visual working memory; thus, fewer features are identified at one time and whole shapes may not be easily detected.
- Line terminations and horizontals appear to be the two most important features for letter identification.
- The multiple accounts of inefficient reading acquisition beyond adolescence suggest the existence of a sensitive period affecting the early parts of the visual system, feature integration, or face recognition.
- Sensitive periods affect certain perceptual and motor skills early in life.

- Higher-order functions pertaining to abstract thought (such as analysing or learning grammatical rules) are not particularly sensitive to increasing age.
- The hypothesised sensitive period(s) affects implicit memory; thus, the reduced plasticity of a low-level function may affect complex behaviours upon which it depends.
- A sensitive period for reading automaticity is reminiscent of language learning in childhood.
- Many people who learn of neo-literate adult dyslexia (NAD) believe it should be expected given the difficulties experienced by adults when learning languages.
- Effortless, implicit, language learning during youth declines, but explicit memory and complex cognition can take over.
- Processing speed peaks in a person's late teens and starts to decline at approximately 25 years.
- Visual reproduction peaks before the age of 20, while visual search and short-term memory for faces and family pictures and visual recognition all peak at approximately 20 years.
- Research shows the involvement of the visual word form area (VWFA) of the fusiform gyrus in recognising words (reading), musical notation, and numbers.
- The face recognition function provides flexibility in recognising words; we identify cursive and decorative letters, just as we identify people in profile and sideways (with or without long hair).
- In all cultures, people use the same brain structures to read.
- Depending on the orthographic depth and type of script, the activation patterns may differ, although the same principles apply.
- Approximately the first 170 ms of the process are visual; linguistic information and comprehension are added about 0.5 s later.

- From the VWFA, electrochemical signals of the visual stimuli move to areas connected to phonology and to meaning; fluent readers receive almost instant feedback about sounds and meaning through recurrent loops.
- The neural signature of dyslexia is a disruption of the posterior reading system.
- Some research suggests that developmental dyslexia involves deficits arising from the workings of the magnocellular layers of the lateral geniculate nuclei in the dorsal visual pathway.
- People with dyslexia have disruptions in the connectivity of neuronal bundles of neurons that link the visual cortex to the VWFA.
- Dyslexic readers are impaired in their recognition of faces and other complex objects and show hypoactivation in ventral visual stream regions that support word and object recognition.
- People with dyslexia tend to present early signs (such as white-matter deficits) in children that are clearly not shared by non-dyslexic readers.
- Illiterate people who perform worse than those who are literate on visuo-spatial tasks and who exhibit less consistent visual scanning paths demonstrate difficulties in discriminating between mirror images. They maintain a holistic mode of visual processing rather than adopting analytic strategies.

### **Performance of unschooled illiterate people during or after reading instruction**

- When illiterate adults are taught, their brain reorganises to accommodate the new skill; however, the activation patterns only partly resemble those of individuals who learned literacy during childhood.
- Illiterate adults can learn to decode, but can only read laboriously and deliberately.
- Most studies show that the ventral pathway is not



engaged (or is engaged insufficiently); the VWFA is not consistently or sufficiently activated.

- Some studies show that reading speed is related to the intensity of arousal observed in the VWFA.
- Moreover, brain imaging demonstrates that neo-literate people engage brain areas associated with effortful serial reading of letters, much like dyslexic people.
- In comparison to childhood literates, neo-literate adults demonstrated anatomical connections linking the left and right angular and dorsal occipital gyri through the area of the splenium of the corpus callosum; it was found that white matter in these brain regions was more dense in late-literate than illiterate people.
- Some studies revealed decreased grey matter intensities in functionally illiterate people compared to normal readers in several reading-related brain regions, such as the superior temporal gyrus, supramarginal gyrus, and angular gyrus.
- The findings suggest that poor literacy skills are associated with several structural abnormalities in reading-related brain areas.
- This also suggests that adults who read fluently, but slowly, may improve reading skills with training; then, structural brain differences disappear.

### **Educational programmes for teaching illiterate adults: results**

- Poor results in adult literacy instruction appear to be due (in part) to ineffective instructional methods.
- Generations of university students have been trained in the belief that adults are self-directed learners who need a facilitator rather than a teacher.
- One common sense idea has been to focus on the meaning of texts and their relevance in adults' lives.
- Textbooks are typically short, with large pictures and small letters, and learners are often encouraged to talk

about their social situations rather than read.

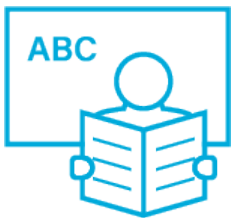
- For example, a UNESCO-sponsored Freirean method (REFLECT) in Burkina Faso saw learners score 2.4 out of 10 in text reading.
- Many studies have shown that instruction on individual letters and associated sounds engender much better results than an early focus on meaning.
- Better reading performance depends on phonological awareness, letter recognition speed, and verbal reasoning.

### **Where are neo-literate adult dyslexia deficits located? Some hypotheses**

- When children start reading they rely on the dorsal pathway.
- As they attain fluency, processing shifts to the ventral pathway that offers a direct print-to-meaning connection.
- The dorsal pathway locates the symbols in space and sequence. This seems related to phonological activation (letter-by-letter reading).
- The dorsal stream relies on the right parietal lobe, which is critical in visual working memory.
- It is possible that a restriction of visual short-term memory results in fewer features being identified at one time after a certain age.
- The origin could be at an early stage in the visual system; for example, the lateral geniculate nucleus and the V1 area of the occipital lobe. This area is activated by spatial cognition tasks and episodic memories and is heavily implicated in both spatial and object-based forms of contextual/predictive processing and associative learning in scene perception.
- A critical area may lie between the thalamus and along

the dorsal path, including the input neurons from the thalamus to the parietal cortex.

- It is also possible that it could be in the spatial attention network of the parietal cortex.
- The parietal cortex is involved in spatial attention and binds features into larger shapes when the features are shown simultaneously at different locations.
- Another suspect area may be the ventral occipitotemporal cortex that integrates visual input with higher-order experiences.
- Furthermore, temporoparietal connectivity may develop deficits.



## **Conclusions and implications**

The research highlights some issues that are relevant to policy and instruction, as follows:

- Difficulties with literacy are perceptual rather than linguistic.
- The suspected problem seems to lie somewhere along the dorsal stream.
- A sensitive period may involve declining circuits but also oscillations of brain waves that are out of sync with the neuronal groups where a signal is to be transmitted.
- Interviews with educated neo-literate adults suggest that the problem becomes significant by the age of 18 years approximately and deteriorates thereafter.
- Clearly, some people perform better than others, as suggested by perceptual learning research.

- Larger visuospatial memory may help, and some people may have better genetic connectivity among various regions.
- A slightly larger VWFA and/or an enhanced ability to recognise faces may compensate for upstream deficits.
- Exceptional executive functions and perseverance may also help maintain effort.
- The qualitative information available on educated readers and quantitative data on unschooled neo-literate people who have sought to learn to read suggest that we all become dyslexic toward new scripts by the age of 19 years approximately.

### **Instructional and policy implications**

- Research suggests that because of being unschooled earlier in life, illiterate adults have shorter working memory, phonological awareness deficits, and language processing limitations.
- They are often poor and from rural populations.
- Given current knowledge, hundreds of practice hours are needed to automatise a script, and learners may possess neither the time nor the materials.
- Complicated literacy instruction requires extensive training of poorly paid instructors who may be expected to plan lessons, complete administrative tasks, and test students, while often being poorly educated themselves.
- To avoid these problems later in life, children should acquire fluency by mid-adolescence.

### **Potential remedies for performance improvement**

- Hundreds of practice hours are needed to streamline the output of brain circuits that carry the various signals.
- Transparent orthographies are clearly the simplest to teach and practice.
- Reading instruction should build and optimise each of the tasks that seem to affect the dorsal stream.
- This suggests first adopting approaches that optimise

visual perceptual processes and matching them with sounds until they are automatised, taking only a few milliseconds to process.

- Intensive courses involving extensive perceptual learning practice (longer than 30 min at a time) with short breaks are recommended.
- Learners should spend most class time in individual practice and do homework if possible.
- Teaching and practicing letters, one by one is recommended.
- Every learner should have a textbook with (for example) 10,000 words of text in spaced and large letters from which to practice.
- It should be ensured that characters are large and spaced, gradually decreasing in size over time.
- Repeated reading practice is required to increase speed.
- Practicing within 3.5 hours following formal class instruction may facilitate consolidation.
- Using mnemonics and memorisation techniques to facilitate long-term consolidation (at least in explicit memory) is recommended.
- Multisensory methods, such as touching letters in relief, help adults connect shapes and sounds more than just visually.
- Focusing on stimuli for extended periods is recommended.
- Learners should practice extensive writing, including copying and dictation.
- Facilitating feature integration by guiding students to letter locations is important for discrimination.
- Using computer media can help as many techniques and methods are best delivered through computers, cell phones, and tablets.
- The dorsal system should be prepared for reading through exercises to detect coherent dots motion.
- Learners should practice perceiving moving small objects in low-contrast lighting conditions.
- Fast action videogames may evoke emotions and thus

consolidate shapes into implicit memory.

- Stimulating the vagus nerve may speed up consolidation of individual letters.
- Auditory practice of the same skill is recommended to continue learning.
- In the past, essential fatty acids have been shown to offer some effectiveness in improving children's reading skills.

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# Why Do Children Differ in Their Development of Reading and Related Skills?

eTale 2022



Modern behavioural genetic studies of twins in the United States, Australia, Scandinavia, and the United Kingdom show that genes account for most of the variance in children's reading ability measured at the end of the first year of formal reading instruction. Although strong genetic influences do not reduce the importance of environment for reading development in the population (and therefore for helping struggling readers), the efficacy of setting the same minimal performance criterion for all children is called into question

by these findings.

**Authors: Richard K. Olson, Janice M. Keenan, Brian Byrne, & Stefan Samuelsson**

Source: Olson, R.K., Keenan, J.M., Byrne, B., & Samuelsson S. (2014). Why do children differ in their development of reading and related skills? *Scientific Studies of Reading*, 18(1), 38–54. DOI: 10.1080/10888438.2013.800521

Modern behavioural genetic studies of twins in the United States, Australia, Scandinavia, and the United Kingdom show that genes account for most of the variance in children's reading ability measured at the end of the first year of formal reading instruction. Although strong genetic influences do not reduce the importance of environment for reading development in the population (and therefore for helping struggling readers), the efficacy of setting the same minimal performance criterion for all children is called into question by these findings.

- Why do children differ in their development of reading and related skills?
- Answers to this question have been predominantly environmental, including preschool language and print exposure, the quality and quantity of reading instruction in school, peer and family influences, socioeconomic status (SES), and learning to read in a second language.
- This environmental focus is understandable because reading is a learned skill that initially depends on formal instruction.
- A different perspective on the aetiology of individual differences in reading and related skills has been provided by behavioural genetic studies that compare similarities between large samples of identical (monozygotic or MZ) and fraternal (dizygotic or DZ) twins who share their home and school environment, yet

differ in their additive genetic similarity (100% for MZ pairs, 50% of segregating genes for DZ pairs).

### **General qualifications and limitations of twin research**

- They are assessments of the sources of variance between individuals in a sample, not mean performance of that sample.
- Estimates of genetic and environmental influence are specific to the behaviourally-relevant environmental range in the sampled population.
- Behavioural genetic studies only describe the average current balance of genetic and environmental influences on individual differences within a sample; they do not specify the genetic and environmental aetiology for any individual in that sample.
- Estimates of genetic and environmental influences do not speak to the possibility of changing the average reading level in a population.
- Genes are expressed through environment.

### **The genetic and environmental aetiology of reading disability**

- DeFries and Fulker (1985) recognised that the continuous normal distribution of reading ability in the population could be used to support a continuous regression method for assessing the average genetics and environmental aetiology of twins' reading disability, based on the similarity of the MZ and DZ co-twins' regression to the population mean.
- In behavioural genetic studies, additive genetic influence is labelled as A, shared environmental influence as C, and non-shared environmental influence as E.
- Here, only A and C percentages are used, because E



simply equals  $100\% - (A\% + C\%)$ .

- For reading disability,  $A \sim 60\%$  and  $C \sim 30\%$ ; thus, the average influence of genes is approximately twice as strong as the shared environment.
- The genetic effect is higher in a high SES environment than a low SES environment.

### **The genetic and environmental aetiology of individual differences in reading**

- While it is important to understand the aetiology of reading disabilities, it is also important to understand the aetiology of the full normally-distributed variation in reading and related skills in the population.
- There are low-to-moderate genetic correlations between word decoding and oral language.
- For example, the genetic correlation ( $r_g$ ) between word recognition and listening comprehension is modest ( $r_g = .37$ ).
- This highlights the importance of partly independent genetic influences on paired associate learning between print and speech for the development of word recognition.
- When reading and related skills were modelled as latent traits in children aged 10 and 16 years, the latent-trait longitudinal correlations were  $r = .98$  for word recognition,  $r = 1.0$  for phonological awareness,  $r = .93$  for phonological decoding, and  $r = .95$  for spelling.
- This means that most children establish a very stable developmental trajectory for growth in reading and related skills by 10 years of age.
- At preschool, most individual differences on a print-knowledge latent trait (primarily based on letter name and sound knowledge) were due to differences in shared family environment ( $A = 20\% - 26\%$ ;  $C = 62\% - 74\%$ ).
- By the end of kindergarten, most children could read enough words and nonwords that the genetic and

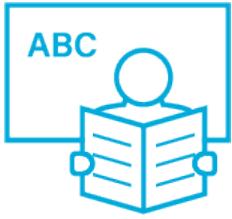
environmental effect could be estimated according to their individual differences.

- Considering regional results, those individual differences were mostly due to genes in Australia (A = 84%; C = 9%) and in Colorado (A = 68%; C = 25%); however, in Scandinavia they were mostly due to shared environment (A = 33%; C = 52%). This may be because reading is not formally taught in Scandinavia until the first grade.
- However, after all children had received a year of formal reading instruction, genetic influence was approximately as strong in Scandinavia (A = 79%; C = 7%) as it was in Australia (A = 80%; C = 2%) and in Colorado (A = 83%; C = 7%) at the end of first grade.
- The conclusion drawn from these findings is that after a year of formal reading instruction, individual differences in word reading, spelling, and reading comprehension are highly influenced by genes in these populations.
- It is recognised that environmental influences have a significant effect, as the level of reading in the population is affected by learning to read in classrooms and homes.
- When compared with the strong shared environmental influences on preschool print knowledge, it appears that formal reading instruction in schools considerably reduces the environmental variance of reading development in these populations.
- In part, schools aim to overcome the factors that produce significant differences among children before they attend school, particularly when those environmental influences are negative.



## Summary

- In summary, the question, 'Why do children differ in their development of reading and related skills?' is answered by the evidence that suggests on average, after the first year of formal literacy instruction, genetic differences between children are mostly responsible.
- In principle, twin samples with greater reading-relevant environmental variance are likely to demonstrate lower average estimates for genetic influences and higher average estimates for environmental influences on individual differences or deficits in reading.
- It is important to consider that even when behavioural genetic estimates of the average environmental influence within a sample are low, there can be extreme cases of poor reading within the sample that are entirely due to environmental influences (such as a particularly poor home, peer, or classroom environment for reading).
- The average classroom effect on individual differences in early grade reading has been consistently found to be small.
- It is recognised that extremely effective (or ineffective) teachers can have a very positive (or negative) influence that is not obvious from the very modest average influence of classroom differences on early reading development.



## Implications

- The implication for education is that depending on the severity of reading difficulties, more reading practice (possibly involving computer or tutor support for decoding difficulties) may be required for children with genetically constrained learning rates for reading accuracy, fluency, and comprehension. This will support them attaining or more closely approaching the necessary 'grade-level' criterion (average performance).
- All children should have strong support for their reading development, including the opportunity for additional intensive instruction for those with learning difficulties in reading.
- The evidence for strong genetic influences on many reading difficulties (including reading fluency, which appears most resistant to intervention) indicates that a much more nuanced approach is applied to reading ability expectations for children.
- There is evidence that some of the high genetic influence on reading ability is due to a gene-environment correlation for reading practice, further emphasising the importance of reading environment in reading development.
- Even if estimates of shared environmental variance are very low in a twin sample, this does not preclude changes in the environment for improving reading at the low end of the distribution in that sample, as well as across the whole sample.
- Thus, regardless of the levels of genetic and environmental influence in a population, there is always room for well-designed interventions (including extended

reading practice) and research should continue to explore the most effective interventions for reading difficulty and for improving literacy in the population as a whole.

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# Reading and Phonological Awareness in Africa

eTale 2022



This study examined 85 children from baseline and 2 years later. Although more unschooled children had learned to read, their phonological awareness (PA) had not generally improved. Schooling independently predicted PA and literacy.

**Authors: Katherine J. Alcock, Damaris S. Ngorosho, & Matthew C.H. Jukes**

Source: Alcock, K.J., Ngorosho, D.S., & Jukes, M.C.H. (2017). Reading and phonological awareness in Africa. *Journal of Learning Disabilities*, 1-10. DOI: 10.1177/0022219417728051

Literacy levels in Africa are low, and school instruction outcomes are not promising. Phonological awareness (PA), especially phoneme awareness, is critically associated with literacy. Our previous study found that PA was associated with

reading ability, not schooling or age. We retested 85 children from the baseline study 2 years later. We found that more unschooled children had now learned to read; however, PA had generally not improved for these children. Schooling now independently predicted PA and literacy. PA also predicted literacy and vice versa. Explicit phoneme awareness was again poor.

- Africa is the only continent where more than half of parents cannot read sufficiently well to help their children with their homework.
- Africa has 51% of the world's out-of-school children.
- Phonological awareness (PA) is a multicomponent skill that has been strongly linked to the development of word reading.
- In this study, PA is an abbreviation of phonological awareness; phoneme awareness was not abbreviated.
- A recent, large-scale meta-analysis by Melby-Lervåg, Lyster, and Hulme (2012) found that the concurrent relationship between phoneme awareness and reading was stronger than the relationships between rime awareness/working memory and reading, and independent of relationships between rime awareness/working memory and reading.
- Literacy may to some degree be a prerequisite for gaining phoneme awareness.



## **The study**

In this study, the same cohort of children in Tanzania that were part of a baseline study who were previously either in or out of school were followed up two years later. We aimed to

determine whether children's initial literacy skills continued to be the only influence on their PA at follow-up, or whether schooling, children's age, or initial PA skills now influence PA skills independently.

### *Hypothesis*

- *Literacy at baseline (Time 1) will predict PA after 2 years (Time 2).*
- *PA at Time 1 (T1) will predict literacy at Time 2 (T2).*
- *Age and school instruction will not have an independent relationship with PA over and above literacy.*

### **The sample**

Of the original sample of 101 children in Tanzania, 85 were tested on reading and PA at T1 and T2. Children were 10–13 years old at T2.



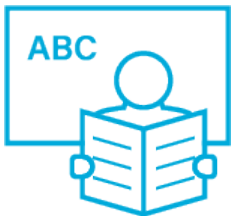
### **Findings**

- Some children who could recognise letters and/or words at above-chance levels were currently out of school, including those who had never been in school.
- Children currently in school scored significantly better than those out of school on some (but not all) PA tests.
- Age was not related to PA task scores.
- Even at older age when most children are competent word decoders, very few children appeared to be able to segment phonemes.
- Children who have never been in school seem to make very limited improvements in PA over time.
- T1 PA and schooling independently predicted T2 PA.

- PA and schooling predicted T2 reading.

## Summary

- Almost every child was at T2 when they were 10–13 years old, and a functional “decoder” in this regular orthography (Kiswahili), whether or not they had been to school. This confirms our prediction that literacy would have improved at T2 even among children who had never been to school.
- Children both in and out of school can benefit from self-teaching through phonological recoding.
- It seems that children who are in school are better at PA tasks in general than those who are not in school.
- All children continued to perform poorly specifically on a proxy measure for explicit phoneme awareness.



## Implications

- Children can gain some PA skills (including some phoneme manipulation skills) before attending school and/or learning to read.
- Some PA skills will fail to improve among children who are out of school, even though the majority would be accurate word decoders at age 10–13 years.
- Without literacy, PA in general and phoneme awareness in particular cannot be developed beyond basic levels; however, once the initial stages of literacy are gained, PA boosts literacy.
- Schooling is nevertheless increasing children’s literacy



and PA skills.

- Schooling may improve literacy and PA through additional concentrated practice, access to higher-level reading books, or explicit classroom practices.
- Literacy instruction tends to emphasise syllable (rather than phoneme) awareness.
- Children's home language skills can assist in their school learning.

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# Development of Reading and Writing Skills and Motivation in Preschool and Early School Years

eTale 2022



This study explored the progress of reading and writing skills from preschool to grade 2 among three groups: a risk group, an early readers group, and a middle group. Differences were observed between these groups through the school years in pre-reading skills, reading and spelling skills, and motivation. These skills were lowest in risk group and highest in early readers group.

**Authors: Marja-Kristiina Lerkkanen, Anna-Maija Poikkeus, Timo Ahonen, Martti Siekkinen, Pekka Niemi, & Jari-Erik Nurmi**

Source: Lerkkanen, M-K., Poikkeus, A-M., Ahonen, T., Siekkinen, M., Niemi, P., & Nurmi, J-E. (2010). Luku- ja kirjoitustaidon kehitys sekä motivaatio esi- ja alkuopetusvuosina. *Kasvatus*, 41(2), 116–128.

This study explored the progress of reading and writing skills from preschool to grade 2 among three groups: a risk group, an early readers group, and a middle group. Differences were observed between these groups through the school years in pre-reading skills, reading and spelling skills, and motivation. Parents of early readers had more positive performance expectations and beliefs about their child and they taught reading more frequently to their child.

- Preschool provides the foundation for learning to read and write by supporting children through playful activities, phonemic awareness, and letter knowledge.
- Approximately a third of Finnish children starting school already know how to read, and they remain in the region of one year ahead of others in reading speed.
- Approximately 5%–20% of children are at-risk in terms of reading difficulty.
- Letter knowledge and phonological skills predict later reading and writing skills.
- Reading comprehension depends on reading fluency. Furthermore, vocabulary and listening comprehension, deduction, metacognitive skills, and memory are all related to reading comprehension.
- Self-concept, working habits, and interests are motivational constructs related to reading.
- There is a reciprocal relationship between motivation and reading skills development.

## What is intrinsic motivation?

- This refers to motivation that comes from within an individual, such as interesting, challenging, and joyful activities that provide internal satisfaction.

## What is extrinsic motivation?

- This comes from something external, such as a reward system in a classroom, which is not related to the learning of the skill itself.



## The study

This study formed part of the larger First Steps study, in which approximately 2000 children were followed from preschool to grade 9. In this particular study, children's reading and writing skill development was monitored from preschool to grade 2 among three groups: a risk group for reading difficulty (n = 162), an early readers group (n = 469), and a middle group including all the other children (n = 1205).

### Research questions:

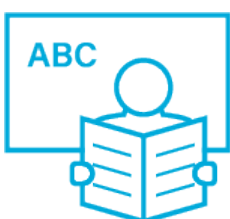
- *How do the risk and the early readers groups differ in reading and spelling skills' development and motivation?*
- *How do girls and boys differ in reading and spelling skills development and motivation?*
- *How are parents' expectations and beliefs related to development of reading and spelling skills and motivation in both the risk and early readers groups?*

The study included several assessments (on a yearly basis) of student academic performance, motivation, social skills, and wellbeing.



## Findings

- Pre-reading skills and reading and writing skills were lowest in the risk group compared to other children, and highest in the early readers group.
- The risk group demonstrated lower motivation to read and less interest towards letters and reading. They also demonstrated the lowest self-concept as learners for letters and reading, and greater avoidance behaviour towards this kind of task.
- In the risk group, girls achieved better results in letter knowledge, reading comprehension, and spelling through all years.
- In the early readers group, girls also achieved better results in listening comprehension and spelling, as well as being more interested in letters and reading.
- Parents of the children in the risk group had lower expectations for their child's achievements and abilities. They also provided less guidance to their children at home for reading.



## Implications

Children in the risk group had lower pre-reading, reading, and spelling skills, as well as motivation compared to other children. Furthermore, their parents had lower achievement expectations and beliefs as well as guiding their children less towards reading. Children in the risk group may need more motivation and individualised support at school to learn to read. Their vocabulary and listening comprehension skills should already be practiced in preschool. Risk group children (especially boys) might benefit from teaching that includes adventure, action, and movement while learning letters, phonemes, and decoding. In addition, computer-based games might help them to learn to read. One important factor in learning is the teacher–student relationship and the quality of instruction. The quality of teaching practice and emotional support affects the climate of the class and therefore also student motivation and reading skill development.

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# Early Childhood Reading Sessions Support Reading Skills

eTale 2022



The present study focused on how does the young child become excited about reading. The number of books at home, library visits, and the type of reading modelled by the parents are all important, as well as shared reading with the child. However, the child's independent reading is the most important thing.

**Authors: Marja-Kristiina Lerkkanen, Jenni Salminen, & Eija Pakarinen**

Source: Lerkkanen, M.-K., Salminen, J., & Pakarinen, E. (2018). Varhaislapsuuden lukuhetket tukevat lukutaitoa. *Onnimanni*, 1-2, 20-26.

How does the young child become excited about reading? According to our research, the home environment has an effect. The number of books at home, library visits, and the type of reading modelled by the parents are all important, as well as shared reading with the child. However, the child's independent reading is the most important thing.

- The home literacy environment is important for the child.
- A rich literacy environment provides opportunities to get to know the language.
- Finnish parents value reading. For the child, a bedtime story is read, library visits are shared, and books are available. Thus, the child is exposed to language and reading.

### **What is the home literacy environment (HLE)?**

- This refers to texts, letters, and reading-related resources and opportunities.
- This might include shared reading, the number of children's books at home, the number of library visits, and the type of reading modelled by the parents.

- An *informal* home reading environment includes parent's behaviour that indirectly provide the child with reading models.
- A *formal* home reading environment includes parent's direct acts when they direct the child's attention to texts and reading or teach reading directly.



## The study

Here, two studies are presented about the HLE of children aged 2–3 years and 6 years old and their pre-reading skills.

**Participants** in the first study were 208 parents who reported their HLE practices with their 2–3-year old children. The second study consisted of 536 children aged 6 years old and 362 parents who reported the HLE and child's pre-reading skills.

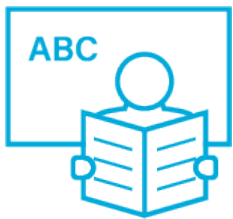


## Findings

- Most parents (>80%) read to their children at home. This is important for the child's vocabulary, attention, concentration, and motivation.
- Almost all children browsed books by themselves.
- The children aged 2–3 years looked at books more than television or mobile devices. However, those aged 6 years watched television and mobile devices more than

they browsed books.

- Almost all children visited libraries. The 6 years olds visited more often than the 2–3-year olds. Such visits are related to positive attitudes and motivation towards reading.
- About half of the 2–3-year olds had more than 10 children's books in their home, whilst 6-year olds had more than 50 books.



## **How parents can support their child's reading skill development**

- Read to their child.
- Read with their child.
- Listen when their child reads.
- Visit the library together with their child.

## **What are the benefits of reading to a child?**

- The child learns to notice the relationship between the spoken and written language.
- The child learns to notice the relationship between text and their own experiences.
- The child develops awareness of the structure of written language.
- The child develops vocabulary and comprehension of language.
- The child develops listening comprehension skills.
- The child learns the basics of reading, and may even actually learn to read.



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# Does early reading instruction promote the rate of acquisition? A comparison of two transparent orthographies

eTale 2022



This study explored the development of children's reading skills in two transparent orthographies: Estonian and Finnish. Despite Estonian children had formal reading instruction one year earlier and thus better reading skills at the beginning of school, fluency and reading comprehension skills were at the same level across both groups by the end of first grade.

**Authors: Piret Soodla, Marja-Kristiina Lerkkanen, Pekka Niemi, Eve Kikas, Gintautas Silinskas & Jari-Erik Nurmi**

Source: Soodla P., Lerkkanen, M.-K., Niemi, P., Kikas, E., Silinskas, G., & Nurmi, J.-E. (2015). Does early instruction promote the rate of acquisition? A comparison of two transparent orthographies. *Learning and Instruction*, 38, 14–23. DOI: 10.1016/j.learninstruc.2015.02.002

This study explored the development of children's reading skills in two transparent orthographies: Estonian and Finnish. Formal reading instruction begins one year earlier in Estonia than in Finland. Despite Estonian children having better reading skills at the beginning of school, fluency and reading comprehension skills were at the same level across both groups by the end of first grade. Thus, an earlier start to reading instruction in transparent orthographies does not necessarily offer any long-term advantage.

- The development of reading skills is influenced by children's pre-reading skills and several underlying cognitive antecedents, as well as teaching practices in literacy instruction.
- The timing of when proper literacy instruction commences can also have different short- and long-term effects. Although the importance of early reading instruction in kindergarten has been emphasised, there are doubts concerning its benefits for children's later reading development.
- The optimal age for reading instruction may also depend on the language.

### **Learning to read in different languages**

- Regularity and transparency of correspondence between phonology and orthography significantly affect reading in the early phase of literacy acquisition.
- Some orthographies are shallow with consistent grapheme–phoneme correspondences; others are deeper in the sense that they contain more inconsistent correspondences as well as morphological influences on spelling.
- Beginning readers using deep orthographies experience greater difficulties in decoding and a slower rate of development than those using shallower orthographies.

- The Estonian and Finnish languages share a common origin and share much in common in terms of phonology, syntax, morphology, and lexicon.



## The study

The present study compared the development of children's reading skills during the first school year in two languages with highly transparent and linguistically related orthographies: Estonian and Finnish. Estonian children are expected to have basic decoding skills before their entrance into primary school, whereas in Finland, formal literacy instruction begins in the first grade.

- *Estonian children* are expected to know all Estonian letters and be able to read and spell one- and two-syllable words before they begin school.
- *Finnish kindergarten education* should create a foundation for literacy skills, but children's reading skills are not explicitly taught. About 30% of students are decoders at the beginning of school in Finland.

**Participants** were 433 Estonian children from 22 different classrooms and 353 Finnish children from 137 different classrooms. The participants were in the first grade at school and all had attended kindergarten. Pre-reading skills (letter knowledge and phoneme awareness) were assessed in September. Word reading skills were assessed in both September and April, and reading comprehension was assessed in April.



## Findings

### Beginning of the first grade

- **Estonian students performed better than Finnish** students in letter writing, phoneme blending, and decoding.
- **Estonian children performed better than Finnish children** in word recognition and word reading fluency.

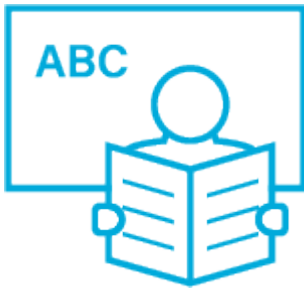
### End of the first grade

- **Finnish students performed better than Estonian** students in word recognition and word reading fluency.
- **Word reading accuracy** was high in both the Estonian and Finnish samples.
- **Reading comprehension** did not differ between Estonian and Finnish children.

## Summary

- Despite Estonian children beginning formal reading instruction one year earlier at the age of 6, both Estonian and Finnish children's reading skills were largely comparable by the final semester of first grade.
- Estonian children had better pre-reading and decoding skills as well as word recognition and fluency skills than Finnish children at the beginning of their first year at the age of 7.
- Finnish children's reading skills developed to a greater extent during the first grade.
- Reading comprehension was at a similar level for Estonian and Finnish children at the end of the first

grade.



## **Implications**

Because of the fast rate of acquisition of decoding skills in transparent orthographies, linguistic comprehension has a greater influence on reading comprehension at the end of the first grade than decoding. Because Finnish children's listening comprehension and inference-making skills are both strongly supported during kindergarten and first grade by shared reading and other activities with texts, we expect that these activities might also support the development of reading comprehension. Early reading instruction does not necessarily offer any long-term advantage for further success in reading development at school in transparent orthographies. However, support for children's general language skills and motivation toward letters and books in kindergarten (as well as overall classroom quality and the phoneme-based reading instruction at grade 1) might play a more significant role in the development of emergent reading skills.

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# **We Do Not Have Language at**

# Our House: Disentangling the Relationship Between Phonological Awareness, Schooling, and Literacy

eTale 2022



This study examined phonological awareness (PA) and literacy among 108 children aged 7-10 years, who were attending (or not attending) school in rural East Africa. Implicit and explicit PA skill with small or large units was related to letter naming ability. Basic PA develops prior to the attainment of literacy, and learning to read improves PA.

**Authors: K.J. Alcock, D. Ngorosho, C. Deus, & M.C.H. Jukes**

Source: Alcock, K.J., Ngorosho, D., Deus, C., & Jukes, M.C.H. (2009). We do not have language at our house: disentangling the relationship between phonological awareness, schooling, and literacy. *British Journal of Educational Psychology*, 80(1), 55–76. DOI:10.1348/000709909X424411

The aim of this study was to examine phonological awareness (PA) and literacy among 108 children aged 7–10 years, who were attending (or not attending) school in rural East Africa. Implicit and explicit PA skill with small or large units was related to letter naming ability. Some PA tasks were performed above chance levels by children who could not recognise letters. Basic PA develops prior to the attainment of

literacy, and learning to read improves PA.

- Phonological awareness (PA) is a metalinguistic skill that has been defined as the ability to reflect on phonological properties of words, for example, seeing similarities between words, manipulating words (including forming new words), and awareness of the constituent parts of words.
- Two hypotheses concerning the association between literacy and PA skills were included in the study: either earlier PA skills contribute to later literacy skills or earlier literacy skills contribute to later PA skills.
- If training in PA leads to improvement in reading skills, this might indicate that earlier PA contributes to later literacy skills.
- If PA can be shown to exist in individuals who have not yet learned any literacy skills, this would help discriminate between these two alternative theories.
- It has been suggested that once children learn to read, they carry out PA tasks in a qualitatively different way.

### **What is the structure of PA?**

- Metalinguistic awareness of the phonological components of words can occur at a variety of levels of representation: from small to large units, as well as sub-syllable units such as onset and rime.
- While different aspects of PA may appear to develop at different times (implying that PA is in fact a set of skills rather than a unitary ability), this may be an artefact based on the varying difficulty of different types of PA tasks.
- Factor analysis suggests that this ability is indeed a single skill, manifesting in different ways at different

developmental time points.

- Children are aware of larger unit sizes (syllables) before reading instruction; however, explicit awareness of smaller unit sizes (phonemes) usually only reaches mature levels after reading instruction has commenced.



## **The study**

This study was conducted in coastal Tanzania, where approximately 65% of children attend school. The language spoken is Kiswahili. Children are not explicitly taught the phonemes associated with letters, only the syllabic letter name. Some of the children not in school can nonetheless read, while some attending school cannot. This study examines the influence of literacy experience and skill on PA using tasks at a variety of levels of representation and variety of levels of response.

## **The sample**

108 children (54 boys and 54 girls) with between 0 and 2 years of educational experience participated in the study. They were between 7 and 10 years old and all spoke Kiswahili.



## **Findings**

- Significant numbers of children not attending school

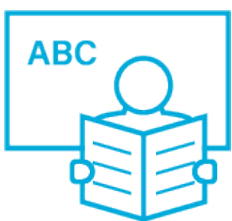


were found to perform on the letter and/or word reading tasks at levels significantly above chance.

- This finding means that it is possible to analyse the effects of schooling and of literacy skills separately.
- Non-readers performed significantly less well at all PA tasks, except counting syllables, counting sounds, and nonsense word repetition.
- Letter naming, memory, and vocabulary were significant predictors of the majority of PA tasks. However, word reading did not independently predict PA.

## Summary

Performance of PA tasks at a variety of levels of response or size of unit was related to the ability to perform on the letter reading task at above chance levels. This is consistent with the hypothesis that basic letter reading ability would influence PA. Neither verbal cognitive test performance, nor family or environmental variables explained the relationship between PA and letter naming. This might be because learning to read alters the way children carry out PA tasks. Children who have not yet learned to read are capable of performing above chance on PA tasks, but the main predictor of performance is letter naming ability, whilst some of the PA tasks appear impossible for non-readers. These results provide evidence of implicit PA and some evidence of more explicit PA among children who had not yet learned to read letters.



## Implications

- PA does not improve solely due to maturation.
- Some level of PA, including some phoneme awareness, develops before children learn to read; however, that literacy acquisition is necessary for further development of PA.
- All children performed very poorly on the most explicit phoneme manipulation task (phoneme segmenting), although children who could read letters performed better.
- Thus, although children (even those children who could not yet read letters) do have some PA, they may not have explicit phoneme awareness.
- For explicit phoneme awareness tasks, knowing how to read letters is a necessary, but not sufficient, condition for success.

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# **The Role of the Home Environment in Phonological Awareness and Reading and Writing Ability in Tanzanian Primary School Children**

eTale 2022



This study examines the role of the home environment in children's literacy skills for a sample of 75 grade 2 children from rural eastern Tanzania. Fathers' education and mothers' occupation were strong predictors of phonological awareness and reading and writing.

**Authors: Damaris Ngorosho & Ulla Lahtinen**

Source: Ngorosho, D., & Lahtinen, U. (2010). The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary school children. *Education Inquiry*, 1(3), 211–234. DOI: 10.3402/edui.v1i3.21943

This study examines the role of the home environment in children's literacy skills for a sample of 75 grade 2 children from rural eastern Tanzania. Most of the factors studied were significantly related to phonological awareness and reading and writing. Fathers' education and mothers' occupation were strong predictors of phonological awareness and reading and writing. Home environment variables accounted for 25% of the variance in phonological awareness and 19% in reading and writing ability.

- It is well known that the home environment is one of the most important factors influencing the development of a child's language and literacy skills.
- Socioeconomic status and home literacy environment are related to children's phonological awareness and reading and writing ability.

### **What is phonemic awareness?**

- This refers to the ability to identify, think about, and manipulate the individual sounds in words.
- It has importance for the development of early reading skills.

## What does home environment refer to in the context of this study?

- Socioeconomic status (parents' education, occupation, and income)
- Physical objects, such as housing variables
- Literacy-related activities in the home, e.g. book reading

## What is Kiswahili?

- This is a language of the Bantu group spoken in areas of East Africa.
- It is a regularly spelt language with almost all letters corresponding to only one Kiswahili sound.



## The study

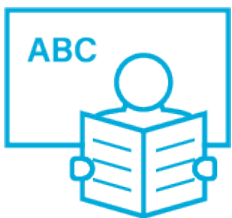
The aim of this study was to identify specific aspects of the home environment that predict children's phonological awareness and reading and writing ability in Kiswahili in Tanzania.

**Participants** were 75 grade 2 children aged between 8 and 10 years. The selection of the children was guided by their fathers' education. The idea was to find fathers with a variety of education levels. Children's phonological awareness and reading and writing ability were tested, and their female guardians participated by completing a questionnaire-based interview. All measures were designed in Kiswahili.



## Findings

- A majority of mothers had primary-level education, with only 4% being educated to secondary level or higher.
- House-building materials and domestic facilities were of a fairly low standard.
- Only 5% of families had three or more books for school subjects.
- Fathers' education and occupation, mothers' occupation, house building material, and domestic facilities were significantly correlated to phonological awareness, reading, and writing.
- Home environment variables explained 25% of the variance in phonological awareness, whilst fathers' education and mothers' occupation were the main predicting variables.
- Home environment variables explained 19% of the variance in reading and writing, and fathers' education was the main predicting variable.



## Practical Implications

- It was found that various home environment variables make a significant contribution to phonological awareness and reading and writing scores.
- Results suggest a need for the government to strengthen

developing plans for improving the home environment because this plays an important role in enhancing literacy and learners' education.

- Early screening and support for children who are not developing as good readers are proposed for inclusion in educational plans and strategies.
- Activities such as children's book projects and school library facilities are suggested, aiming at supporting literacy-related activities in low income homes.